

Final Programmatic Environmental Impact Statement For The Columbia River Water Management Program

Under Chapter 90.90 RCW

Volume I

February 15, 2007
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Final Programmatic Environmental Impact Statement For The Columbia River Water Management Program

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 West Yakima Avenue, Suite 200 • Yakima, Washington 98902-3452 • (509) 575-2490

February 15, 2007

Dear interested parties:

The Washington State Department of Ecology (Ecology) has prepared and issued this Final Programmatic Environmental Impact Statement (EIS) pursuant to the State Environmental Policy Act (SEPA) (Chapter 43.21C RCW) and the SEPA Rules (Chapter 197-11 WAC). The programmatic EIS allows for early review of the Columbia River Water Management Program and is appropriately used to assist "agencies and the public to focus on issues that are ready for decision and exclude from consideration issues already decided or not yet ready" (WAC 197-11-060(5)).

The Draft Programmatic EIS was issued October 5, 2006. The public comment period was open until November 20, 2006 and extended until November 22, 2006. Public Workshops were held from 4 pm to 7 pm on October 24 in Moses Lake, October 25 in Colville, November 1 in Kennewick and November 7 in Wenatchee. Additional comments were received via e-mail and mail. The comments received are included in Chapter 8 of the Final EIS. Written responses are provided for each comment. Where appropriate, changes have been made to the EIS text in response to comments or to provide clarification or updates to information.

The Draft Programmatic EIS evaluated conceptual approaches to the development of a Columbia River Water Management Program, which implements the Columbia River Water Management Act. The Act was passed by the state legislature in February 2006. The major components evaluated in this document are storage, conservation, Voluntary Regional Agreements, instream flow, and policy alternatives for implementing requirements of the legislation. Three early implementation actions—Lake Roosevelt Drawdown Project, Supplemental Feed Route Project to supply Potholes Reservoir, and the proposed Columbia-Snake River Irrigators Association Voluntary Regional Agreement—are also evaluated. These early actions reflect a higher level of detail than the broad Management Program components, but all three will require additional project-level review under SEPA.

The Final EIS will form the basis for subsequent development of the Management Program, as well as for subsequent SEPA environmental review of individual program elements. This EIS has evaluated a programmatic or non-project action for the Management Program. It is likely that a number of the major elements of the Management Program would trigger additional project level environmental review under SEPA and/or the National Environmental Policy Act (NEPA).

Sincerely,

Derek I. Sandison
Central Regional Director
SEPA Responsible Official

FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR THE COLUMBIA RIVER WATER MANAGEMENT PROGRAM

FACT SHEET

Brief Description of Proposal:

The Washington State Department of Ecology (Ecology) was directed through the Columbia River Water Management Act (Engrossed Substitute House Bill (ESSHB) 2860) to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." Ecology is currently in the process of developing a Columbia River Water Management Program (Management Program) to facilitate implementation of the legislation. The Management Program includes administration of the Columbia River Basin Water Supply Development Account which the legislation created to fund storage, conservation, and other projects to provide new water supplies for the Columbia River Basin. The legislation also authorizes Ecology to enter into Voluntary Regional Agreements (VRAs) to provide new water for out-of-stream use, streamline the application process, and protect instream flows. This Programmatic Environmental Impact Statement (EIS) is part of the development process for the Management Program. The EIS evaluates the potential impacts of the major components of the Management Program. It also evaluates potential impacts of early actions that will be implemented under the Management Program—additional drawdown of Lake Roosevelt to supply a variety of water uses in the project area, a supplemental feed route to Potholes Reservoir, and the VRA submitted by the Columbia-Snake River Irrigators Association.

Proposed or Tentative Date for Implementation:

Implementation of the Management Program is ongoing. No specific storage or conservation projects have been identified for implementation under the Management Program. Ecology has developed the initial water supply and long-term water supply and demand forecast, which will assist Ecology in identifying and prioritizing potential storage and conservation projects. Implementation of specific future projects may require additional environmental review and permitting.

Proponent:

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Permits, Licenses, and Approvals Required for Proposal:

Because the specific nature of projects that will be proposed under the Management Program is not yet known, it is not possible to present a complete list of permits, licenses, and approvals that may be required for the components of the Management Program. It is possible, however, to identify a number of the most common types of permits, licenses, and approvals associated with water resources and habitat that would generally be required for the Management Program components presented in this document. These permits, licenses, and approvals are listed below by the jurisdictional agency:

Federal Permits, Licenses, and Approvals

Section 404 permit – U.S. Army Corps of Engineers
Section 10 permit – U.S. Army Corps of Engineers
Endangered Species Act consultation – NOAA Fisheries
Endangered Species Act consultation – U.S. Fish and Wildlife Service

State Permits, Licenses, and Approvals

Water use permit/certificate of water right – Department of Ecology
Reservoir permit/aquifer storage and recovery – Department of Ecology
Dam safety permit – Department of Ecology
National Pollutant Discharge Elimination System permit(s) – Department of Ecology
Section 401 water quality certification – Department of Ecology
Shoreline conditional use permit, or variance – Department of Ecology
Water system plan approval – Department of Health
Hydraulic project approval – Department of Fish and Wildlife
Forest practices approval – Department of Natural Resources

Local Permits, Licenses, and Approvals

Critical areas permit or approval – Appropriate local jurisdictional agency
Floodplain development permit – Appropriate local jurisdictional agency
Shoreline substantial development permit, conditional use permit, or variance – Appropriate local jurisdictional agency
Building permit – Appropriate local jurisdictional agency
Clearing and grading permit – Appropriate local jurisdictional agency

Authors and Contributors to the Programmatic Environmental Impact Statement:

The following **Department of Ecology** individuals were reviewers or contributors to the preparation of the Environmental Impact Statement:

Derek Sandison – All chapters
Bob Barwin – All chapters
Dan Haller- All chapters

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Golder Associates – Earth, Water Quality, Ground Water, Water Rights
Perkins Coie, LLP – Water Rights
R2 Resource Consultants – Fish and Wildlife
EcoNorthwest – Socioeconomics
Paragon Research Associates – Cultural Resources

Timing of Additional Environmental Review:

This Programmatic EIS has been prepared to generally address probable significant adverse impacts associated with implementation of components of the Columbia River Water Management Program. This EIS is being prepared in accordance with the State Environmental Policy Act (SEPA), and discusses actions subject to SEPA review. Individual projects associated with the Management Program will require additional environmental review when they are proposed; these projects may require SEPA compliance, National Environmental Policy Act (NEPA) compliance, or both, depending upon the implementing agency, source of funding, and/or types of permits required. Projects will be evaluated as they are developed and ready for environmental review. This could occur within the next few years for some of the early action items, or as long as several years in the future for other projects.

Public Comment Period on the Draft Environmental Impact Statement:

In accordance with WAC 197-11-455, Ecology conducted a public comment period from October 5 to November 20, 2006. Ecology received written comments from a total of 75 persons

or agencies. In addition, five people submitted oral comments at the Moses Lake public workshop. No oral comments were submitted at the other public workshops. The comments and Ecology's responses to those comments are published in Volume II of the Final EIS.

Date of Issuance of Final EIS:

February 15, 2007

Document Availability:

The Final EIS can be viewed on-line at: **http://www.ecy.wa.gov/programs/wr/cwp/eis.html**. The Final EIS can be obtained in hard copy or CD by written request to the SEPA Responsible Official listed above, or by calling 509-454-7679. Persons with disabilities may request this information be prepared and supplied in alternative formats.

Location of Background Materials:

The following documents were used as background materials for the preparation of this Final EIS. They are available on-line at the following links.

Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW. Washington State Department of Ecology. Ecology Publication #03-06-013. July 18, 2003. Available on-line at: http://www.ecy.wa.gov/pubs/0306013.pdf

Columbia River Mainstem Storage Options, Off-Channel Storage Assessment Pre-Appraisal Report. Prepared for the Washington Department of Ecology and the U.S. Bureau of Reclamation by MWH. December 2005. Available on-line at: http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/cssr_final_12062005.pdf

Odessa Subarea Special Study, Columbia Basin Project, Plan of Study. U.S. Bureau of Reclamation. February 2006. Available on-line at: http://www.usbr.gov/pn/programs/ucao_misc/odessa/planofstudy.pdf

Initial Alternative Development and Evaluation. Odessa Subarea Special Study. U.S. Bureau of Reclamation. September 2006. Available on-line at: http://www.usbr.gov/pn/programs/ucao_misc/odessa/report-alternatives.pdf

Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival. A Report of the National Research Council of the National Academies. The National Academies Press. Washington, D.C. 2004. Available on-line at: http://www.ecy.wa.gov/programs/wr/cri/Images/PDF/navscrivrpt.pdf

Draft Environmental Impact Statement: Columbia River Mainstem Water Management Program. Washington State Department of Ecology and Washington Department of Fish and Wildlife. December 2004. Available on-line at: http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/0411028.pdf

Changes to the Draft EIS:

For this Final EIS, the Draft EIS has been amended to reflect responses to comments, additional information on the Management Program and early actions, and to more clearly describe the proposal and impacts. Comments received on the Draft EIS are included in Volume II along with responses to those comments.

The major changes to the Draft EIS include:

- Figure 2-4 has been revised to more clearly indicate the proposed Supplemental Feed Routes.
- Figures 3-20 and 3-21 have been added to illustrate wildlife-related recreation areas.
- Tables S-1 and S-2 have been added to clarify the future environmental review on projects proposed under the Management Program and on early actions.
- Chapter 2 has been revised to provide additional detail about the project components.
- Section 2.1.2.5 has been revised to describe the Long-Term Water Supply and Demand Forecast that was completed following issuance of the Draft EIS.
- Section 2.1.2.6 has been added to describe the water information system.
- Section 2.2 has been revised to include changes to the Policy Alternatives.
- Section 2.3 has been added to describe Ecology's preferred alternatives for the Policy Alternatives.
- Section 3.1.3 has been added to describe the multi-jurisdictional management of the Columbia River.
- Additional information on Lake Roosevelt National Recreation Area has been added to Section 3.9.4.1.
- The role of the Spokane Tribe in the Management Program has been clarified throughout the document.
- The discussion of plants and terrestrial wildlife has been expanded in Section 3.7 and Section 4.1.1.6. A new Appendix I has been included with lists of plants and wildlife located in the project area.
- Additional economic studies have been summarized in Sections 3.8 and 4.1.1.7.
- Discussions of the affected environment and impacts have been revised throughout to reflect new information and comments on the Draft EIS.
- Chapter 6, Policy Alternatives, has been revised with additional discussion of the Policy Alternatives and preferred alternatives. New figures have been added.

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ACRONYMS AND ABBREVIATIONS

AIP	Agreement in Principal
ASR	aquifer storage and recovery
BMPs	best management practices
BPA	Bonneville Power Administration
CBA	cost/benefit analysis
CBP	Columbia Basin Project
CFR	Code of Federal Regulations
cfs	cubic feet per second
CRI	Columbia River Initiative
CRMP	Cultural Resources Management Plan
CSRIA	Columbia-Snake River Irrigators Association
DAHP	Department of Archaeology and Historic Preservation
DNR	Department of Natural Resources
DOH	Department of Health
DPS	distinct population segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ET	evapotransporation
FCRPS	Federal Columbia River Power System
FERC	Federal Energy Regulatory Commission
HPA	hydraulic project approval
IJC	International Joint Commission
KID	Kennewick Irrigation District
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRC	National Resources Council
NRCS	Natural Resource Conservation Service
NWI	National Wetland Inventory
OCPI	overriding considerations of the public interest
OHWM	ordinary high water mark
PHS	Priority Habitats and Species
PIA	practically irrigable acreage
RCW	Revised Code of Washington
RID	Roza Irrigation District
Reclamation	U.S. Bureau of Reclamation
SBEIS	Small Business Economic Impact Statement
SEPA	State Environmental Policy Act
SVID	Sunnyside Valley Irrigation District
TCP's	traditional cultural properties
TMDL	total maximum daily load
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRA	Voluntary Regional Agreement
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area

SUMMARY

S.1 Purpose and Need of the Proposal

The Columbia River Basin in Washington is affected by a variety of water resource management problems that limit the availability of water for agriculture and economic development and for sufficient streamflows for fish species. Hundreds of water rights applications for new diversions from the Columbia River are pending, some for over a decade. Several of the communities along the river do not have adequate or reliable water rights for growth and economic development. State water rights issued since 1980 are subject to interruption during periods of low river flows.

The Washington state Legislature determined that a priority of water management in the Columbia River Basin is the development of new water supplies to meet the economic and community development needs of people and instream flow needs of fish. In 2006, the Legislature enacted the Columbia River Water Management Act (Engrossed Second Substitute House Bill (ESSHB) 2860 – subsequently codified as Chapter 90.90 RCW) to address these issues. The proposal involves establishment of a Columbia River Water Management Program (Management Program) in response to the legislation.

S.2 Description of the Proposal

The Columbia River Water Management Act directs the Washington State Department of Ecology (Ecology) to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." Ecology is currently in the process of developing a Management Program to facilitate implementation of the legislation. This programmatic Environmental Impact Statement (EIS) evaluates two major aspects of the Management Program—the components of the Columbia River Water Management Program and early implementation actions. A complete description of the proposal is provided in Chapter 2.

S.2.1 Columbia River Water Management Program

The Management Program consists of several water supply development components authorized by the Columbia River Water Management Act. Those components include administration of the Columbia River Basin Water Supply Development Account which the legislation created to fund storage, conservation, and other projects to provide new water supplies for the Columbia River Basin. The Columbia River Water Management Act also authorized Ecology to fund feasibility studies, design, or construction of storage facilities. For the purposes of the EIS, Ecology is evaluating impacts associated with the following types of storage projects:

- New large storage facilities (greater than 1 million acre-feet);
- New small storage facilities (less than 1 million acre-feet);
- Modification of existing storage facilities; and
- Aquifer storage and recovery (ASR).

Conservation and other water supply projects can also be funded under the Management Program. Ecology is evaluating the impacts of the following types of conservation projects in this EIS:

- Municipal conservation;
- Agricultural water conservation and irrigation efficiency through regional or irrigation district infrastructure improvements;
- Pump exchanges;
- On-farm conservation and irrigation efficiency improvements; and
- Industrial conservation.

The legislation authorizes Ecology to enter into Voluntary Regional Agreements (VRAs) to provide new water for out-of-stream use, streamline water rights application processes, and protect instream flows. VRAs allow water users to enter into agreements with Ecology to exchange a package of conservation projects for new water rights or water right transfers. The legislation describes minimum requirements that must be met for Ecology to approve VRAs, including mitigation to prevent negative impacts to instream flows on the mainstem Columbia and Snake Rivers during critical flow periods.

Ecology is also proposing a strategy for developing new water supplies to meet instream flow needs. Several of the Management Program components will be used to augment streamflows, including storage and conservation projects. Ecology will work with the Washington Department of Fish and Wildlife and other fisheries co-managers to develop and implement the instream flow strategy.

Ecology is also considering a number of policy alternatives and guidelines for implementing the Management Program. These policy alternatives include options for:

- Funding and screening proposed storage and conservation projects;
- Calculating net water savings from conservation;
- Defining acquisition and transfer;
- Conditioning water rights on instream flows;
- Initiating and processing Voluntary Regional Agreements;
- Defining “no negative impact” to instream flows;
- Defining main channel and one-mile zone;
- Coordinating VRA mitigation and processing of new water rights;
- Coordinating VRA and non-VRA processing of new water rights;
- Funding projects associated with VRAs; and
- Including exempt wells in the water resources information system.

S.2.2 Early Actions

The Management Program includes three early actions—additional drawdown of Lake Roosevelt to supply water for some instream and out-of-stream water uses in the project area, development of a supplemental feed route to Potholes Reservoir, and a decision regarding the VRA proposal

submitted by the Columbia-Snake River Irrigators Association. The first two early actions are being developed in cooperation with the U.S. Bureau of Reclamation (Reclamation).

S.2.2.1 Lake Roosevelt Drawdown

Reclamation proposes to divert or release a total of 132,500 acre-feet from its existing storage right for water in Lake Roosevelt. During non-drought years 82,500 acre-feet of water would be used to provide the following:

- 25,000 acre-feet of municipal/industrial supply;
- 30,000 acre-feet of irrigation water for replacement of ground water supplies in the Odessa Subarea; and
- 27,500 acre-feet for streamflow enhancement downstream of Grand Coulee Dam.

During drought years, Reclamation proposes to divert or release an additional 50,000 acre-feet to provide:

- 33,000 acre-feet of water for Columbia River mainstem interruptible water right holders; and
- An additional 17,000 acre-feet for flow augmentation downstream of Grand Coulee Dam.

The non-drought year diversions and releases would result in approximately a 1-foot drawdown of the reservoir, and the drought-year diversions and releases would draw the lake down another 0.5 foot. Prior to making decisions on water rights needed for the proposed drawdown, both Ecology and Reclamation will work with the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians, and the National Parks Service to address issues associated with the diversions and releases.

Supplemental Feed Route

Reclamation, in cooperation with the state of Washington, is studying possible supplemental feed routes to convey water from Banks Lake to Potholes Reservoir to supply the South Columbia Basin and East Columbia Basin Irrigation Districts. For each of the three alternative routes, feed water would flow from Banks Lake to Billy Clapp Reservoir behind Pinto Dam. The alternatives for the supplemental feed routes are:

- Crab Creek Route Alternative;
- W20 Canal Route Alternative; and
- Frenchman Hills Route Alternative.

S.2.2.2 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The Columbia-Snake River Irrigators Association (CSRIA) submitted a VRA to Ecology following passage of the Columbia River Water Management Act. The CSRIA represents irrigators with farming operations in eastern Washington. The CSRIA proposes 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 VRA includes provisions for payments to reimburse Ecology for conservation projects funded in advance by the state. The conservation projects could be undertaken by municipal as well as agricultural users.

S.3 Summary of Impacts and Mitigation

This section summarizes the identified probable adverse environmental impacts and proposed mitigation measures associated with the Management Program. Impacts for each alternative are presented, followed by a brief discussion of general mitigation measures. These impacts and mitigation measures are discussed in greater detail in Chapters 4 and 5.

This programmatic EIS compares the impacts of implementing the Management Program against the No Action Alternative of not implementing the Management Program. If the Management Program were not implemented, the allocation of water and processing of water rights would continue under existing programs and policies.

S.3.1 Columbia River Water Management Program

The impacts of the components of the Management Program are presented in Chapter 4. The impacts are discussed in general terms, because the details of projects that would be proposed under the Management Program are not known. The scale of impacts would vary depending on the specific project proposed. Depending on the type of project proposed, specific projects may require additional environmental review to identify specific impacts.

The intent of the Columbia River Water Management Program is to increase water supply in the project area to provide additional streamflows for fish, and to meet community and economic needs. Improved water supplies may expand agriculture and municipal development in the project area. Any commercial or residential development that occurs as a result of the Management Program would comply with local planning and zoning requirements, but may require expansion of transportation systems and public utilities and services. Expanded agriculture may result in additional conversion of shrub-steppe habitat, with negative impacts on native vegetation and wildlife. The socioeconomic impacts of additional water supply would likely be positive for those who receive the water, but may have negative impacts for others at the local and regional level.

The following summary focuses on the major long-range or operational impacts that would occur for the Management Program components. Short-term impacts associated with construction or development of specific projects are described in Chapter 4.

S.3.1.1 Storage Component

The major impacts associated with new storage or modified storage facilities would be to surface water (Section 4.1.1.3); ground water (Section 4.1.1.4); fish, wildlife, and plants (Section 4.1.1.6); and cultural resources (Section 4.1.1.9). Impacts to other elements of the environment would also occur as described in Chapter 4. Table 4-2 highlights the differences in impacts for the major types of storage projects that Ecology is considering for the Management Program. The most significant impacts would be associated with large storage facilities.

Surface Water

Potential impacts to surface water associated with storage facilities include:

- Conversion of free flowing stream reaches to regulated waterways (on-channel only);
- Changes to flow regimes and channel morphology downstream;
- Evaporative losses from reservoirs and conveyance lines;
- Fluctuations in reservoir and downstream water levels;
- Potential for dam breach and catastrophic flooding;
- Changes to downstream sediment loading and gas entrainment;
- Blockage of natural debris carried downstream (on-channel only);
- Increased stream temperature downstream of the impoundment;
- Decreased dissolved oxygen downstream of the impoundment; and
- Increased temperatures in the impoundment and potential for eutrophication.

Ground Water

Potential impacts to ground water associated with storage facilities include:

- Increased recharge rates and ground water levels near the storage facility;
- Changes to ground water recharge and discharge along reaches downstream of diversions;
- Changes in ground water flow directions; and
- Potential decrease in ground water quality, depending on contaminant concentrations at reservoir locations.

Fish, Wildlife and Plants

Potential impacts to fish, wildlife, and plants associated with storage facilities include:

- Loss of existing habitat under the reservoir;
- Altered hydrologic and thermal regimes;
- Fish passage impediments;
- Changes in aquatic species from free-flowing to ponded;
- Permanent loss of plant communities in areas inundated;
- Loss of shrub-steppe communities;
- Displacement of wildlife from areas inundated; and
- Increased conversion of shrub-steppe habitat to agricultural use.

Cultural Resources

Potential impacts to cultural resources associated with storage facilities include:

- Inundation of cultural resources;
- Destruction or damage of cultural resources;

- Increased vandalism and artifact collecting; and
- Effects on the integrity of Traditional Cultural Properties through inundation or alteration of characteristics that make the areas Traditional Cultural Properties.

S.3.1.2 Conservation Component

The impacts of conservation projects would vary with the type and scale of the conservation project. Small on-farm conservation projects would have few impacts. Larger regional scale projects would have greater impacts. Table 4-3 highlights the differences between the general types of conservation projects being considered under the Management Program. The major impacts associated with implementing conservation programs would be to surface water (Section 4.1.2.3); ground water (Section 4.1.2.4); and fish, wildlife, and plants (Section 4.1.2.6). Impacts to other elements of the environment are described in the other sections of Section 4.1.2.

Surface Water

Potential impacts to surface water from conservation projects include:

- Increased streamflows, with more water available for instream flows and other beneficial uses;
- Improved water quality with increased streamflows; and
- Reduced streamflows and decreased water quality.

Ground Water

Potential impacts to ground water from conservation projects include:

- Reduced artificial ground water recharge from decreased seepage;
- Changed local ground water recharge with both positive and negative impacts; and
- Changed ground water quality from artificial recharge.

Fish, Wildlife, and Plants

Potential impacts to fish, wildlife, and plants from conservation projects include:

- Benefits to fish from increased streamflows;
- Loss of wetlands and habitat from reduced leakage;
- Increased waterfowl habitat resulting from constructed ponds;
- Loss of shrub-steppe habitat from expanded irrigation and development; and
- Altered habitats for fish, wildlife, and plant species from expanded irrigation and development.

S.3.1.3 Voluntary Regional Agreements

The primary impacts of implementing Voluntary Regional Agreements (VRAs) would be changes to how Ecology processes water rights. VRAs are intended to streamline the water rights application process. These impacts are described in Section 4.1.3 and in Chapter 6. Impacts of specific storage or conservation projects that may be included in VRAs would be similar to those described above and in more detail in Chapter 4. The two main changes to processing water rights are:

- Protection of instream flows in the mainstem Columbia and Snake Rivers during designated months is deemed adequate mitigation for new water rights; and
- Consultation requirements are reduced and restructured.

S.3.1.4 Policy Alternatives

Chapter 6 is a discussion of the policy alternatives that Ecology considered for implementing the Management Program. The alternatives relate to how Ecology will interpret some provisions of the Columbia River Water Management Act, how new water rights would be processed under the legislation, and how potential conflicts with existing policies would be resolved. Ecology has selected preferred alternatives for policy implementation. These are presented in Chapter 6.

S.3.1.5 No Action Alternative

Under the No Action Alternative, the Columbia River Water Management Program would not be implemented. Water allocation and the processing of water rights would continue under the existing programs and policies. There would be less state funding for storage, conservation, or other water projects and no coordinated program for implementation.

Impacts of the No Action Alternative are described in Section 4.2. Although storage and conservation projects could be developed without the Management Program, the rate of development would be significantly slower. There would be fewer opportunities to improve the reliability of interruptible and other water rights. There would be fewer incentives to increase streamflows in the Columbia and Snake Rivers. There would be no Voluntary Regional Agreements to streamline the processing of new water rights applications and water rights changes. Processing of Columbia River water rights applications would continue to be slowed by the current consultation process. Without the Management Program, there would be less opportunity for development of a coordinated program to improve water allocation in the Columbia River Basin in Washington.

S.3.1.6 Mitigation Measures

Mitigation measures to minimize short-term impacts would include construction best management practices (BMPs) to reduce erosion and sedimentation. Mitigation measures for impacts to cultural resources would be developed in consultation with the Washington Department of Archaeology and Historic Preservation and the affected tribes. Any property and right-of-way acquisitions would be conducted in accordance with Washington State law. Acquisitions would be negotiated with each landowner on a case-by-case basis.

Recommended mitigation measures are described for each element of the environment in Chapter 4. When specific projects are proposed, specific mitigation measures would be developed based on more detailed studies of impacts. These studies would include detailed feasibility and cost-benefit analysis of major storage facilities. All projects would comply with applicable local, state, and federal regulations. Mitigation measures would be developed in coordination with state and federal fish and wildlife agencies, the state Department of Archaeology and Historic Preservation, and affected tribes.

S.3.2 Early Actions

A general description of the types of impacts associated with the early actions is provided in Chapter 5. Ecology's assessment of impacts is focused on the SEPA actions related to the early actions.

S.3.2.1 Lake Roosevelt Drawdown

The additional drawdowns of Lake Roosevelt are intended to provide water to meet beneficial uses in the project area. Reclamation will conduct NEPA review of the contracts and agreements it enters into with the state. Potential impacts of the drawdown include:

- Additional exposure of sediments which could become airborne;
- Minor increases in streamflows in the Columbia River;
- Small reductions in the amount of ground water withdrawn in the Odessa Subarea;
- Potential impacts to resident fish in Lake Roosevelt and tributaries;
- Increased impacts to nesting wildlife species along the lake shore;
- Increased exposure of cultural resources;
- Increased potential for vandalism of cultural resources;
- Reduced potential for hydropower generation at downstream facilities;
- Impacts on payments by the Bonneville Power Administration to the Colville Confederated Tribes pursuant to the 1994 Settlement Agreement between the Confederated Tribes of the Colville Reservation and the United States;
- Increased reliability of interruptible water rights;
- Potential for expansion of irrigated agriculture and additional decline of shrub-steppe habitat;
- More reliable water supply, allowing continuation of current economic activities; and
- Expanded municipal and industrial development.

The SEPA action associated with the Lake Roosevelt drawdown is Ecology's approval of Reclamation's requests for new water rights and water right changes. The impacts of granting these water rights are described in Section 5.1.2.5.

Because the additional drawdowns are within the normal operation of Lake Roosevelt, it is unclear whether additional mitigation measures are required for the actual drawdown. Studies currently being conducted by the Confederated Tribes of the Colville Reservation will factor into that decision. The Agreement in Principle between the state and the Confederated Tribes

(Section 1.3.1.2) provides for the mitigation of certain impacts. Ecology will determine appropriate mitigation for changes to water rights in the water rights application process, which does not permit impacts to existing water rights.

S.3.2.2 Supplemental Feed Routes

The specific impacts of developing a supplemental feed route to Potholes Reservoir will be determined by Reclamation in a NEPA Environmental Assessment (EA) on the project. The general impacts associated with the project are described in Section 5.2, and Table 5-1 compares the impacts for the three proposed routes.

The Crab Creek route would use an existing stream channel. Increased flow in Crab Creek may increase erosion but could benefit fish and wildlife in the stream. The Crab Creek and W20 Canal routes would require the most construction with related short-term disturbances. The Frenchman Hills route would use an existing drainage route and require improvements to two highway culverts. The Frenchman Hills route would route water directly to Potholes Reservoir and bypass Moses Lake.

For all alternatives, the impacts to Potholes Reservoir would be similar. The supplemental feed route is intended to provide a more reliable water supply to the South Columbia Basin Irrigation District and greater flexibility in the delivery system. The amount of water delivered to Potholes Reservoir would not change as a result of the supplemental feed route. Mitigation enhancement measures would be developed in Reclamation's NEPA EA for the project.

The SEPA action associated with this early action would be the issuance of permits such as the Hydraulic Project Approval and construction stormwater permits. These permits would be issued through the normal agency approval process, which would establish specific permit conditions. Reclamation is preparing a NEPA EA on the project.

S.3.2.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The primary impacts of Ecology's approval of the CSRIA Voluntary Regional Agreement (VRA) would be to water rights processing. Specific projects that may be undertaken to implement the VRA would have impacts similar to those described in Chapter 4. As described in Section S.3.1.3, the processing of new water rights and water rights changes under the VRA process is intended to streamline the process. It would do so by changing the consultation requirements and by providing specific mitigation requirements.

S.3.2.4 No Action Alternative

Under the No Action Alternative for the early actions, Ecology would not partner with Reclamation to implement the additional drawdown of Lake Roosevelt or the supplemental feed route. No additional water from Lake Roosevelt would be available to supply municipal/industrial uses, instream flows, or interruptible water rights. The 30,000 acre-feet of water to help reduce ground water use in the Odessa Subarea would need to be provided through another method or process. Reclamation will continue to study options for providing additional surface water to the Odessa Subarea. The state would not provide funding for a new

supplemental feed route to Potholes Reservoir. The East Low Canal would continue to be used to supply Potholes Reservoir, and funds to improve the delivery system would need to be secured through another source. Ecology would not process the Columbia-Snake River Irrigators Association VRA. The processing of new water rights and water rights changes for members of CSRIA would not be streamlined and would continue under existing policies and regulations. CSRIA members would have fewer incentives to implement conservation projects and water management improvements.

S.4 Project Phasing and Schedule of Future Environmental Review

This programmatic EIS has been prepared to generally address probable significant adverse impacts associated with implementation of components of the Columbia River Water Management Program. This EIS is being prepared in accordance with the State Environmental Policy Act (SEPA) and discusses actions subject to SEPA review. Individual projects associated with the Management Program may require additional environmental review when they are proposed. These projects may require SEPA compliance, National Environmental Policy Act (NEPA) compliance, or both, depending upon the implementing agency, source of funding, and/or types of permits required. Projects will be evaluated as they are developed and ready for environmental review; this could occur within the next few years for some of the early action items, or as long as several years in the future for other projects.

Tables S-1 and S-2 summarize the anticipated future review of the Management Program components, and the early actions and other known projects. In addition to the SEPA and NEPA compliance summarized in the tables, the projects will comply with all applicable federal, state, and local regulations.

S.5 Areas of Significant Uncertainty and Controversy

There are several areas of uncertainty associated with the Management Program, in part because specific projects to implement the Management Program have not been proposed. Potential impacts have been evaluated at a programmatic level. This EIS is intended to provide decision-makers with an analysis of impacts that is conceptual in nature to assist with decision-making on how to implement the Management Program. The conceptual analysis indicates the general range of impacts that will be associated with components of the Management Program. When specific projects are proposed under the Management Program, additional environmental review may be conducted. That additional review is expected to resolve some of the uncertainties associated with impacts of the Management Program.

A major area of uncertainty in the Columbia River Basin is the relationship between environmental variables and the survivability of anadromous fish. This uncertainty was confirmed by the National Research Council report commissioned by Ecology (see Section 1.3.1.3). In particular, the relationship between flow levels in the Columbia River and salmon survival is not clear. It is known that lower survival rates and changes in salmon migratory behavior are expected when streamflows become critically low or when water temperatures become excessively high. However, the specific flow requirements of fish are not known.

Table S-1. Future Environmental Review for Management Program Components

Management Program Component	Future Environmental Review	Comments
Storage		
New Large (>1 million acre-feet)	SEPA and NEPA review Likely SEPA lead agency: Ecology Likely NEPA lead agency: Reclamation, Corps of Engineers	Environmental documentation would likely be an EIS under both NEPA and/or SEPA. Congressional authorization and appropriation may be required.
New Small (< 1 million acre-feet)	SEPA and/or NEPA review Likely SEPA lead agency: Ecology, Irrigation Districts Likely NEPA lead agency: Reclamation, Corps of Engineers	Environmental documentation would likely be an EIS. Congressional authorization and appropriation may be required.
Modification of Existing Facilities Includes projects such as raising the height of existing impoundments and changing operation of existing facilities.	SEPA and/or NEPA review Likely SEPA lead agency: Ecology, Irrigation Districts, Public Utility Districts Likely NEPA lead agency: Reclamation, Corps of Engineers	Level of environmental review would depend on the type of project proposed. Those requiring substantial construction would likely require an EIS; lower levels of construction would likely be a Supplemental EIS (if applicable) or SEPA Checklist.
Aquifer Storage and Recharge	SEPA review Likely SEPA lead: Ecology, Local City/County or utility with SEPA lead agency status	
Conservation		
Municipal	SEPA review Possible NEPA review, depending on funding Likely SEPA lead agency: Municipality/County/Utility with SEPA lead agency status Likely NEPA lead agency: Environmental Protection Agency, US Department of Agriculture, other federal agency with funding authority	Incentives programs are unlikely to require review. Reclaimed water projects would require SEPA evaluation if federal funds are requested.

Management Program Component	Future Environmental Review	Comments
Regional Agricultural Efficiency Improvements	SEPA and/or NEPA review Likely SEPA lead agency: Conservation Districts, Irrigation Districts with SEPA authority Likely NEPA lead agency: Reclamation, Natural Resources Conservation Service	Level of environmental review would depend upon the nature of improvements proposed. Minor changes would likely fall below SEPA and/or NEPA thresholds of significance.
On-Farm Conservation	Additional review unlikely	Anticipated improvements would likely fall below SEPA or NEPA thresholds of significance.
Industrial	SEPA review	Some improvements would fall below SEPA significance thresholds, other improvements could require a SEPA checklist if construction is involved.
Pump Exchanges	SEPA review NEPA review Likely SEPA lead agency(ies): Ecology Irrigation Districts with SEPA authority, Local municipality/County Likely NEPA lead agency: Reclamation, Corps of Engineers	Major pump exchange projects could require a SEPA EIS. Federally funded projects would require NEPA review. Tribal projects may require TEPA review.
Voluntary Regional Agreements		
Storage or conservation projects	SEPA and/or NEPA review Likely SEPA lead agency: Ecology, local irrigation districts Likely NEPA lead agency: Reclamation, Natural Resources Conservation District	Smaller scale, on-farm conservation projects likely would not require SEPA review. NEPA review would be triggered by permit requirements or funding.
Water rights changes	SEPA threshold determination by Ecology	

Table S-2. Future Environmental Review for Early Actions and Other Identified Projects

Project	Future Environmental Review	Comments
Lake Roosevelt Drawdowns	SEPA Supplemental EIS SEPA lead: Ecology NEPA Evaluation NEPA lead agency: Reclamation will conduct NEPA on any federal action for the use of water	Ecology anticipates releasing the Supplemental EIS in March 2008.
Supplemental Feed Route	NEPA Environmental Assessment NEPA lead agency: Reclamation	Reclamation expects to complete EA in late summer 2007.
CSRIA Voluntary Regional Agreement	SEPA review of Implementation Plan	Ecology will develop an Implementation Plan.
Off-Channel Storage Project (Hawk Creek, Foster Creek, Sand Hollow, Crab Creek alternatives)	Appraisal Report Feasibility Study NEPA/SEPA EIS SEPA lead agency: Ecology NEPA lead agency: Reclamation	Appraisal Report is expected in March/April 2007. Additional studies will depend on whether a site is feasible and whether Congress authorizes the studies and appropriates funds. Studies could be completed in 2011.
Odessa Subarea Special Study	Appraisal Report Feasibility Study NEPA/SEPA EIS SEPA lead agency: Ecology NEPA lead agency: Reclamation	Appraisal Report is expected in September 2007. The Feasibility Study and NEPA EIS review could start in 2008 with completion in 2010.
Walla Walla Pump Exchange	Feasibility Study NEPA NEPA lead agency: Corps of Engineers	SEPA Review may be required. Feasibility Study and NEPA expected to be complete in 2007.
Yakima River Basin Projects Black Rock Reservoir	Feasibility Study NEPA/SEPA EIS NEPA lead agency: Reclamation SEPA lead agency: Ecology	Feasibility Study and NEPA/SEPA EIS are underway. Feasibility Study and NEPA/SEPA EIS expected to be complete in 2008.

Several potential storage sites have been proposed in the project area. The technical and economic feasibility of these sites is not yet known. Reclamation and Ecology will continue to evaluate the viability of the sites through an appraisal level assessment. A feasibility study and NEPA and SEPA analyses will be conducted if Congressional authorization is provided.

The purpose of the Columbia River Water Management Program is to develop new water supplies to provide for continued economic development and to supplement streamflows for fish. It is uncertain how much additional water can be made available through storage, conservation, and other water management projects. The socioeconomic impacts of the Management Program are also uncertain. As discussed in Sections 4.1.1.7 and 4.1.2.7, the Management Program could have both positive and negative economic impacts on local and regional economies.

One area of controversy that could be associated with implementation of the Management Program is the extension of irrigated agriculture and other development in the shrub-steppe environment of eastern Washington. Shrub-steppe habitat has declined throughout the West. Expanded development could exacerbate that decline and further impact declining shrub-steppe plant and wildlife species.

Another area of controversy related to the Management Program is the ongoing debate throughout the West about the construction and operation of reservoirs. Typically construction of a large reservoir is accompanied by controversy, with some people opposed to any reservoir construction. Land acquisition for proposed storage facilities is likely to be controversial, and the commitment of land and existing beneficial uses to a storage reservoir will also likely be the subject of controversy.

Additional evaluations currently being conducted by the Bureau of Reclamation, U.S. Environmental Protection Agency, U.S. Geological Survey, Confederated Tribes of the Colville Reservation, and local agencies and utilities will provide additional information that will help to resolve the uncertainties associated with implementation of the Management Program. This information will be incorporated into the Management Program as it is available. Continuing coordination among the key stakeholders, including Reclamation, the Washington Department of Fish and Wildlife, the Department of Archaeology and Historic Preservation, affected tribes and other state and federal agencies, will ensure that this information is incorporated, and uncertainties are reduced.

CHAPTER 1.0 INTRODUCTION AND BACKGROUND

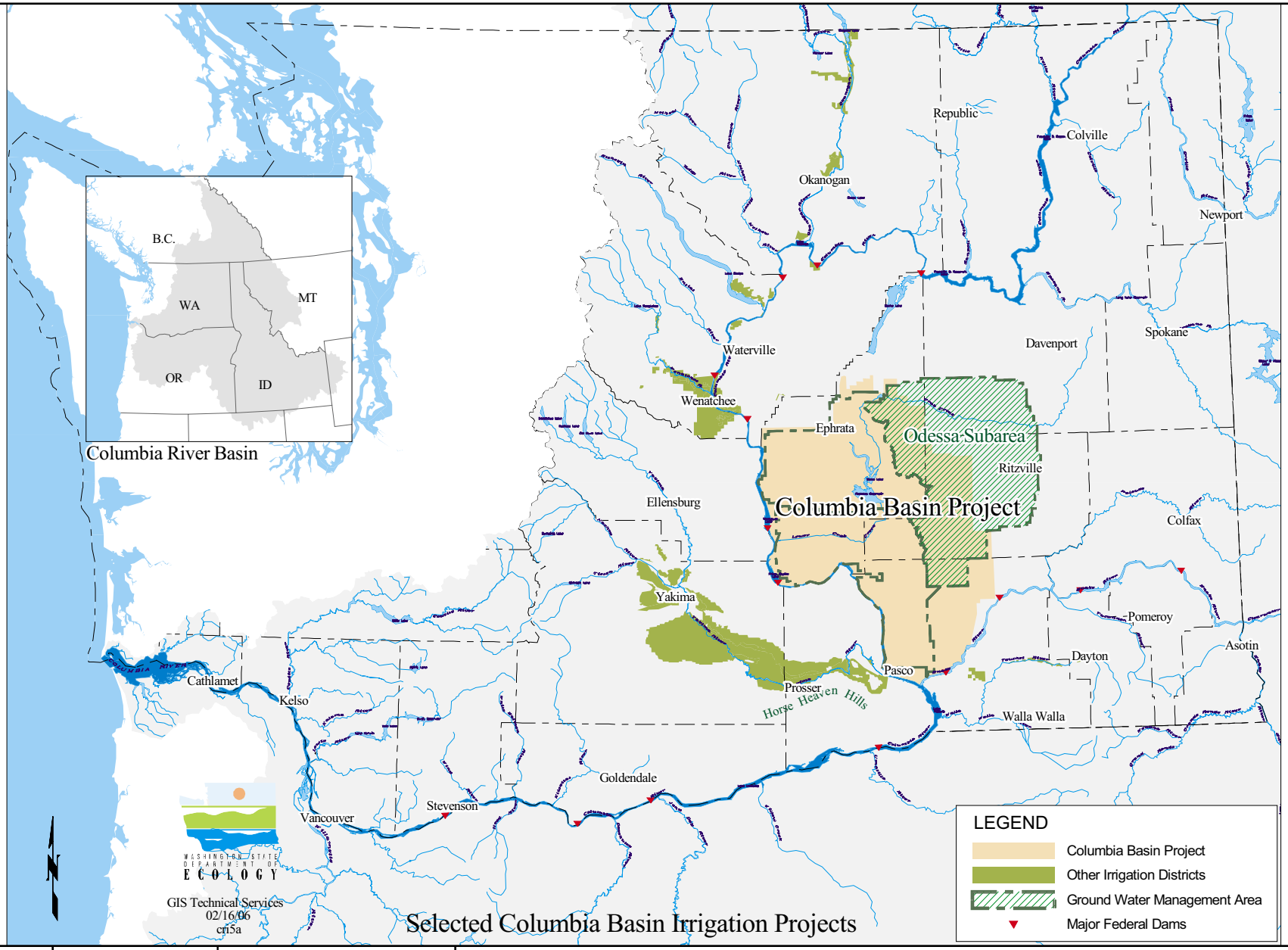
1.1 Introduction

The 2006 Washington State Legislature passed the Columbia River Water Management Act, an act relating to water resource management in the Columbia River Basin (Engrossed Substitute House Bill (ESSHB) 2860) (Appendix A). The Act has been codified as Chapter 90.90 of the Revised Code of Washington (RCW). The Act directs the Washington State Department of Ecology (Ecology) to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." The Act also establishes the Columbia River Basin Water Supply Development Account and authorizes its use to assess, plan, and develop new storage; improve or alter operation of existing storage facilities; implement conservation projects; or undertake any other actions designed to provide access to new water supplies within the Columbia River Basin. The Act authorizes Ecology to enter into Voluntary Regional Agreements (VRA) to provide new water for out-of-stream use, streamlining the application process, and protecting instream flow. The Act applies to the portion of the Columbia River Basin in the state of Washington (Figure 1-1).

Ecology is currently in the process of developing a Columbia River Water Management Program (Management Program) to facilitate implementation of the legislation, including administration of the Columbia River Basin Water Supply Development Account. This State Environmental Policy Act (SEPA) programmatic environmental impact statement (EIS) is part of the program development process.

This programmatic SEPA EIS evaluates the potential impacts of program and policy components of the Management Program as well as activities identified for early implementation referred to as "early actions." The early actions include two projects being conducted in partnership with the U.S. Bureau of Reclamation (Reclamation)—the Supplemental Feed Route from Pinto Dam to Potholes Reservoir and the Lake Roosevelt drawdown—as well as the Columbia Snake River Irrigators Association's (CSRIA) request for Ecology approval of a Voluntary Regional Agreement (VRA). The Lake Roosevelt Drawdown and Supplemental Feed Route projects will require Ecology to issue permits and/or to approve changes to water rights. Both of these projects will require subsequent SEPA threshold determinations and supplemental SEPA environmental review prior to implementation.

This programmatic SEPA EIS discusses some additional projects involving collaboration between Ecology and Reclamation. These projects include the Odessa Subarea Special Study and the Columbia Mainstem Off-Channel Storage Study. The role of Ecology in these projects as well as the Lake Roosevelt Drawdown and Supplemental Feed Route projects is as a funding partner. Actual implementation of the projects will be done by Reclamation in conjunction with operation of the Columbia Basin Project. Thus, it is Ecology's issuance of permits, water rights approvals, and funding that constitute actions that require SEPA review. A number of these projects will trigger environmental review under the National Environmental Policy Act (NEPA). For example, Reclamation anticipates issuing a NEPA Environmental Assessment on the Supplemental Feed Route project in late summer of 2007. Reclamation will prepare a NEPA EIS for the Odessa Subarea Special Study beginning in 2008 and continuing through 2010.



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SOURCE: Washington State Department of Ecology, 2006.

FIGURE 1-1

COLUMBIA RIVER BASIN IN WASHINGTON

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

In addition, should the Columbia Mainstem Off-Channel Storage Study proceed to a "feasibility" level of evaluation, Reclamation will prepare a NEPA EIS for that project. The earliest a feasibility study and EIS could be initiated would be in 2008.

1.2 Organization of Document

Chapter 1 of the programmatic Final EIS provides background information on water allocation issues in the Columbia River Basin and the proposals and studies undertaken by Ecology and others to improve Columbia River water management. Chapter 1 also describes the purpose of this programmatic EIS, the EIS scoping process, and existing documents that have been adopted or incorporated by reference. The proposal and alternatives are described in Chapter 2. The project description includes the Management Program, the policy alternatives within the proposal, the No Action Alternative, and the early actions. An overview of the affected environment for the Columbia River Basin in Washington and for the areas of the early actions is provided in Chapter 3.

Chapter 4 is a programmatic evaluation of the impacts associated with the components of the Management Program. Potential mitigation measures for identified impacts are described. Chapter 4 also includes an evaluation of the No Action Alternative (not implementing the Management Program). Chapter 5 evaluates the potential impacts of the early actions and describes potential mitigation measures. For each early action, a No Action Alternative is evaluated. Chapter 6 is a discussion of the policy alternatives Ecology considered for implementing the Management Program, along with selected preferred alternatives. Options are presented for how Ecology can implement these alternatives within the proposal, including a discussion of the potential impacts on water rights processing in the state. The references used in the document are listed in Chapter 7. Several appendices are attached which include various documents that relate to the Management Program.

1.3 Background

The Columbia River Basin supports two resources that are highly valued in the Pacific Northwest—rich agricultural soils and abundant salmon runs. Making the soils productive in the arid climate requires irrigation and water withdrawals from the river and its tributaries. Irrigation withdrawals are one of the factors contributing to declines of Columbia River salmon populations. The competition between the need for irrigation water and the need to maintain instream flows for fish has been the subject of discussion and debate for decades.

In 1980, Washington adopted an administrative rule for protecting instream flows on the Columbia River (WAC 173-563). The rule required that water rights on the Columbia River mainstem issued after 1980 be subject to the state instream flow rule. These water rights (interruptible rights) can be curtailed in low flow conditions in order to maintain adequate flows for fish. Interruptible rights can be curtailed when the March 1 forecast for April through September runoff at The Dalles Dam on the lower Columbia River is less than 60 million acre-feet. Reliable water supplies are not guaranteed to water users in low flow years.

In the early 1990s, the federal listing of Columbia River salmon species as threatened or endangered under the Endangered Species Act (ESA) intensified the debate over whether

additional withdrawals of water could be allowed from the river without adversely affecting salmon runs. After the 1991 listing of Snake River sockeye salmon, Ecology established a moratorium on new permits in response to water right applications from the Columbia and Snake Rivers filed subsequent to December 20, 1991. The moratorium was filed in response to a petition by environmental groups. The Legislature lifted the moratorium in 1997, and the administrative rule for protecting instream flows on the Columbia River was revised in 1998. The revised rule, known as the consultation rule, required that all water rights applications would be evaluated on a case-by-case basis for possible impacts on fish through consultation with appropriate local, state, and federal agencies and tribal governments. Flow conditions or mitigation requirements to protect fisheries were to be based upon the consultation.

The consultation rule added to the time needed to process water rights applications along the Columbia River. The backlog of applications increased to hundreds with many pending for over a decade. Some communities along the river lacked adequate or reliable water rights for growth or economic development. Ecology did not issue any new permits on water rights applications from the Columbia River filed after December 20, 1991 until 2005, when Ecology approved a permit for Berg Farms under application S4-34553.

In 2000, the Columbia-Snake River Irrigators Association (CSRIA) and the City of Pasco filed a lawsuit to obtain a court order requiring Ecology to process 12 water right applications that were pending prior to the 1991 moratorium. Ecology, the irrigators, and the City of Pasco reached an agreement before the case went to court. Ecology processed the pending pre-moratorium applications; however, prior to issuance of the Reports of Examination, CSRIA sought and obtained an injunction from Benton County Superior Court to prevent Ecology from issuing the permits with flow conditions as recommended in the review draft reports.

By late 2002, CSRIA and Ecology settled the Benton County Superior Court case. The settlement gave two options for processing of water rights applications (American Bar Association 2003). One option was for an applicant to pay $10 per acre-foot per year for the water used to receive a water right permit not subject to flow conditions (noninterruptible water rights). Ecology would use the money to either replace water in a drought situation or to purchase perpetual mitigation for adverse impacts to salmon. Under the second option, the applicant would receive a water right subject to flow conditions (interruptible water right). All of the applicants except for the Quad Cities (Richland, Pasco, Kennewick, and West Richland) elected to pay the annual fee.

In early 2003, Ecology issued Reports of Examination consistent with the settlement. Six of the applications were appealed by the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe, and the Center for Environmental Law and Policy. Ultimately, the Court of Appeals determined that Ecology had not properly consulted with the Umatilla and Nez Perce Tribes and remanded five of the applications back to Ecology. The permit recommended to the Quad Cities was appealed by the Center for Environmental Law and Policy. The Center for Environmental Law and Policy, the Quad Cities, and Ecology settled the appeal and the Quad Cities' permit was issued in 2003.

The continuing controversy over Columbia River water allocation and the backlog of water rights applications led Ecology to a new attempt to improve water management in the Columbia

River. Through the Columbia River Initiative (CRI), Ecology commissioned several studies and convened stakeholder groups to develop solutions to the allocation problems. The following sections describe the CRI process and the actions that led to the passage of the Columbia River Water Management Act and development of the Management Program.

1.3.1 Columbia River Initiative

To address the water management issues in the Columbia River, former Governor Gary Locke created the Columbia River Initiative (CRI). The CRI included a framework for issuing new water rights from the Columbia River while improving stream flows for fish. The CRI included four elements—a legislative proposal for consideration in the 2005 legislative session, a proposed budget to secure water and conduct feasibility studies of new off-channel storage projects, draft rule language for implementation of the CRI, and cooperative agreements with federal and local partners.

The proposed rule included:

- Establishing procedures for drought permits for existing water rights currently subject to interruption during low stream flows;
- Setting the cost to be paid annually by new water right holders to obtain water from the state; and
- Defining responsibilities for acquiring, accounting for, and approving the allocation of water from the Columbia River mainstem.

In December 2004, Ecology and the Washington Department of Fish and Wildlife (WDFW) prepared a programmatic Draft EIS on a water management plan for the Columbia River developed under the CRI (Ecology and WDFW 2004). The Draft EIS evaluated potential impacts of the proposed rule. Governor Gregoire halted the CRI process because of legislative opposition to the proposal and created the Columbia Water Partnership (Section 1.3.2). No Final EIS was issued on the proposed CRI rule, and the CRI rule and legislation were not finalized.

As part of the CRI, Ecology undertook several actions to develop a water management plan. These included developing cooperative agreements with Reclamation and the Colville Tribe, and undertaking technical and economic studies of the proposed rule. These actions are described below.

1.3.1.1 MOU with Bureau of Reclamation and Irrigation Districts

As part of the CRI element to establish cooperative agreements with federal and local partners, the state of Washington, Reclamation, and the three Columbia Basin Irrigation Districts (South Columbia Basin, East Columbia Basin, and Quincy-Columbia Basin) entered into an agreement to work together to support projects to optimize existing water management and to explore new storage options to provide additional water for priority uses. This 2004 Memorandum of Understanding (MOU) includes provisions for:

- Development of a mainstem storage program initially involving conducting appraisal and feasibility level studies of off-channel storage sites near the Columbia River mainstem;

- Drawdown of Lake Roosevelt to provide mainstem drought relief, municipal and industrial water supply, and 30,000 acre-feet of water to replace ground water currently being used for irrigation in the Odessa Subarea;
- A study of options for delivering replacement water to the Odessa Subarea in addition to the 30,000 acre-feet described in the previous bullet;
- An alternative route to supply feed water to Potholes Reservoir and evaluation of other potential operational changes for the reservoir; and
- An agreement to seek water from existing Canadian storage facilities.

The MOU has led to the initiation of a number of projects that are currently being funded through the Columbia River Basin Water Supply Development Account including the Columbia River Mainstem Off-Channels Storage Study and Odessa Subarea Special Study described in Section 2.1.2.1 as well as the Lake Roosevelt Drawdown Project and the Supplemental Feed Route Project described in Section 2.6. The MOU can be viewed at: http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/cri_mou121704.pdf.

1.3.1.2 Agreement in Principle with the Confederated Tribes of the Colville Reservation

Another cooperative agreement developed as part of the CRI was a Government-to-Government Agreement in Principle (AIP) between the state of Washington and the Confederated Tribes of the Colville Reservation regarding management of Lake Roosevelt. In November 2005, the original agreement was extended to September 30, 2006. The AIP can be viewed at: http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/colville_water.pdf. The AIP states that the state of Washington will pursue replacement water for the Lake Roosevelt drawdown and will not seek additional drawdowns as part of the Columbia Water Partnership. The AIP also:

- Provides for investigation of potential impacts of the Lake Roosevelt drawdown and compensation for impacts to the Colville Confederated Tribes;
- Creates an economic development capital fund for the Tribe;
- Creates a fisheries enhancement capital fund and provides for joint work on fisheries management; and
- Provides for tribal participation in investigation of the potential for new off-channel storage in the Columbia River system.

1.3.1.3 National Research Council Report

Ecology requested that the National Research Council (NRC) (a division of the National Academy of Sciences) conduct a review of the scientific issues related to water withdrawals from the Columbia River mainstem and review water management scenarios developed by Ecology. The National Research Council report, *Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival*, was released in March 2004. Regional scientists contributed information and expertise to the review.

The National Research Council reviewed the existing scientific data on the Columbia River fish species listed under the Endangered Species Act and reviewed and evaluated environmental parameters critical to the survival and recovery of listed fish species. The National Research Council also evaluated the effect of potential future water withdrawals on fish survival, using a range of annual withdrawals from 250,000 acre-feet to 1,300,000 acre-feet. Those values represented the range of the volume of water rights applications that had been submitted to Ecology.

The major theme of the conclusions drawn in the report is that there is scientific uncertainty in the importance of environmental variables on the survival of fish, and the allocation of existing water withdrawals is a policy decision. The six major findings of the report are summarized here (National Research Council 2004).

- Within the body of scientific literature reviewed as part of this study, the relative importance of various environmental variables on smolt survival is not clearly established. When river flows become critically low or water temperatures excessively high, however, pronounced changes in salmon migratory behavior and lower survival rates are expected.
- The state of Washington and other Columbia River Basin entities should continue to explore prospects for water transfers and other market-based programs as alternatives to additional withdrawals.
- The conversion of water rights to noninterruptible status will decrease flexibility of the system during critical periods of low flows and comparatively high water temperatures. Conversions to noninterruptible rights during these critical periods are not recommended.
- Sound, comprehensive Columbia River salmon management strategies will depend not only on science, but also on a willingness of elected and duly appointed leaders and managers to take actions in the face of uncertainties.
- Decisions regarding the issue of additional water withdrawal permits are matters of public policy, but if additional permits are issued, they should include specific conditions that allow withdrawals to be discontinued during critical periods. Allowing for additional withdrawals during the critical periods of high demand, low flows, and comparatively high water temperatures identified in this report would increase risks of survivability to listed salmon stocks and would reduce management flexibility during these periods.
- The state of Washington and other basin jurisdictions should convene a joint forum for documenting and discussing the environmental and other consequences of proposed diversions that exceed a specified threshold.

Ecology reviewed the National Research Council report and used its recommendations, along with the economic review described below, as part of the water management proposal in the CRI.

1.3.1.4 Economic Review

In addition to the scientific review of the Columbia River water withdrawals, Ecology conducted economic studies as part of the rule-making for the CRI. Ecology commissioned an economic study of the effects of increased water use from the Columbia River by the University of

Washington (Huppert et al. 2004). The economics report analyzed effects of the proposed rule on agricultural production, municipal and industrial water supplies, hydropower generation, flood control, river navigation, commercial and recreational fishing, regional impacts, and passive use values. The study focused on five water management scenarios for issuing new water rights. The report also evaluated issues related to water markets and water exchange transactions. The major conclusions of the report were that increased diversions:

- Are unlikely to have significant impacts on flood control or river navigation;
- Will have moderately large negative impacts on hydropower production;
- Will have very large positive impacts on the agricultural economy and the state's regional economy; and
- Might have some negative effects on fisheries and passive use values tied to salmon and steelhead runs.

Ecology prepared a Small Business Economic Impact Statement (SBEIS) (Ecology 2004b) and a preliminary Cost/Benefit Analysis (CBA) (Ecology 2004a) using the University of Washington study as the basis. The CBA concluded that the probable benefit of the proposed rule would be greater than the probable cost. The SBEIS was conducted under the guidance of RCW 19.85, which requires Ecology to review the business costs associated with the proposed rule and to determine if costs would be disproportionately higher for small businesses in comparison to large businesses. The SBEIS concluded that if the proposal imposed a net cost on a few businesses, the impact would likely be disproportionately greater for small businesses than for large businesses when measured on a cost per employee basis. However, the proposal itself could be interpreted as a cost reducing method under RCW 19.85.030(3)(f).

Some interest groups thought the economic studies overestimated the economic benefits of the CRI. One environmental organization, American Rivers, commissioned a peer review of the reports (Griffin 2005). The peer review concluded that the University of Washington (Huppert et al. 2004) and the CBA (Ecology 2004b) had overestimated the agricultural benefits of the CRI by not accounting for the increases in crop values that would occur without the CRI, and by omitting many of the costs that would be required to develop new water rights issued under the CRI.

1.3.2 Columbia Water Partnership

The Columbia Water Partnership was created by Governor Gregoire to develop a long-term approach to water allocation from the Columbia River mainstem. The partnership included tribal, federal, state and local governments; farmers; environmental groups; municipalities and other stakeholders.

A joint executive/legislative policy group, the Columbia River Task Force (Task Force), was formed to help resolve the issues that led to the abandonment of the CRI. The Task Force was composed of the governor, Director of Ecology, and two representatives each from the Democratic and Republican House and Senate Caucuses. The goal of the Task Force was to adopt a new water management program for the Columbia River, recognizing that adequate water is needed to achieve economic growth in eastern Washington and sustain endangered fish species in the river.

The Task Force met from June 2005 through the beginning of the 2006 legislative session. The Task Force met with governmental managers of the Columbia Basin, scientists, and stakeholders. Outreach included tribal governments, county commissioners, public utility and irrigation districts, and the environmental community. The Task Force developed an outline of a water management program for the 2006 legislative session. The Task Force outline formed the basis for the Columbia River Water Management Act.

1.4 Purpose of the Programmatic EIS

The purpose of this programmatic EIS is to assist Ecology, federal, state, and local governments and agencies, tribal governments, and stakeholders in formal development and implementation of the Management Program as directed by the Columbia River Water Management Act. It is also intended to allow for public input into the development and implementation process. In accordance with WAC 197-11-704, this EIS evaluates nonproject actions such as policies, plans, and programs at a programmatic level, and will serve as the basis for future project decisions.

Additional SEPA review will likely be required for some components of the Management Program. Specific projects developed under the Management Program that have not yet been identified may include actions, such as development of reservoirs and impoundment facilities, conveyance lines, and conservation projects, that will require additional SEPA review. In addition, components of the Management Program that involve federal permits or funding would require evaluation under NEPA. A programmatic Draft EIS was prepared in 2004 for the proposed CRI rule and legislation (Section 1.3.1), but no Final EIS was issued. Since both the CRI rule and the legislation were abandoned, the SEPA Responsible Official determined that a new, stand-alone EIS specific to the provisions of the 2006 Columbia River Water Management Act was a more appropriate course of action than to attempt to supplement the 2004 document. However, portions of the programmatic Draft EIS on the CRI proposal (Ecology and WDFW 2004) are incorporated by reference into this EIS as described in Section 1.7.

1.5 Scoping Process

In accordance with SEPA, a scoping period for the programmatic EIS on the Management Program was conducted from May 5, 2006 to June 5, 2006. Four public scoping meetings were held in May 2006 to receive public testimony. The meetings were held on May 17 in Wenatchee, May 18 in Colville, May 22 in Moses Lake, and May 23 in Kennewick. At the meetings, staff discussed comments and questions with attendees, and attendees were invited to write or provide formal oral comments that were included in the record of the meetings. Oral comments were recorded and transcribed by a court reporter. Seven people provided oral testimony at the public scoping meetings. Comment forms were provided for written comments. No comment forms were submitted during the meetings. A total of 27 written comment forms, letters, or emails were received during the scoping period.

Written comments were received from the Confederated Tribes of the Umatilla Indian Reservation, Yakama Indian Nation Department of Natural Resources, Spokane Tribal Cultural Compliance Program, WDFW, Benton County Board of Commissioners, a Stevens County Commissioner, Chelan County Natural Resource Department, Water Resource Inventory Area

(WRIA) 43 Planning Unit, seven agricultural and business associations, four environmental advocacy groups, an assistant to a state representative, and five private citizens.

The comments received covered a number of subjects and represented a range of viewpoints. The major areas of concern were:

- The appropriate level of SEPA analysis for the Management Program;
- The alternatives that should be considered in the EIS;
- Suggestions for specific storage and conservation projects or programs that should be considered for the management program;
- Questions about how Voluntary Regional Agreements would be implemented;
- Impacts of the Management Program on:
  - Surface water and instream flows,
  - Water rights and how water rights applications are processed,
  - Fish and wildlife in the project area,
  - Economics of the project area and state,
  - Cultural resources; and
- Recommendations for evaluating economic impacts of the Management Program.

The scoping comments were used to determine which elements of the environment would be evaluated in the EIS. The EIS addresses most of the issues identified during scoping in the text. Ecology determined that some of the issues that were raised during scoping merited separate responses, and some of the comments were outside the scope of issues to be evaluated in this programmatic EIS. These comments and responses are attached in Appendix B. The table in this appendix provides a brief response to the comment and where appropriate, indicates where in the EIS the comment is addressed.

1.6 Adopted Documents

Pursuant to provisions of the SEPA Rules (WAC 197-11-630), the *Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW* is adopted as part of this Management Program EIS to meet a portion of Ecology's responsibility under SEPA. The watershed planning EIS addresses water quantity, instream flow, habitat, and water quality related projects that are being planned and implemented in numerous tributaries of the Columbia and Snake Rivers. The Adoption Notice is included as Appendix B.

Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW. Washington State Department of Ecology. Ecology Publication #03-06-013. July 18, 2003. Available on-line at: http://www.ecy.wa.gov/pubs/0306013.pdf.

> Summary of Document: This Final EIS describes the watershed planning process set forth in the Watershed Planning Act, as well as procedures for rule making that may be undertaken by state agencies to support implementation of watershed plans. It describes the existing framework of federal, state, and local laws, regulations, and programs that affect or are related to management of watersheds. In addition, it evaluates the impacts of and identifies mitigation measures for various types or classes of recommended actions

that may be included in watershed plans including municipal, industrial, and agricultural conservation measures, water banking and transfer mechanisms, water allocation strategies, instream flow requirements, water quality restoration and enhancement measures, and various approaches to fish habitat improvement.

1.7 Documents Incorporated by Reference

Pursuant to provisions of SEPA (WAC 970-11-635), the following documents are incorporated by reference into this Management Program Draft EIS:

Columbia River Mainstem Storage Options, Off-Channel Storage Assessment Pre-Appraisal Report. Prepared for the Washington Department of Ecology and the U.S. Bureau of Reclamation by MWH. December 2005.

> Summary of Document**:** This document evaluates potential off-site locations for additional storage in the Columbia River Basin. The study includes a discussion of the need for additional water in the basin, a review of economic studies, an evaluation of the potential storage capacity of the sites, and a discussion of the general types of impacts that could occur at each site. Available on-line at: http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/crssr_final_12062005.pdf.

Initial Alternative Development and Evaluation. Odessa Subarea Special Study. Columbia Basin Project, Washington. U.S. Bureau of Reclamation. September 2006.

> Summary of Document: Reclamation is studying the continued development of the Columbia Basin Project (CBP) to deliver CBP water to lands currently using ground water in the Odessa Ground Water management Subarea (Odessa Subarea). This document presents the results of the Project Alternatives Solutions Study (PASS) which identified engineering concepts and developed alternative solutions. The alternatives will be further evaluated in an appraisal-level study. Available on-line at: http://www.usbr.gov/pn/programs/ucao_misc/odessa/report-alternatives.pdf

Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival. A Report of the National Research Council of the National Academies. The National Academies Press. Washington, D.C. 2004.

> Summary of Document**:** As part of the CRI, Ecology secured a formal and independent review of the existing science related to fish survival and hydrology in the Columbia River. This review was conducted through the National Academy of Sciences, under contract with the state. As part of the national science review, regional scientists were asked to contribute information and expertise. The report provided guidance for framing water management scenarios under the CRI and is summarized in Section 1.3.1.3. The report is available on-line at: http://www.ecy.wa.gov/programs/wr/cwp/cwpnsr.html. Hard copies can be obtained from the National Academies Press.

Draft Environmental Impact Statement: Columbia River Mainstem Water Management Program. Washington State Department of Ecology and Washington Department of Fish and Wildlife. December 2004.

> Summary of Document: Ecology and WDFW prepared a Draft EIS on the proposed rule and legislation for the CRI (see Section 1.3.1). Since the legislation and rule were abandoned, no Final EIS was issued. The sections of the Draft EIS that are relevant to this document are the Summary and Affected Environment.

CHAPTER 2.0 PROPOSAL AND ALTERNATIVES

2.1 Description of the Columbia River Water Management Program

This chapter describes the main components of the Columbia River Water Management Program (Management Program) authorized under the Columbia River Water Management Act. These components include storage, conservation, Voluntary Regional Agreements and other measures intended to meet the legislative mandate of aggressively pursuing new water supplies for instream and out-of-stream uses. The Management Program also includes administrative support functions such as development of a project inventory, a water supply and demand forecast, and a data management system.

The Management Program also involves funding and management of a number of major projects, many of which had been initiated prior to the passage of the Columbia River Water Management Act under a Memorandum of Understanding between the state of Washington, the Bureau of Reclamation (Reclamation), and three Columbia Basin Irrigation Districts signed in December 2004 (Section 1.3.1.1). These projects include the Columbia River Mainstem Off-Channel Storage Study, the Odessa Subarea Special Study, the Potholes Supplemental Feed Route Project, and the Lake Roosevelt Drawdown Project. These projects, discussed below, are being conducted jointly with Reclamation and are intended to be operated as part of Reclamation's Columbia Basin Project.

The Management Program is also providing funding to several water supply projects in tributaries to the Columbia River, including the Yakima Basin Water Storage Feasibility Study (Section 2.1.2.1) and the Walla Walla pump exchange (Section 2.1.2.2). These projects are also discussed below.

Ecology has identified and intends to take action on several "early actions" as soon as possible after the release of this Final Environmental Impact Statement. These include: the Potholes Supplemental Feed Route Project, the Lake Roosevelt Drawdown Project, and a Voluntary Regional Agreement proposed by the Columbia-Snake River Irrigators Association (CSRIA). These early actions are described in Section 2.6.

2.1.1 Columbia River Water Management Act

The 2006 legislature passed the Columbia River Water Management Act, an act related to water management in the portion of the Columbia River Basin that lies within Washington. The legislature recognized that a key priority of water resource management in the Columbia River Basin is the development of new water supplies that include storage and conservation in order to meet the economic and community development needs of people and the instream flow needs of fish" (RCW 90.90.005).

The Columbia River Water Management Act:

- Establishes a Columbia River Basin water supply development program,
- Directs Ecology to aggressively pursue development of water supplies to benefit both instream and out-of-stream uses, and
- Creates a Columbia River Basin Water Supply Development Account (Account).

Funding for the Account can come from legislative appropriations, funds earned through implementation of Management Program components, and other sources. Funds in the account can be used to assess, plan and develop new storage facilities, conservation projects, or other actions to provide new water supplies in the Columbia River Basin. Two-thirds of the funds provided by the legislature in the Account must be used to support the development of new storage facilities with the remaining one-third used for the other components of the Management Program (RCW 90.90.010). Water gained from the funded projects is to be used for both instream and out-of-stream uses.

2.1.2 Columbia River Water Management Program Components

The purpose of the Management Program is to guide Ecology's implementation of the Columbia River Water Management Act, including administration of the Columbia River Basin Water Supply Development Account. The Columbia River Water Management Act directs Ecology to focus its efforts to develop water supplies for the Columbia River Basin to meet the following needs:

- Alternatives to ground water for agricultural users in the Odessa Subarea aquifer;
- Sources of water supply for pending water right applications;
- A new uninterruptible supply of water for the holders of interruptible water rights on the Columbia River mainstem that are subject to instream flows or other mitigation conditions to protect stream flows; and
- New municipal, domestic, industrial, and irrigation water needs within the Columbia River Basin (RCW 90.90.020).

After passage of the Columbia River Water Management Act, a team of Ecology staff established a 12-Month Work Plan to guide development of the Management Program. The plan identifies near-term and longer-term tasks and objectives to guide implementation and to lay the foundation for a successful long-term program. The plan focuses on specific near-term critical path activities within a 12-month period that meet the reporting requirements of the Columbia River Water Management Act. The plan can be viewed at http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/cri_12_plan.pdf.

The 12-Month Work Plan addresses all major components of the Management Program including:

- Storage facilities,
- Conservation projects,
- Voluntary Regional Agreements,

- The Columbia River water supply inventory and demand forecast, and
- The Columbia River water resources information system.

The following sections provide an overview of these Management Program components.

2.1.2.1 Storage Component

Ecology may support the development of storage by funding feasibility studies, design, or construction of new storage facilities, and may do so independently, or in cooperation with other agencies, organizations or individuals. However, funds from the Columbia River Basin Water Supply Development Account may not be used for construction of any new storage facilities until Ecology evaluates the following:

- Water uses to be served by the facility;
- The quantity of water necessary to meet those uses;
- The benefits and costs to the state of meeting those uses, including short-term and long-term economic, cultural, and environmental effects; and
- Alternative means of supplying water to meet those uses, including the costs of those alternatives and an analysis of the extent to which long-term water supply needs can be met using these alternatives (RCW 90.90.010).

Water supplies secured through the development of new storage facilities, including new aquifer storage facilities, made possible with funding from the Columbia River Basin Water Supply Development Account will be allocated as follows:

- Two-thirds of active storage shall be available for appropriation for out-of-stream uses; and
- One-third of active storage shall be available to augment instream flows and shall be managed by Ecology. The timing of releases of this water shall be determined by Ecology, in cooperation with the Washington Department of Fish and Wildlife (WDFW) and fisheries co-managers, to maximize benefits to salmon and steelhead populations (RCW 90.90.020).

A variety of types of storage projects may be funded or approved under the legislation. For purposes of this programmatic EIS, potential storage projects are grouped into the following categories: new large storage facilities, new small to medium size storage facilities, modifications to existing storage facilities, and aquifer storage and recharge facilities.

New Large Storage Facilities (Larger than 1 Million Acre-Feet)

New large storage facilities with a capacity of 1 million acre-feet or more (> 1 million acre-feet) could be constructed. If a single storage facility is large enough, it could potentially resolve major instream and out-of-stream water supply problems in the Columbia River Basin. Benefits associated with a large reservoir could include:

- Supplying water to augment flows during critical periods in the river,
- Replacing ground water in the Odessa Subarea,

- Providing drought-year supply to interruptible water right holders, and
- Providing water for direct pump/pump exchange projects in major tributaries such as the Yakima River Basin.

Large storage facilities could be constructed either on-channel or off-channel. On-channel facilities would impound a river or stream, while off-channel facilities would divert or pump water to an impoundment structure at an upland location. Impoundment structures could be of earthen or concrete construction.

Under provisions of the Memorandum of Understanding between the State of Washington, Reclamation, and the three Columbia Basin Irrigation Districts signed in December 2004 (Section 1.3.1.1), Ecology and Reclamation are cooperating on a study to evaluate the feasibility of new large, off-channel storage sites in the Columbia River Basin. Reclamation is the federal agency that manages water projects, primarily for irrigation, in 17 western states. One of those projects is the Columbia Basin Project in the central portion of the Columbia River Basin in Washington State (Figure 2-1). Because Reclamation is a federal agency, its projects require Congressional authorization and appropriation and evaluation under the National Environmental Policy Act (NEPA).

A preliminary list of 11 potential off-channel storage sites was developed in a Pre-Appraisal Report completed prior to passage of the Columbia River Water Management Act (Ecology and Reclamation 2005). The Pre-Appraisal Report focused on potential sites that are within 10 miles of the Columbia River mainstem, would have capacity of at least 300,000 acre-feet, and would require pumping of no more than 800 vertical feet to lift water from the Columbia River to the reservoir. Ecology and Reclamation recently refined the list of sites by eliminating those that:

- Were too far downstream on the Columbia River to operate in conjunction with Reclamation's existing Columbia Basin Project,
- Would provide less than 1 million acre-feet of active storage, or
- Appeared to represent a high risk of failure or excess leakage.

In addition, the Confederated Tribes of the Colville Reservation requested that two potential reservoir sites that were included in the preliminary list of 11 not be further evaluated.

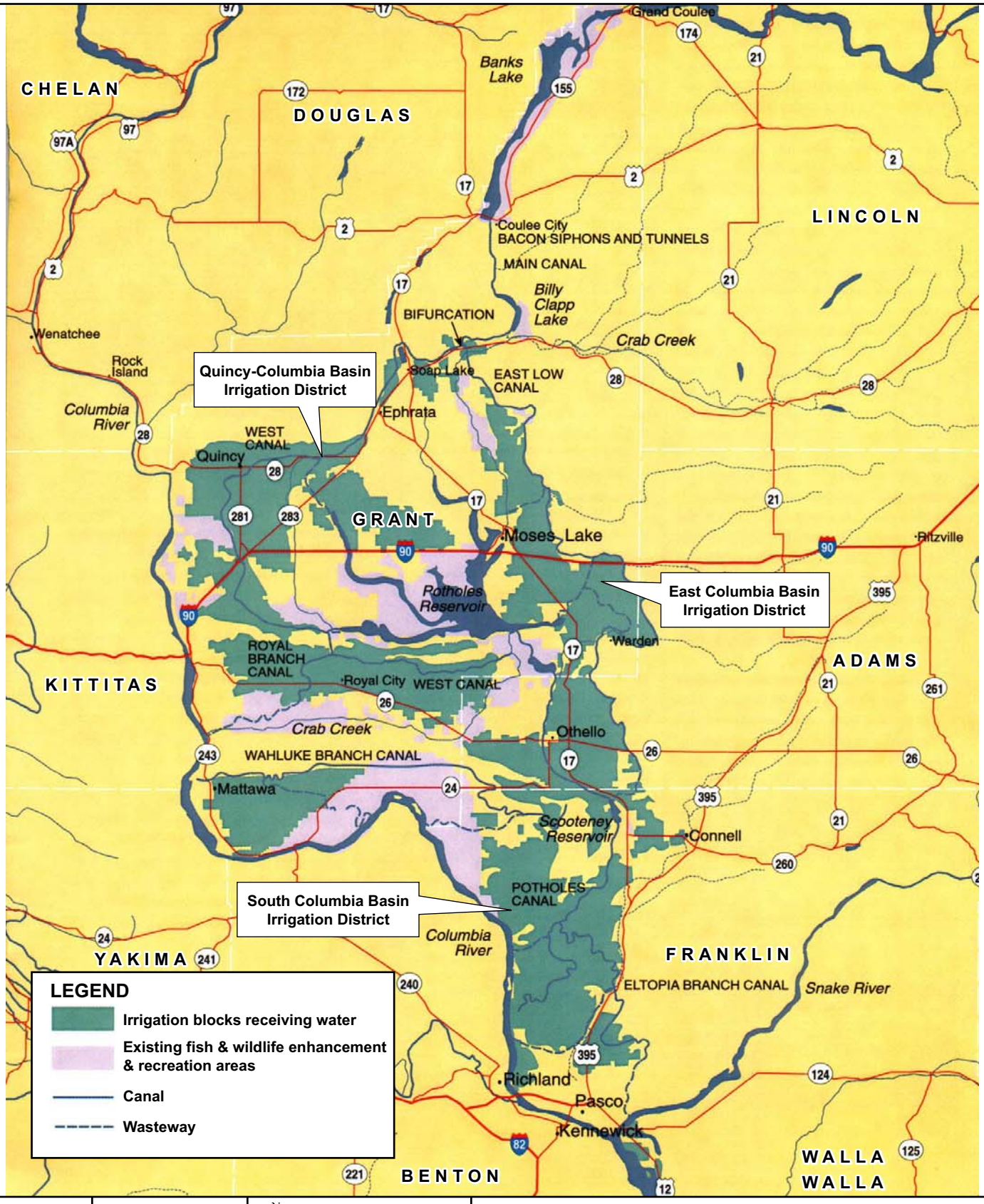
Four remaining sites identified in the Pre-Appraisal Report are being evaluated by Reclamation in an Appraisal Study. An Appraisal Study is the preparatory step to a comprehensive Feasibility Study and NEPA Environmental Impact Statement (EIS). Those sites, identified in Figure 2-2, include:

Hawk Creek - A site in northern Lincoln County tributary to Lake Roosevelt with potential active reservoir capacity of 1,400,000 acre-feet;

Foster Creek - A site in northern Douglas County tributary to Lake Pateros with potential active reservoir capacity of 1,210,000 acre-feet;

Sand Hollow - A site in western Grant County tributary to Lake Wanapum with potential active storage capacity of 1,100,000 acre-feet; and

Crab Creek – A site in western Grant County tributary to Priest Rapids Lake with potential active storage capacity of 2,300,000 acre-feet.



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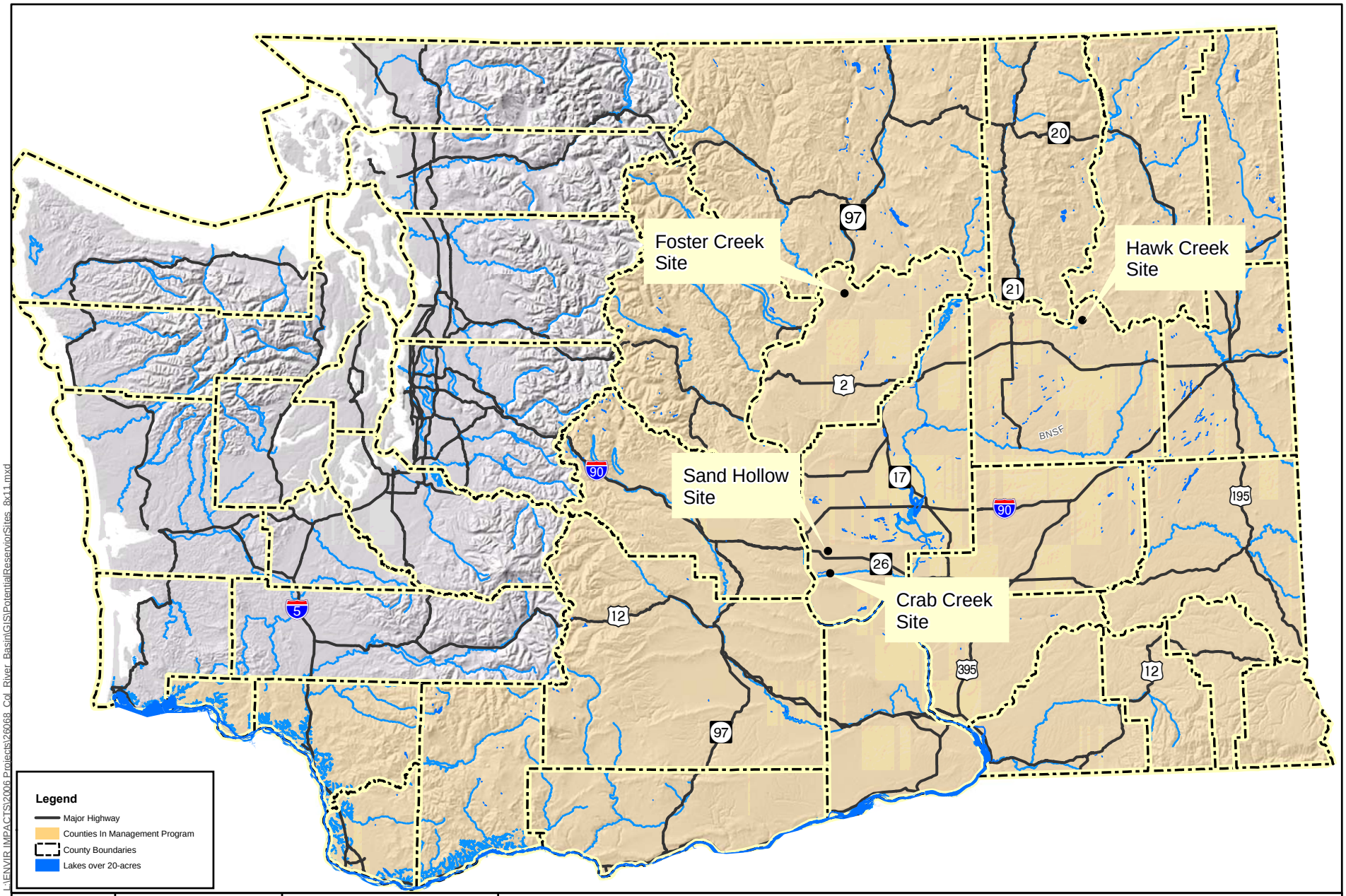
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FIGURE 2-1

COLUMBIA BASIN PROJECT

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

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FIGURE 2-2

COLUMBIA RIVER WATER MANAGEMENT PLAN

POTENTIAL OFF-CHANNEL RESERVOIR SITES

WASHINGTON

During the Appraisal Study, the four sites will be further screened to identify one or two sites that may be suitable to move forward into a Feasibility Study and joint NEPA and State Environmental Policy Act (SEPA) EIS. The screening will involve evaluation of the sites for technical feasibility, preliminary costs, degree of potential benefits, as well as the extent of potential adverse environmental and cultural resource impacts. Areas of concern for potential adverse cultural and environmental impacts include, but are not limited to:

- Native American trust assets and sacred sites;
- Archeological resources;
- National Historic Register eligible resources;
- Special-status aquatic and terrestrial species (for example, federal threatened and endangered species and state sensitive species);
- Special-status habitat (for example, shrub-steppe habitat) and conservation/preservation designated areas (for example, Wild and Scenic River Areas and federal or state wildlife refuges);
- Existing residential, agricultural, extractive industrial, and recreational land uses (displacement impacts); and
- Existing transportation, communication, and utility infrastructure.

The Appraisal Study is scheduled to be completed in March 2007. Prior to conducting a Feasibility Study, Reclamation must receive specific Congressional authorization; thus, it would likely be 2008 or 2009 before such a study could potentially be initiated. In addition, expenditures from the Columbia River Basin Water Supply Development Account needed for the state share of the Feasibility Study and EIS would require authorization from the Washington State Legislature. It is estimated that a Feasibility Study and EIS would require three years for completion.

Reclamation is also involved in the Yakima River Basin Water Storage Feasibility Study. One of the storage alternatives identified in the study is a proposal for a large reservoir to be located approximately 30 miles east of the City of Yakima, known as the Black Rock Reservoir. While the Yakima Basin Storage Study is being partially funded from the Columbia River Supply Development Account (Account), it has its own Congressional authorization and evaluation criteria. Those criteria include:

- Improve anadromous fish habitat by leaving more water instream and creating more normative flows in the Yakima River;
- Improve reliability of water supply for pro-ratable irrigation districts; and
- Assist in meeting growth in demand for municipal water supply.

The Black Rock project involves a proposal to construct an 800,000 to 1,300,000 acre-foot storage reservoir in eastern Yakima County. The proposed reservoir would be filled with water pumped from Priest Rapids Lake on the Columbia River when such water is available in excess of current Columbia River flow targets. Water from Black Rock Reservoir would be used by participating irrigation entities within portions of the lower Yakima Basin in exchange for water currently diverted by those entities from the Yakima River under existing water rights. Also

under consideration in the Yakima Basin Storage Study are proposals for a smaller reservoir, known as Wymer, and a pump exchange project, both described in more detail below. Development of a Planning Report and joint NEPA/SEPA EIS for the Yakima Basin Storage Study was initiated in December 2006 and is scheduled to be completed by the end of 2008. Additional information regarding the Yakima River Basin Water Storage Feasibility Study and the Black Rock Reservoir proposal can be viewed at the following link: http://www.usbr.gov/pn/programs/storage_study/ .

Ecology anticipates that, as part of the Columbia River Water Management Program, other potential large storage sites will be identified. For example, the Okanogan PUD and Okanogan County have requested that Ecology consider funding an Appraisal Study of a large reservoir proposal on the Similkameen River at a location known as Shankers Bend. This would involve development of up to a 1,600,000 acre-foot on-channel reservoir approximately five miles west of Oroville. This request is currently under consideration.

New Small Storage Facilities (Smaller than 1 Million Acre-Feet)

The Columbia River Water Management Act does not indicate a preference for the size of storage reservoirs to be pursued as part of the Management Program. Thus, new facilities with a capacity of less than 1 million acre-feet could also be funded under the Management Program. These facilities would generally be similar in nature to the large storage facilities described above and would be evaluated using criteria similar to those described above for large storage facilities.

The Water Supply Inventory and Long-Term Water Supply and Demand Forecast Report was completed in November 2006 pursuant to RCW 90.90.040 (Section 2.1.2.5). It identified a number of storage proposals that have been contemplated in Watershed Plans prepared under Chapter 90.82 RCW as well as those identified by conservation districts, irrigation districts, and municipalities. Many of these proposals are for reservoirs of less than 1,000 acre-feet. Reservoir proposals identified through the inventory will be screened with the funding criteria developed as part of the Management Program to determine eligibility for funding from the Account. It is anticipated that annual updates of the Water Supply Inventory will identify a number of additional small storage projects.

In addition to the storage proposals identified in the Water Supply Inventory, Douglas County requested Ecology to consider evaluating a potential off-channel reservoir site at the east end of Foster Coulee near Banks Lake. A preliminary analysis of the site indicates that it could support approximately 140,000 acre-feet of active storage. However, construction of a reservoir at the site would require pumping greater than 800 feet in elevation to fill the reservoir from Banks Lake. Douglas County has also requested consideration of an off-channel reservoir site north of the intersection of State Route 17 and State Route 174. A preliminary analysis has not yet been conducted for that site.

As mentioned previously, partial funding from the Account has been provided to Reclamation's Yakima Basin Water Storage Feasibility Study. One of the projects under consideration as part of that study is the Wymer off-channel reservoir proposal. The Wymer Site is located between the Yakima River and Interstate 82 at a point approximately 10 miles south of Ellensburg. The

reservoir, with an active capacity of approximately 174, 000 acre-feet, is intended to be filled with water pumped from the Yakima River. As part of the Feasibility Study, Reclamation evaluated Wymer Reservoir in conjunction with the Bumping Lake Enlargement and Keechelus-to-Kachess Pipeline Projects. Reclamation also evaluated Wymer Reservoir in conjunction with a pump exchange from the mouth of the Yakima River. Under the pump exchange scenario, Wymer Reservoir would be filled from winter flows from Cle Elum Reservoir and excess flows in the Yakima River.

Modification of Existing Storage Facilities

Projects of this type would make alterations to the structure or operation of existing facilities or conveyance systems to increase water availability. Modifications could include raising the height of existing impoundments (on-channel or off-channel) and/or altering operations at existing facilities in a manner that would provide water for additional beneficial uses. Examples of this type of project include re-operation of Banks Lake, under consideration as part of the Odessa Special Study described below and the proposed drawdown of Lake Roosevelt, described in more detail in Section 2.6.1.

Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) involves introducing water, usually surface water from rivers, into an aquifer through injection wells or through surface spreading and infiltration. The introduced water is stored in the aquifer until needed and then withdrawn from the aquifer through wells for beneficial use. Water to be stored in an aquifer must meet the state's ground water quality standards (Chapter 173-200 WAC). Aquifer storage and recovery does not include aquifer recharge from water artificially stored due to construction, operation, or maintenance of an irrigation system (Chapter 90.44.130 RCW) or projects involving recharge of reclaimed water (RCW 90.03.370).

The City of Kennewick has engaged in preliminary discussions with Ecology concerning the eligibility for funding from the Account for an ASR project associated with its municipal water system. The city's sources of water include a direct diversion from the Columbia River and two shallow wells near the Columbia River. Water from these sources is pumped to a water treatment facility before being routed to the municipal water system. Kennewick is proposing to pump water from the treatment facility during winter and spring, the period of greatest surplus production capacity, though the water distribution system to two injection wells to be installed at the south end of the city. The water would be introduced to the aquifer system and stored for use during the period of peak summer demand. Water would then be pumped back into the distribution system and made available for municipal use. If successful, the ASR system would give the city a firm supply of water for peak summer demand and allow it to reduce the level of diversions from the Columbia River during July and August, the most critical period for fish. Ecology is currently considering funding a portion of a pilot project to determine if the ASR project is feasible. Ecology anticipates that other ASR projects will be proposed for funding through the Account.

Odessa Subarea Special Study

The Odessa Ground Water Management Subarea (Odessa Subarea, Figure 1-1) was designated by Ecology in response to declining ground water levels. Approximately 121,000 ground water irrigated acres of the Odessa Subarea are located within the boundaries of Reclamation's Columbia Basin Project. This number is somewhat variable depending on the extent of acreage in production in any given year and could range from about 103,000 acres to 140,000 acres. The easternmost 230,000 acres of the Odessa Ground Water Management Subarea, including about 49,000 acres of irrigated land, are located outside of the Columbia Basin Project. Reclamation, in conjunction with Ecology, is conducting a study of the portions of the Odessa Subarea that lie within the Columbia Basin Project to identify options for replacing ground water currently used for irrigated agriculture with surface water from the Columbia River. This project is referred to as the Odessa Subarea Special Study.

The Odessa Subarea Special Study is a ground water replacement project and not a storage study. However, for purposes of this EIS, it has been included in the storage section of the Management Project description because the strategies for supplying replacement water would involve modifications of existing storage facilities and/or construction of new storage facilities.

In 2006, Reclamation identified four initial alternatives for further study (Reclamation 2006). As originally proposed, these alternatives would replace ground water use on between 48,000 and 121,000 acres of existing farmland by means of the following conveyance infrastructure:

- Construction of a scaled down version of an East High Canal system to serve the lands currently irrigated with ground water (this canal was part of the original design of the Columbia Basin Project, but was never built);
- Construction of a scaled down version of the East High Canal system and enlargement of the existing East Low Canal south of Interstate 90;
- Enlargement and partial extension of the existing East Low Canal system south of Interstate 90; or
- Using the existing East Low Canal system infrastructure.

In order to provide a replacement surface water supply to implement the alternatives, ranging in quantities from160,000 to 520,000 acre-feet, modifications to existing storage facilities or construction of new storage facilities, or both, would be necessary. Among the water supply options under consideration are the following:

- A number of scenarios for re-operation of Banks Lake ranging from increasing the pool elevation by 2 feet to drawing down the reservoir to levels below current operating levels;
- Cycling more water through Potholes Reservoir during the course of the year (also requiring acquisition of a larger downstream evacuation route); and
- Construction of new off-channel reservoirs at Dry Coulee, Rocky Coulee, and Lind Coulee, and Lower Crab Creek.

Reclamation is currently conducting appraisal level analyses involving additional engineering and hydrologic modeling to develop further engineering details and preliminary cost estimates,

verify ground water acreage, and determine the volume of water supply needed. The appraisal level analyses will likely result in revisions to the initial alternatives as more data are collected and evaluated. It is anticipated that a Feasibility Study and NEPA/SEPA EIS will be initiated in 2008 and completed in October 2010. More information regarding the Special Study can be obtained at the following link: http://www.usbr.gov/pn/programs/ucao_misc/odessa/report-alternatives.pdf.

While not considered as an alternative in the Odessa Subarea Special Study, the proposed diversion of an additional 30,000 acre-feet of water from Lake Roosevelt would supply a portion of the needed replacement water (Lake Roosevelt Drawdown Project in Section 2.6).

The purpose of this current Odessa Subarea Special Study is ground water replacement. While the alternatives envisioned by the study may help slow declines of ground water in areas receiving the new surface water, they are not intended to actually restore water levels in underlying ground water. Aquifer restoration would require some form of aquifer recharge project. Such a project was envisioned in Section 16 of the Memorandum of Understanding between the State of Washington, the Reclamation, and three Columbia Basin Irrigation Districts, and may be considered after the project or projects that emerge from the Odessa Subarea Special Study are initiated. However, at present, there are no specific plans for such a project.

2.1.2.2 Conservation and Other Actions Designed to Provide New Water Supplies Component

Funds from the Columbia River Basin Water Supply Development Account may be used to implement water conservation projects. Net water savings through conservation measures funded by the Management Program must be placed in Ecology's Trust Water Rights Program (Trust Program) in proportion to the state funding provided to the project (Appendix D for more details on the Trust Program). Water placed in the Trust Program would be managed by Ecology. Ecology would allocate water from the Trust Program for instream flows, irrigation, or other beneficial uses. Net water savings achieved through conservation projects within the boundaries of the Columbia Basin Project and for use as a replacement source of existing ground water use in the Odessa Subarea are not required to be placed in the Trust Program (RCW 90.90.010(5)).

Many different types of conservation projects are currently funded through Ecology, BPA, the Washington State Conservation Commission and other entities. Some of these conservation projects will complement the Management Program because they put more water into the Columbia River and allow for new water rights to be issued. Other projects would primarily benefit tributaries and may not complement Management Program goals. Through the recently completed Water Supply Inventory prepared pursuant to requirements of RCW 90.90.040, Ecology has developed an inventory of over 5,000 conservation projects. Screening and ranking procedures intended to elevate in priority those projects that best meet Management Program goals are currently under development.

The Management Program can fund a variety of types of conservation projects anywhere within the State of Washington portion of the Columbia River Basin. For purposes of this programmatic EIS, the following general types of conservation projects are described in this

subsection: Columbia Basin conservation projects, municipal conservation, agricultural conservation, and industrial conservation. In addition, this subsection addresses pump exchange projects.

Columbia Basin Conservation Projects

Water users in the Columbia Basin counties of Grant, Adams, and Franklin have proposed several innovative approaches to conservation. The Ground Water Management Area (GWMA) organization, the Columbia-Snake Irrigators Association (CSRIA), and local conservation districts have led this effort. These organizations are evaluating approaches such as Irrigation Water Management, where growers are provided incentive payments to reduce water use by factoring in weather conditions (for example, using information from Reclamation's AgriMet system) and soil moisture conditions into decisions regarding timing of water application to meet crop demands. Proposals are also being developed for full- and partial-season water banking projects. These proposed projects will be evaluated on a project-by-project basis.

Municipal Conservation

Municipal conservation projects could involve improvements to infrastructure for delivering municipal water supplies and/or demand management to reduce household water consumption. Operational efficiency measures could include minimizing losses of water during routine flushing of mains, detecting and repairing leaks, and testing and repairing meters. Household water conservation programs could include education, implementation of rate structures that discourage excessive water use, or adoption of local landscaping ordinances. Household programs could include incentives to purchase more water efficient appliances.

Municipal conservation may also include the use of reclaimed water. Reclaimed water can be used for industrial and commercial uses, in land application (for example, irrigation), direct recharge of ground water, surface percolation and indirect recharge of ground water, discharge to wetlands, direct stream-flow augmentation, and indirect stream-flow augmentation through ground water recharge.

Agricultural Water Conservation and Irrigation Efficiency Through Regional or Irrigation District Infrastructure Improvements

Irrigation districts are responsible for delivering water to farmers and other agricultural producers for use in irrigating their land. As such, irrigation districts operate extensive regional conveyance systems. A number of types of conservation measures may be implemented for such systems including:

- Lining canals to reduce water losses through infiltration;
- Replacing canals and ditches with closed pipe systems;
- Installing pump-back stations to capture tail water for reuse;
- Implementing canal automation and constructing re-regulation reservoirs to optimize water delivery and use; and
- Improving water measurement and accounting systems.

On-Farm Conservation and Irrigation Efficiency Improvements

On-farm agricultural water conservation and irrigation efficiency measures would typically be implemented by individual landowners, often with technical assistance from the local conservation district or the Natural Resources Conservation Service (NRCS). Such measures could include:

- Replacing open laterals and trenches with closed pipe systems;
- Replacing non-pressurized irrigation systems with pressurized sprinkler systems or drip irrigation systems;
- Using soil moisture sensors to optimize water use;
- Constructing on-farm ponds to capture and reuse tailwater; and
- Implementing automated water management and control systems in conjunctions with integrated soil moisture sensors.

Industrial

Industrial conservation measures would primarily be undertaken by individual business owners. Conservation measures could include improving infrastructure and changing operations to reduce water use. Industrial conservation may include the use of reclaimed water.

Pump Exchanges

Several pump exchange projects have been proposed in the project area. Use of funding from the Account to support Reclamation's Yakima River Basin Water Storage Feasibility Study was discussed in Section 2.1.2.1. Another one of the projects under consideration as part of that study is a Yakima River pump exchange. The pump exchange project would involve installation of a pumping plant at the mouth of the Yakima River near Kennewick, and a dual pipeline system that would convey the pumped water from the pumping plant up-river to the Sunnyside area. One purpose of the project is to improve stream-flows and water quality in the Yakima River. The water would be introduced to the Sunnyside Valley Irrigation District (SVID) and the Roza Irrigation District (RID) systems. The pump exchange project would deliver a total up to 1,200 cubic feet per second (cfs) of water in increments at various points along the pipeline route. Water provided to SVID and RID would replace water normally diverted from the Yakima River, allowing the water to remain in the river and augment stream-flows. Water delivery from the pump exchange would occur during the irrigation season from April through August.

Kennewick Irrigation District (KID) is also proposing a Yakima River pump exchange project to benefit flows in the Yakima River below the Prosser Dam. KID would forego a portion of their diversion at Prosser Dam in exchange for increased diversions lower on the Yakima River and on the Columbia River. Yakima River flows would increase by approximately 350 to 400 cfs from Prosser Dam to Chandler Canal. From Chandler Canal to a new pump station at Kiona, Yakima River flows would increase by approximately 175 cfs. Additional diversions at the new Kiona pump station on the Yakima River would reduce the net water savings to approximately 130 cfs from Kiona downstream to the Columbia River. Operation of a new pump station at Edison Street on the Columbia River that would be needed to supply water for the pump

exchange would create a 57 cfs deficit in Columbia River stream-flows. This project may be included as part of the proposed Columbia-Snake Irrigators Association Voluntary Regional Agreement (VRA) (Section 2.6.3). Under the proposed VRA, mitigation for the 57 cfs deficit in July and August could be provided by KID paying Ecology $10 per acre-foot per year, in perpetuity, to acquire water or fund conservation projects.

Ecology recently agreed to provide funding from the Account to the Confederated Tribes of the Umatilla Indian Reservation to support a Feasibility Study of a Walla Walla pump exchange project. Under the proposed project, a water intake and pumping plant would be installed near the confluence of the Walla Walla and Columbia Rivers. At least two options are under consideration involving conveyance of between 150 and 225 cfs of water upstream to the Milton-Freewater area. The conveyed water would be used in lieu of water that would normally be diverted from the Walla Walla River, thus increasing stream flows from the normal point of diversion to the mouth of the river. The pump exchange is part of a larger study to evaluate a number of aquatic ecosystem restoration projects within the Walla Walla River Basin in Oregon and Washington. The study is being co-sponsored by the Corps of Engineers and involves broad-based involvement of irrigators, irrigation districts, elected officials, and watershed groups. In addition to the pump exchange, off-channel reservoirs, irrigation efficiency projects, aquifer storage recharge projects, and other measures are also under consideration. The study is expected to be completed in late 2007.

2.1.2.3 Voluntary Regional Agreement Component

The legislation provides for groups or organizations to enter into Voluntary Regional Agreements (VRAs) with Ecology to exchange a package of water projects for new water rights. VRAs could be proposed anywhere within the Washington portion of the Columbia River Basin upstream of Bonneville Dam. According to RCW 90.90.030(2), VRAs must meet the following minimum requirements to be approved:

- For water rights issued from the Columbia River mainstem, there shall be no negative impact on Columbia River mainstem instream flows during July and August as a result of the new appropriations issued under the agreement;
- For water rights issued from the Snake River mainstem, there shall be no negative impact on Snake River mainstem instream flows from April through August as a result of the new appropriations issued under the agreement;
- Efforts must be made to harmonize the VRA with Watershed Plans adopted under the authority of Chapter 90.82 RCW that are applicable to the area covered by the agreement;
- The VRA may not impair or diminish a valid water right or a habitat conservation plan approved for purposes of compliance with the federal Endangered Species Act (ESA); and
- Any rights issued under a VRA approved through the Management Program must also meet the requirements of the "4-part test" that applies to all water right permits issued in Washington. That test includes the following criteria:
  - The water must be for a beneficial use.
  - The water must be available for appropriation.

- The proposed use must not impair existing water rights.
- The proposed use must not be detrimental to the public interest.

Ecology has received one formal request for a VRA submitted by the Columbia-Snake River Irrigators Association (CSRIA). That VRA is being evaluated as an early activity under this EIS (Section 2.6.3).

2.1.2.4 Instream Water Component

Sections 2.1.2.1 and 2.1.2.2, the Storage and Conservation and Other Actions Designed to Provide New Water Supplies Components, describe methods for securing water to be made available for instream and out-of-stream uses. Various projects that have been proposed or are contemplated are described in those sections, including a number that focus primarily on providing water for out-of-stream use. This section describes the overall strategy for developing water supplies needed for instream uses.

The primary directive of the Columbia River Water Management Act is for the Department of Ecology (Ecology) to:

> ". . . aggressively pursue the development of new water supplies to benefit both instream and out-of-stream uses" (RCW 90.90.005) (emphasis added).

Ecology is pursuing a full range of options for augmenting instream resources including development of new storage, modification of existing storage, and conservation. Ecology intends to continue working with the Washington Department of Fish and Wildlife (WDFW) and the fisheries co-managers to determine the specific periods during which water supplies developed through the Management Program will be available for instream use. The strategy for developing water supplies needed for instream uses involves a number of different approaches.

The Columbia River Water Management Act, Chapter 90.90 RCW, states that one-third of the active storage in any new storage facility made possible with funding from the Columbia River Basin Water Supply Development Account (Account) must be made available to augment instream flows. The timing of releases of water stored for instream use would be determined by Ecology in consultation with the WDFW and the fisheries co-managers.

The Act does not specify a formula for allocating water developed through conservation measures and other investments not related to new storage but designed to provide new water supplies. However, in developing its policies for implementing the Act, Ecology is proposing a preferred alternative for addressing the lack of clear direction regarding allocation (Section 2.2.3). Under the proposed policy, when the Account is used to fund non-storage projects, preference will be given to projects that produce instream benefits in tributaries as water flows to the mainstem. Once in the mainstem, determinations will be made by Ecology on a case-by-case basis concerning when it is necessary for a portion of the water to remain in trust for instream use. When making a determination regarding the amount of water to retain instream, Ecology will consider the risks associated with allowing the full quantity of water developed to be appropriated in new water rights. These risks could include those to instream values as well as those associated with issuing and defending any new water permits issued by Ecology. Water

reserved for mainstem instream flow in this manner could be reallocated to out-of-stream use in the future when adequate water from new or modified storage becomes available.

In addition, the proposed Lake Roosevelt Drawdown Project, described in Section 2.6.1, is intended to provide significant instream benefits for the Columbia River mainstem downstream of Grand Coulee Dam. Under this proposal, 27,500 acre-feet of water would be released from Lake Roosevelt from each year dedicated in trust for instream use. In drought years, an additional 17,000 acre-feet of water would be allocated to augment instream flow downstream of Grand Coulee Dam.

While not directly a component of the Management Program authorized under the Columbia River Water Management Act, the Washington Water Acquisition Program is actively pursuing acquisition of water for instream use in eight river basins that are tributary to the Columbia River. The basins are: the upper and lower Yakima, Naches, Methow, Okanogan, Walla Walla, Wenatchee, and Middle Snake Rivers. These basins are considered to be critical to fish, where low flows have been identified as a known limiting factor to salmon populations.

The Washington Water Acquisition Program is supported by local, state, and federal agencies; tribal governments; and private entities. State agencies involved in the program include Ecology, WDFW, and Washington Conservation Commission. Using state and federal funds, program sponsors are providing opportunities for water right holders to participate in salmon recovery by selling, leasing, or donating their water where critically low stream-flows limit fish survival. Water obtained through the program is left instream. Water right holders can also participate though the Irrigation Efficiencies Program. Water right holders can voluntarily place all or part of water saved through efficiency measures that they pay for into trust to enhance stream-flow. In addition, water saved through the publicly funded portion of conservation or irrigation efficiency projects must be placed in trust for stream flow.

2.1.2.5 Inventory and Demand Forecasting Component

The Columbia River Water Management Act directed Ecology to develop a Columbia River water supply inventory and a long-term water supply and demand forecast. The long-term water supply and demand forecast will be updated every five years. The inventory includes, at a minimum:

A list of conservation projects that have been implemented under the legislation and the amount of water conservation achieved; and

A list of potential water supply and storage projects in the Columbia River Basin, including estimates of:

- Cost per acre-foot,
- Benefit to fish and other instream needs,
- Benefit to out-of-stream needs, and
- Environmental and cultural impacts.

The first water supply inventory and long-term water supply and demand forecast was released in November 2006, following release of the Draft EIS. The inventory was prepared by consultants hired by Ecology and in cooperation with the State Conservation Commission, local conservation districts, and Washington State University. The inventory includes the following components:

- Conservation and storage projects;
- Water rights inventory;
- Water use inventory;
- Long-term water supply forecast; and
- Long-term demand forecast.

The following is a summary of the inventory and demand forecast. The inventory is available at: http://www.ecy.wa.gov/programs/wr/cwp/wsi_ltsdf.html.

Conservation Projects Inventory

Ecology's initial effort at developing an inventory identified more than 5,000 potential agricultural conservation projects. The projects, identified through surveys conducted by the Washington State Conservation Commission and through existing irrigation district planning documents, have the potential to save almost 1 million acre-feet of water. About half of the conservation districts in the region participated in the survey and, together, identified over 5,000 potential conservation projects. The conservation district inventory results can be summarized as follows:

- 5,315 projects;
- Approximately 530,000 acre-feet of estimated water savings (consumptive and non-consumptive);
- Total estimated cost of $663,000,000; and
- Average cost of $1,250 per acre-foot.

Projects or groups of projects that were identified though the irrigation districts can be summarized as follows:

- 82 projects;
- Approximately 425,000 acre-feet of estimated water savings (consumptive and non-consumptive);
- Total estimated cost of $450,000,000; and
- Average cost of $1,100 per acre-foot.

The two important considerations for the agricultural conservation inventory are: 1) the costs and water savings presented should be viewed as preliminary and used only to screen or compare projects within the inventory; and 2) the volume of water conservation that is likely to actually

accrue to the Columbia River is currently expected to be less than the total volume from the conservation opportunities that have been identified. This is likely because of a variety of challenges with the delivery of conserved water to the mainstem of the Columbia River.

Potential municipal conservation projects were also identified by reviewing water system plans of the largest municipalities within the Management Zone. The total conservation potential from municipal entities is difficult to estimate. Actual reported volumes of conservation are much lower than what was identified for agriculture, but it is likely that municipal conservation is under-reported in existing documents.

Storage Projects Inventory

Ecology and Reclamation are studying the feasibility of storage projects on different scales, in order to develop new water supplies for the Columbia River. The current inventory can be summarized as follows:

- Six large storage opportunities (larger than1 million acre-feet), cost ranging from $971 to $4,000 million;
- Numerous small storage opportunities (smaller than 1 million acre-feet), many of which did not have a volume or cost estimate.

The large projects inventory includes four projects on the Columbia River (Hawk Creek, Foster Creek, Sand Hollow, and Crab Creek) and two projects on the Yakima River (Black Rock Reservoir and Wymer Reservoir with Columbia River Pumpback). The total volume of potential small surface storage and aquifer recharge projects, identified primarily through WRIA storage assessment reports, was difficult to estimate for the initial inventory and will be added to future inventory reports.

Water Rights Inventory

Ecology's inventory of water rights within the Management Zone can be summarized as follows:

- 7,087 water rights in the Washington portion of the Management Zone totaling 8,194,586 acre-feet per year; and
- 551 water rights and applications in the Oregon portion of the Management Zone totaling 936,190 acre-feet per year.

The validity of these water rights was not determined as part of the inventory. It is probable that the actual use is less than the identified amount. Agricultural use accounts for over 79 percent of the water right quantity. The largest number of water rights, is in domestic uses, but the quantity of domestic water rights is only 7 percent of the total quantity.

Water Use Inventory

Water use estimates were also prepared for the inventory. Data were drawn from the U.S. Geological Survey (USGS), which compiles the most comprehensive and consistent estimate of water use currently available. USGS conducts its inventory every five years, with the last available inventory from the year 2000. Estimates from that inventory are as follows:

- Washington (21 counties): 3,756,172 acre-feet; and
- Oregon (7 counties): 847,094 acre-feet

The 2000 USGS water use estimates indicate that the largest water use in the Columbia Basin is irrigation and that irrigation use is concentrated in counties in the Management Zone.

Long-Term Water Supply Forecast

The future water supply of the Columbia Basin is not well defined and depends on a variety of fluctuating and undefined factors. In addition to changes in snowpack and runoff resulting from climate change, a number of management agreements such as flood control requirements and federal hydropower objectives influence future water supply. Interstate and international agreements also influence future water supply. Existing agreements with Canada, Idaho, and Oregon have varying levels of predictability for flow volume. Federal flow targets for fisheries management under the Biological Opinion for Columbia River fisheries listed under the Endangered Species Act have not been finalized. Tribal treaty rights to water in the Columbia River have also not been defined. All of these factors contribute to a lack of predictability for future water supply at this time.

Long-Term Water Demand Forecast

The inventory's initial water demand forecast was carried out in two formats or "tiers". The first tier demand forecast is based solely on water right applications on file in Ecology's Water Rights Tracking System (WRTS) database as of July 2006. The second tier demand forecast is based on projections of estimated actual water use, rather than water rights issued.

The first tier demand forecast estimate is for 454 water rights applications totaling 383,000 acre-feet. About 56 percent of that demand is associated with requested irrigation of just over 57,000 acres of land. About 23 percent of that demand is for municipal/domestic purposes, which could support an additional population of just over 450,000 people. About 21 percent of that demand is for commercial and industrial purposes, providing a peak demand of 230 cubic feet per second (cfs).

Agricultural water demands associated with water right applications are estimated at approximately 211,323 acre-feet with interruptible water rights constituting at least an additional 163,000 acre-feet. Potential total conservation amounts are currently estimated at 971,065 acre-feet. The annual conservation estimate is encouraging, but there are three important considerations:

- Only a small portion of the annual conservation potential is likely to accrue directly to the Columbia River;
- Because the total annual amount of conservation is distributed on a monthly basis, there is less conservation volume available during the peak irrigation season; and
- The amount of water available from conservation savings will be further reduced by the time lag between a point of withdrawal or conservation and the return flow to the Columbia River.

The second-tier demand forecast was based on agricultural forecasting tools developed by Washington State University. The tools estimate how much water demand changes will be driven by changes in crops grown in the basin and the land area planted to each crop. The results of the study show little or no change expected in crop acreage, but could not forecast acreage for some crops such as wine grapes and alfalfa. Projections of future agricultural demand based on actual water use are uncertain and could be higher or lower than current water right applications. Crop acreage is expected to be stable, though an upper bound increase of more than 750,000 acres is possible.

Projections of future municipal demand based on population forecasts are lower than current water rights applications. The Office of Fiscal Management (OFM) estimates an increase of 350,000 people in the Columbia Basin with an increase of 157,000 people in the Management Zone.

The inventory compares the results of the first and second tier forecasts and makes two conclusions. First, Although there is a discrepancy between water right applications and potential future demand, this does not mean that individual water right applications are not valid or that future total water use will not approach the quantities currently requested in applications.

Second the estimated future use for both water right applications and expected levels of use are reasonably close to the conservation savings currently identified in the basin. This, coupled with the possibility of additional storage in the basin, suggests that actual future demands for water can be accommodated in large part through the conservation and storage parts of the Management Program.

2.1.2.6 Water Information System

Ecology is in the process of developing a Columbia River Mainstem Water Resources Information System, with the intent of enabling Ecology, water users, and water resource planners to better understand water use, future demands, and supply alternatives in the Columbia River. It will form the basis for future permitting decisions, water marketing, and regional planning and forecasting. System development is well underway, with GIS mapping for all water rights within the one-mile corridor nearly complete. Future projects will include:

- Aerial photo delineation and field verification of actual water use;
- Water use metering;
- Creating electronic images of water right files;
- Incorporating existing stream gage and monitoring sites, and;
- Tracking conservation and storage inventories.

Ecology's goal is to publish its interactive information system to the internet by 2009.

As part of the Water Information System, Ecology is developing a water metering program. The Legislature requires that Ecology report metered water use data by June 30, 2009. Funding assistance is available for installation of water meters. The metering program will be implemented in phases. Phase 1, scheduled for 2007, covers the area from Priest Rapids Dam to

McNary Dam and up the Snake River to Ice Harbor Dam. Phase 2 will be completed in 2008 and extends from Wells Dam to Priest Rapids Dam. Phase 3 includes the area from the Canadian border to Wells Dam and from McNary Dam to Bonneville Dam. Phase 3 will be completed in 2009. Additional information on the metering program is available on Ecology's web site: http://www.ecy.wa.gov/.

2.2 Alternatives for Program Implementation

The Columbia River Water Management Act establishes a new mandate for Ecology to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." To implement the new directive, Ecology needs to develop new policies and guidelines. Ecology is considering a number of policy alternatives for implementing the Management Program. These policy alternatives are described briefly here and discussed in more detail in Chapter 6, Policy Discussion.

2.2.1 Selecting Water Supply Projects

Ecology's role in state water management has traditionally been one of regulation and permitting. The Columbia River Water Management Act adds to this traditional role by requiring the agency to "aggressively pursue" water supply development. Ecology currently plays some role in water supply development for instream flows and out-of-stream uses, but the legislation has "ramped up" this role by requiring that Ecology take an aggressive role in water supply development. This first policy alternative frames the discussion by describing Ecology's role in new water supply projects when it "aggressively pursues" them. Two alternatives are proposed:

> **Review projects only as proposed by applicants**. Water supply projects would be reviewed only as proposed by applicants, and screened and ranked by criteria developed by Ecology, including cost effectiveness, fisheries benefits, and other criteria.
>
> **Aggressively pursue water supply options.** In addition to reviewing water supply projects proposed by applicants, Ecology would aggressively pursue storage options (e.g., use Watershed Plans to identify and pursue smaller storage options; purchase stored water in Idaho and/or Canada; consider buying or negotiating changes in operations of existing federal facilities; conduct studies for ASR or passive ground water recharge; promote small projects that benefit small landowners); water conservation, and acquisition projects.

2.2.2 Calculating Net Water Savings from Conservation

The Columbia River Water Management Act provides that net water savings from conservation projects shall be placed in the Trust Water Rights Program: "net water savings achieved through conservation measures funded by the account shall be placed in trust in proportion to the state funding provided to implement the project (RCW 90.90.010(4)). Integration of the Act with the existing Trust Water Rights Program results in two central questions. First, what conservation projects can be considered and second, how will conservation savings be calculated?

Ecology is considering two alternatives for calculating net water savings.

Use GUID-1210 methodology. Net water savings methodology would be defined by rule, primarily based on existing guidance in GUID-1210 (Ecology 2005), an Ecology document that establishes Ecology's approach for determining irrigation efficiency and consumptive use of water.

Develop and use a methodology incorporating scientific evidence on the benefits of the net water savings to instream flows. Net water savings methodology would be developed based on scientific evidence regarding the benefits to instream flows. The methodology could include any credible approach that addresses the fate, pathway, timing, and legality of the water transfer being proposed.

2.2.3 Funding Criteria for Conservation Projects

The Columbia River Water Management Act specifies that two-thirds of the funding in the Columbia River Water Supply Development Account (Account) must be spent on storage projects and establishes a specific standard for spending funds associated with storage projects funded from the Account. Two-thirds of the new water is allocated to out-of-stream use and one-third is allocated to instream flows. The Act does not provide similar policy direction for funding of conservation projects or the criteria by which conservation projects will be screened and ranked.

The Act provides that the remaining one-third of the funds from the Account must be "used for other purposes in this section," which includes conservation. Net water savings from conservation are to be placed in the Trust Program, but the Act does not specify how the water in the Trust Program is to be used (RCW 90.90.010(2)(b)(4)). Ecology is considering three alternatives for funding and allocating new water that results from conservation projects.

Funding projects to benefit only out-of-stream water allocation. Any net water savings derived from funds that Ecology spends for conservation projects would be assigned to mitigate for permits authorizing out-of-stream beneficial use. Net water savings would not benefit instream flows in the Columbia River, but could benefit tributaries depending on the source of conserved water.

Funding projects to benefit only instream flows and water quality. Under this allocation proposal, net water savings from funded conservation projects would be used to benefit instream flows and water quality in the Columbia River as well as tributaries, if applicable.

Funding projects to obtain one-third of the benefit to instream purposes and two-thirds to benefit out-of-stream water allocation. Net water savings derived from funding conservation projects would be assigned to benefit both instream flows and out-of-stream uses on the Columbia River. One-third of the net water savings would be managed in the Trust Program to benefit Columbia River instream flows, and two-thirds would be assigned to mitigate for out-of-stream beneficial uses authorized by permits that would be issued under the program.

2.2.4 Defining "Acquisition" and "Transfer"

The Columbia River Water Management Act prohibits Ecology from expending money from the Account on conservation projects that will result in "water acquisition or transfers from one water resource inventory area (WRIA) to another." The bill does not define either acquisition or transfer. Ecology is considering two alternative definitions that describe the degree of flexibility that Ecology will have in issuing new water permits from the Columbia River based on projects funded under the Management Program:

> **Acquisition and transfer means any non-storage project.** Ecology will interpret "acquisition or transfer" to mean any non-storage project funded in part by conservation monies from the Account that results in water put into the Trust Program. Ecology will manage new permits so that conserved water from a WRIA is used, where possible, to offset new permits from the Columbia for beneficial uses within that WRIA.
>
> **Acquisition and transfer means direct purchase of water rights**. Ecology will interpret "acquisition or transfer" to mean the direct purchase of water rights, not infrastructure or conservation improvements that may yield conserved water. Ecology will manage new permits so that water rights purchased within a WRIA stay within a WRIA.

2.2.5 Conditioning Water Rights on Instream Flows

RCW 90.90.020(2) states that "Water developed under the provisions of this section to offset out-of-stream uses and for instream flows shall be deemed adequate mitigation for the issuance of new water rights." Currently, Ecology conditions new water rights and water right changes to protect instream flows (Chapter 173-563 WAC and Chapter 173-564 WAC). This requirement has discouraged some water right changes that could provide a "new source of water" for municipal users. Ecology is considering two alternatives for processing water rights changes:

> **Apply instream flow water right created by the June 24, 1980 Columbia River instream flow rule to new permits or changes of season of use that authorize use outside the season where the conserved water or acquired water right was beneficially used.** All changes of seasonal to year-round rights would continue to be subject to the adopted instream flows. Also, new permits that rely on a seasonal water right for mitigation, but which authorize a new use outside the season of use of the water right acquired for mitigation, would be subject to the adopted instream flow during the period outside the time when the mitigation water right was historically exercised.
>
> **Waive instream flow water right created by the June 24, 1980 Columbia River instream flow rule where new permits or transfers shift consumptive demand away from critical periods and benefits aquatic species**. Under this alternative, Ecology would develop an approach that would recognize the benefit to aquatic species of shifting the demand from the critical July and August period to the period from October through March. This approach would include an evaluation of the public benefits and costs, and whether the overriding considerations of the public interest (OCPI) would be served by shifting the out-of-stream uses away from a critical period for fish. An example of this approach would be the conversion of a seasonal irrigation use to a year-round municipal use that would reduce actual water use during July and August for the mainstem

Columbia or the April to August period for the Snake River. If the municipal use would be less during July and August than the amount currently used for irrigation during that period, it would benefit instream flow in the same manner as a scheduled release of water from a storage facility. This determination could either be implemented on a case-by-case basis when rights are proposed for change (or mitigation is evaluated for adequacy to issue a new permit) or it could be addressed through rulemaking.

2.2.6 Initiating Voluntary Regional Agreements

The alternatives considered here relate to how aggressively Ecology will pursue VRAs. Two alternatives are proposed:

Process VRAs as proposed. Ecology would review VRAs only as proposed by applicants.

Aggressively pursue VRAs. In addition to reviewing VRAs proposed by applicants, Ecology would aggressively pursue new water and actively seek groups who wish to develop VRAs through such strategies as water marketing and reverse auctions (a reverse auction occurs when Ecology notifies water rights holder that it is looking for water to buy or lease and asks those interested to respond to Ecology and let the agency know how much water they are willing to sell or lease and at what price).

2.2.7 Processing Voluntary Regional Agreements

Ecology currently processes water rights applications according to the "Hillis Rule" (Chapter 173-152-050 WAC). Generally, Ecology will process new water right applications and water right change applications in two separate tracks in the order they are received within a region. Ecology may make decisions from multiple water sources within a region based on the oldest priority date in each source. Ecology generally prioritizes its work by source (WRIA) for efficiency in investigation and permitting. The oldest priority date is based on the date the application is filed with Ecology (WAC 173-152-030).

Ecology has identified three alternatives for processing applications for new water rights and water right changes associated with VRAs.

Process applications according to Hillis Rule. Ecology would continue to process new water rights applications according to the "Hillis Rule." In order for an application associated with a VRA to be processed ahead of prior competing applications, it would have to meet one of the exceptions in the Hillis Rule.

Amend the Hillis Rule for VRAs that convert interruptible rights. The Hillis Rule would be amended to add a new processing line for water right applications submitted under VRAs that are solely for the conversion of interruptible rights to non-interruptible rights.

Amend the Hillis Rule for new water rights from VRAs. The Hillis Rule would be amended to add a new processing line for issuing new water rights resulting from VRAs.

2.2.8 Defining "No Negative Impact" to Instream Flows of the Columbia and Snake Rivers

The Columbia River Water Management Act sets forth that there shall be no negative impact to stream-flow allowed in July and August on the Columbia River and from April through August on the Snake River as a result of a VRA. VRAs could propose withdrawals of water in one part of the basin, based on net water savings through conservation in another part of the basin. There is no existing policy on how or where to measure whether a withdrawal of water pursuant to a VRA would result in a net reduction in stream-flow. The Management Program could include any project that would benefit instream-flows in the Columbia and Snake Rivers, which would include some projects on tributaries of these rivers. The location where net water savings from a tributary project would be measured would be at the mouth of the tributary.

Ecology is considering four alternative policies to address measuring a net reduction in instream flow. For each of these alternatives, if a VRA includes a conservation project funded by Ecology, there may be an additional restriction that the mitigation must be in the same WRIA as the new withdrawal (for example see RCW 90.90.010(2)(a) and Section 2.2.4).

Same pool and downstream. Withdrawal can occur anywhere downstream of, or anywhere in, the same pool where net water savings through conservation occur, including in tributaries.

Same major reach. Withdrawals can occur anywhere within the same major reach, but not downstream of the major reach in which the net water savings through conservation occur.

Same pool, but not downstream. Withdrawals can occur anywhere within the same pool where net water savings through conservation occur, but not downstream of the pool.

Same pool, but only downstream of point of net water savings. Withdrawals can occur within the same pool where net water savings through conservation occur, but only downstream of the point where net water savings through conservation occur, and not downstream of the pool.

2.2.9 Defining the Main Channel and One-Mile Zone

The legislation defines the mainstems of the Columbia and Snake Rivers to include "all water . . . within the ordinary high water mark [OHWM] of the main channel…" and "all ground water within one mile of the ordinary high water mark." Ecology interprets "all water" in these definitions to refer to diversions within the one-mile corridor, whereas the place of use could be outside of the one-mile corridor. Significantly, this definition applies only to RCW 90.90.030 and RCW 90.90.050, which address VRAs and the water resource inventories. The definition applies to:

- Water rights issued from the mainstem;
- No negative impact on instream flows of the mainstem; and

- Water resource inventory for "effective mainstem water resource planning and management."

Ecology is considering how to define the OHWM of the main channel and how to measure the one-mile zone. If a narrow definition were used, the Management Program would focus on a smaller number of users. Many water users with interruptible water rights would not be included because they divert water outside of the one-mile corridor and thus might not be eligible to benefit from VRAs or storage projects. Further, there are springs and creeks tributary to the mainstems within the one-mile corridor that could be considered “all water”. Ecology is considering two alternatives for defining the main channel OHWM and one-mile zone.

> **No backwater areas included.** The definition of the main channel OHWM would not include any of the backwater areas on tributaries. A straight line would be drawn across the mouth of each tributary to delineate the mainstem channel. The main channel also would not include any tributary surface water rights within the one-mile corridor.
>
> **Backwater areas included.** The definition of the main channel OHWM would include backwater areas on tributaries and tributary surface water. Thus the one-mile zone would extend one mile from the OHWM of any of the backwater areas as well as from the mainstem proper.

2.2.10 Coordinating VRA Mitigation and Processing New Water Rights

Processing new water rights from the Columbia River will require mitigation for any impacts to instream flows. The mitigation will be provided either through a VRA or through the consultation process (WAC 173-563-020, Section 1.3 for additional information). A VRA requires no negative impact on instream flows in July and August (April through August for the Snake River). Mitigation under a VRA means avoidance of impacts on flows and is in-kind, in-time, and in-place.

Ecology plans to aggressively pursue funding of storage and conservation projects to make mitigation water available for such permits. However, adequate mitigation water may not be available for new water rights associated with a VRA. RCW 90.03.380(5)(c) allows Ecology to skip over a water rights change application to the next person in line if information is lacking to make a decision on the request. Ecology does not have similar statutory discretion for processing new water rights and must process them in the order they are received. Ecology may request permission from the applicant to be skipped over if the applicant has not provided enough information on the application.

Ecology is considering two alternatives for processing applications if adequate mitigation water has not been acquired in the area needed to make a permit decision.

> **Deny the application.** If mitigation water is not available to meet the requirements in the legislation, Ecology should deny the application or otherwise require the applicant to provide adequate mitigation in a timely manner (to meet the VRA standard or that imposed by Ecology following consultation). If the application is denied and mitigation later becomes available in that area, the applicant would have to refile an application and the mitigation water would be used for the oldest application in line in that area.

Seek legislative authority to skip applications. Ecology should seek legislative authority similar to that provided in the change statute (RCW 90.03.380(5)(c)) so it can skip over VRA applications upon request of the applicant where mitigation is not available. If mitigation later becomes available, the senior-most applicant in that area would be able to use the mitigation for the proposed project subject to the terms and conditions of Ecology's acquisition of the mitigation.

2.2.11 Coordinating VRA and Non-VRA Processing

WAC 173-152-030 states that Ecology will process new water right applications in the order they are received within a region. It also allows Ecology to make decisions from multiple water sources within a region, based on the oldest priority date in each source (Ecology defines "source" as the same body of public water that is not hydraulically connected). The oldest priority date is based on the date of the application filed with Ecology. Generally, Ecology processes water rights applications on a WRIA-by-WRIA basis within the region to maximize permitting efficiency, which may include Columbia River applicants and non-Columbia River applicants.

The Columbia River spans multiple WRIAs and three Ecology regions (Southwest, Central and Eastern). How Ecology chooses to prioritize its work will affect the seniority of applicants who will be processed under the Management Program, where Ecology should prioritize its conservation efforts to generate mitigation water through acquisitions and conservation project funding, and who will be eligible to receive mitigation water from projects funded with Columbia River dollars. Ecology is considering three alternatives for processing VRA and non-VRA applications:

Grouped within the Columbia River one-mile corridor. Ecology would group all applicants in the Columbia River one-mile corridor together, giving maximum weight to the existing priority system.

Grouped within the Columbia River one-mile corridor by region. Ecology would group all applicants in the Columbia River one-mile corridor by region and direct staff to work on the first applicant in each region at the same time. This would provide regional parity by processing water rights in each region. Water rights in one region would not be processed at the exclusion of another region.

Grouped within the Columbia River one-mile corridor with WRIA permitting. Ecology would group all applicants in the Columbia River one-mile corridor with tributary WRIA permitting, which integrates permitting at the WRIA level. Ecology would choose which WRIA to work in based on the existence of mitigation water available to offset Columbia River impacts.

2.2.12 Funding Projects Associated with a VRA

The Columbia River Water Management Act does not directly require Ecology to use conservation or storage funding to assist in providing mitigation water for VRAs. Ecology is considering three alternatives for funding projects associated with VRAs.

Mitigation for all applicants. Ecology would spend conservation project money on projects that will provide mitigation for all applicants subject to their priority date in line regardless of whether they participate in a VRA or not.

Mitigation only for applicants in VRAs. Ecology would only spend conservation project money on projects that will provide mitigation for applicants in VRAs. Applicants not in VRAs that participate in the consultation process would provide their own mitigation.

No mitigation for applicants in VRAs. Ecology would not spend conservation project money for mitigation associated with VRAs. VRA participants would provide their own mitigation.

2.2.13 Inclusion of Exempt Wells in Water Use Inventory

The Columbia River Water Management Act directs Ecology to develop a Columbia River mainstem water resources information system that includes "the total aggregate quantity of water rights issued under state permits and certificates and filed under state claims on the Columbia River mainstem and for ground water within one mile of the mainstem" (RCW 90.90.050(2)(a)). Exempt wells are not issued permits or certificates, and yet are allowed to withdraw water, and they are subject to interruption in order to protect instream flows. Exempt wells are an important part of the water balance for the defined area, but they are not technically within the definition of what the information system is expected to include. Ecology will consider two alternatives for including exempt wells in the inventory system.

Do not include exempt wells in the information system.

Include exempt wells in the information system.

2.3 Preferred Alternatives for Program Implementation

The following section describes Ecology's preferred alternatives for the policy choices described in Section 2.2 after considering comments received on the Draft EIS. These choices can be implemented through policy actions and permit decisions. Rulemaking may be required in conjunction with Ecology's choices described in Sections 2.3.2 and 2.3.10. Additional discussions of the preferred alternatives is provided in Chapter 6.

2.3.1 Selecting Water Supply Projects

Current water supply needs are identified in the *Water Supply Inventory and Long-Term Water Supply and Demand Forecast*, Ecology, November 15, 2006 (Section 2.1.5). This inventory will be updated frequently to ensure an ongoing understanding of real water needs. Ecology will actively pursue the most cost-effective and beneficial methods to meet the future water supply needs of the Columbia River Basin. Both large and small water supply projects will be evaluated and considered.

First, Ecology will continue to fund studies designed to identify large off-channel storage projects that would serve multiple water supply purposes and benefit both public and environmental water needs. Second, Ecology will work to identify other, likely smaller, water

supply opportunities that might substitute for, or complement, new large off-channel storage. Opportunities include: using Watershed Plans to identify and pursue smaller storage projects, purchasing stored water in Idaho and/or Canada, buying or negotiating changes in operations of existing federal facilities to provide additional water when and where it is needed, aquifer storage and recharge: passive ground water recharge, and other water conservation and acquisition projects.

2.3.2 Calculating Net Water Savings from Conservation

The Columbia River Water Management Act provides that net water savings from conservation projects shall be placed in the Trust Water Rights Program (Trust Program). The Act states: "net water savings achieved through conservation measures funded by the account shall be placed in trust in proportion to the state funding provided to implement the project" (RCW 90.90.010(4)).

Ecology will use GUID-1210 (a 2005 Ecology guidance document that establishes Ecology's approach for determining irrigation efficiency and consumptive use of water) for calculating net water savings. Ecology may, if required by RCW 34.05, propose a rule that adopts the GUID-1210 methodology as the basis for calculating consumptive use and net water savings.

2.3.3 Funding Criteria for Conservation Projects

Net water savings derived from funding conservation projects will be assigned to benefit both instream flows and out-of-stream uses on the Columbia River. Projects would be qualified and then ranked by the magnitude and significance of the instream and out-of-stream benefits expected. In-kind contributions and cost-sharing by applicants will be among the criteria to be developed by Ecology.

Ecology will ensure the expected project benefits are realized in two ways. First, if conservation projects are funded on tributaries, water savings will be assigned solely to instream flow benefit within the tributary stream down to the confluence with the Columbia River. Second, during initial program implementation, Ecology may initially reserve a portion of the water rights acquired with Account funds for instream purposes on the mainstem Columbia River. Ecology may subsequently alter the initial reservation once measuring and accounting systems are fully implemented and any uncertainties associated with management of the new Trust Water Rights and new permits are defined and addressed.

To ensure that anticipated out-of-stream benefits are achieved, Ecology will allocate water rights not reserved exclusively for mainstem flow improvement to provide mitigation for new water rights from the Columbia mainstem. Ecology will provide mitigation water for each permit it approves; however, the state-funded portion of the mitigation package will be determined by the project funding criteria and anticipated public benefits associated with the proposed use of water.

2.3.4 Defining "Acquisition" and "Transfer"

The Columbia River Water Management Act prohibits Ecology from expending money from the Account on conservation projects that will result in "water acquisition or transfers from one water resource inventory area (WRIA) to another" without express legislative authorization. The bill does not define either "acquisition" or "transfer."

For purposes of determining where Account funds may be spent, Ecology will define the terms "acquisition" and "transfer" as follows:

> "Acquisition" means funding projects using the Columbia River account for the purpose of effectuating the following forms of consumptive water use reduction:
>
> - Purchase of water rights to place in the Trust Program;
> - Crop water duty reductions (e.g., deficit irrigation without crop change);
> - Change in crops (e.g., permanent change of orchard to vineyard);
> - Fallowing or idling corner irrigation of center-pivot irrigation systems;
> - Switching from irrigated to non-irrigated crops; and
> - Partial season acquisitions (e.g., foregoing irrigation after first cutting of hay).
>
> "Transfer" means the change of a water right from one place and person to another place and person, or the issuance of a new permit where the consumptive demand associated with the new permit is mitigated by a water right "acquired" using Account funds and held in the Trust Program.

Pumps and pipes infrastructure projects are not considered to be "acquisition" or "transfer."

2.3.5 Conditioning Water Rights on Instream Flows

RCW 90.90.020(2) states that "Water developed under the provisions of this section to offset out-of-stream uses and for instream flows shall be deemed adequate mitigation for the issuance of new water rights." Currently Ecology conditions new water rights and water right changes to protect the instream flow water right established in 1980 and referred to as the Columbia River Instream Flow Rule (Chapter 173-563 WAC). This requirement has discouraged some water right changes that otherwise could provide a reliable new source of water for municipal users. Ecology will continue to apply the instream flow water right created by the 1980 Columbia River Instream Flow Rule to new permits and to season of use changes that authorize a beneficial use during a different season than the mitigation water right. In situations where demand shifting from critical summer months to less critical winter months would result in a benefit to aquatic species, Ecology will consider case-specific waivers of the 1980 instream flow after consulting with the Directors of the Department of Fish and Wildlife and the Department of Agriculture and the Commissioner of Public Lands.

2.3.6 Initiating Voluntary Regional Agreements

Ecology will support water users with common interests to consider a VRA where it benefits the Columbia River program and is in the public interest. Ecology will respond to and work with proponents to execute new VRA proposals that are consistent with RCW 90.90.030. However, this will not be a major focus of Ecology's activities

2.3.7 Processing Voluntary Regional Agreements

Ecology currently processes water rights applications according to the "Hillis Rule" (Chapter 173-152-050 WAC). Ecology will continue this practice for new Columbia River applications, including those associated with a VRA. This means that, generally, Ecology will process new water right applications and water right change applications in two separate lines in the order they are received within an Ecology region. Ecology may make decisions from multiple water sources within a region, beginning with the application with oldest priority date from each source. Ecology generally prioritizes its work by source (WRIA) for efficiency in investigation and permitting. The priority date is based on the date an application is filed with Ecology (WAC 173-152-030).

2.3.8 Defining "No Negative Impact" to Instream Flows of the Columbia and Snake Rivers

The Columbia River Water Management Act sets forth that there shall be no negative impact to stream flow allowed in July and August on the Columbia River and from April through August on the Snake River as a result of a VRA. Ecology will use metering, monitoring, stream gaging and water masters to account for Trust Water Rights derived from conservation and acquisitions together with all mitigated permits. Ecology will authorize new out-of-stream uses only within the first mainstem pool that benefits from a trust water right and any downstream pools, subject to the limitations of RCW 90.90.010(2)(a) on acquisitions and transfers. Net water savings from a tributary project would be measured at the mouth of the tributary.

2.3.9 Defining the Main Channel and One-Mile Zone

The Columbia River Water Management Act defines the mainstems of the Columbia and Snake Rivers to include "all water ... within the ordinary high water mark (OHWM) of the main channel…" and "all ground water within one mile of the ordinary high water mark." Ecology interprets "all water" in these definitions to refer to diversions within the one-mile corridor, even where the place of use of the diverted water is outside of the one-mile corridor. The definition of the main channel and one-mile zone applies to:

- Water right permits issued from the mainstem;
- The mitigation standard for VRAs (no negative impact on instream flows of the mainstems); and
- The water resource inventory prepared for "effective mainstem water resource planning and management."

A straight line will be drawn across the mouth of each tributary to delineate the mainstem channel. The main channel OHWM does not include any of the backwater areas on tributaries nor does it include tributary surface water rights within the one-mile corridor.

2.3.10 Coordinating VRA Mitigation and Processing New Water Rights

Processing new water rights from the Columbia River will require mitigation for any impacts to instream flows. The mitigation will be provided either through a VRA or through the

consultation process (WAC 173-563-020, see Section 1.3 for additional information). The mitigation standard for Columbia River water rights covered by a VRA is no negative impact on instream flows during July and August. For the Snake River, it is no negative impact for the months of April through August. Mitigation under a VRA means avoidance of negative impacts on flows and must be in-kind, in-time, and in-place.

Ecology will aggressively pursue funding of water supply projects to make mitigation water available for new mainstem permits, whether covered by a VRA or not. However, in some cases, adequate (in-kind, in-time, in-place) mitigation water may not be available. RCW 90.03.380(5)(c) allows Ecology to skip over a water right change application to the next person in line if information is lacking to make a decision on the request. Ecology does not have similar discretion for processing new water rights and must process them in the order they are received. However, Ecology may request permission from new water right applicants to skip to the next applicant.

If state-funded mitigation is unavailable and those earlier in line who require mitigation cannot provide their own, Ecology would allow those earlier in line to voluntarily step aside for up to a set period of time. After that period of time, the application would be processed, even if adequate mitigation water has not been found. This may result in a denial of an application to the extent that mitigation was inadequate. If an earlier applicant declines to step aside, Ecology will process the application and would deny an application that fails to meet the four-part test under RCW 90.03.290. Ecology will address this process through policy development or, if required by RCW 34.05, rulemaking and will consider reasonable timeframes (e.g., two years) necessary to coordinate acquisition of adequate mitigation under the program (in-kind, in-place, in-time) with new application requests.

2.3.11 Coordinating VRA and Non-VRA Processing

WAC 173-152-030 states that Ecology will process new water right applications in the order they are received within a region. It also allows Ecology to make decisions from multiple water sources within a region, beginning with the oldest priority date in each source. The priority date is based on the date an application is filed with Ecology. Ecology defines a "source of water" as surface waters and/or ground water in hydraulic connection, meeting the following four conditions:

1. They share a common recharge area.
2. They are part of a common flow regime.
3. They are separable from other water sources by effective barriers to hydraulic flow.
4. They are an independent water body for the purpose of water right administration, as determined by Ecology.

Generally, Ecology processes water rights applications on a WRIA-by-WRIA basis within a region to maximize permitting efficiency. WRIAs may include Columbia River applicants and non-Columbia River applicants.

Ecology will use a hybrid of two choices presented in the Draft EIS to coordinate VRA and non-VRA application processing based on 1) the source of mitigation water acquired and placed into the Trust Program (e.g., mainstem savings versus tributary savings) and 2) whether saved water must stay within the WRIA by statute (e.g., RCW 90.90.010(2)(a)), as follows:

- **Grouped within the Columbia River one-mile corridor.** If the source of mitigation water is a mainstem conservation, acquisition, or storage project, Ecology will group all applicants in the Columbia River one-mile corridor together. Ecology will process applications from the mainstem independent of WRIA boundaries when the source of water from a water supply project is from the mainstem Columbia, for example, the proposed Lake Roosevelt drawdown.
- **Grouped within the Columbia River one-mile corridor with WRIA permitting.** If the source of mitigation water is a conservation or acquisition project within a tributary stream, Ecology will group applicants within the Columbia River one-mile corridor together with tributary WRIA permitting. Ecology will choose which WRIA to work in based on the availability of water rights within the Trust Program to match up with new permits from the Columbia River requiring mitigation to satisfy the no negative impact policy described in section 6.1.9. The senior-most applicant *within the WRIA* will be processed ahead of older mainstem applicants downstream if those older applicants cannot benefit from mitigation water that must stay within the WRIA.

2.3.12 Funding Projects Associated with a VRA

The Columbia River Water Management Act does not directly require Ecology to use conservation or storage funding to assist in providing mitigation water for VRAs. However, Ecology will expend Account funds on projects that will provide mitigation for mainstem water right applicants, including those who participate in VRAs. New VRAs will be expected to include provisions for funding a portion of the costs associated with developing new water supplies.

2.3.13 Inclusion of Exempt Wells in Water Use Inventory

Ecology will include uses of ground water exempt from permitting in the water use inventory. However, the first inventories will address only uses that rely on wells for which electronic information is available. Over time, as resources and opportunities allow, Ecology will expand the inventories to include additional exempt uses. Ecology will provide access on its website to the aggregate inventory data by 2009.

2.4 No Action Alternative

Under the No Action Alternative, the Management Program would not be implemented and the allocation of water and processing of water rights would continue under the existing programs and policies. The Columbia River Basin Water Supply Development Account would not be used to fund new storage projects or conservation projects, but those projects could continue to be pursued with other funding. Ecology would not enter into VRAs with groups or entities or establish the inventory and demand forecasting component. There would be no Ecology funding for the Lake Roosevelt drawdown or Supplemental Feed Route projects, but those projects could

be implemented by other parties. The purpose of the No Action Alternative is to provide a means of comparing the impacts associated with the Management Program to the impacts of continuing without the legislated program.

2.5 Other Non-project Alternatives Considered but Not Carried Forward to Environmental Review

During the development of the Columbia River Water Management Act, numerous proposals were considered for improving the allocation of water in the Columbia River Basin. The state Legislature did not carry these proposals forward and they are not being evaluated in this programmatic EIS. These proposals generally advocate using only one approach to resolving the allocation problems. The Columbia River Water Management Act and the Management Program recognize the value of the individual approaches to managing water, but propose a more comprehensive approach that includes aspects of each of the proposals.

2.5.1 Conservation Only Approach

Under this proposal, all new water in the Columbia River Basin would be obtained through conservation projects only. No new storage facilities would be pursued through studies, analyses, funding, or construction. The Management Program legislation encourages conservation projects and the legislation allocates funding for conservation projects. The Columbia River Water Management Act strongly supports both storage and conservation by prescribing a formula for funding both activities.

2.5.2 Storage Only Approach

The storage only approach would include only storage projects and would not include conservation projects or other water management strategies. The state Legislature rejected the storage only approach because other approaches to water management can also provide benefits and improve water allocation.

2.5.3 Water Marketing/Water Banking

Water marketing, the purchase of existing water rights for allocation to new uses, along with water banking, have been proposed as an approach to water management in the Columbia River Basin. Water marketing and water banking could reallocate existing water rights to new uses. Water banking refers, in general, to a formalized exchange of water rights in a particular area. A water bank transaction is one that involves the transfer of all or a portion of a water right from the owner of the right to the buyer or new user of the right. The institution serving as the water bank will deposit the water right into trust to be held for a period of time until a buyer of the water right is identified. The water bank is the institutional framework that comprises the rules and other market mechanisms to meet the basic needs of buyers and sellers, and to facilitate pricing, documentation, and completion of the transactions.

The legislation did not authorize water banking in the Columbia River Basin, but did not preclude Ecology from pursuing marketing options in the future. Ecology has established a pilot water bank project in the Yakima River Basin and that approach could be expanded in the future.

2.6 Description of Early Actions and Alternatives

This section describes the actions identified for early implementation under the Management Program. They include two actions that involve a partnership between the state of Washington and Reclamation, the Lake Roosevelt drawdown project and the Supplemental Feed Route project, as well as the Voluntary Regional Agreement (VRA) submitted by the Columbia-Snake River Irrigators Association (CSRIA).

This programmatic EIS evaluates the impacts associated with the SEPA actions related to the early actions. The Supplemental Feed Route project conducted in coordination with Reclamation will receive separate NEPA analysis as described in Section 1.1. The NEPA analysis will cover the impacts of construction and operation of the project. For the Lake Roosevelt drawdown, the action subject to SEPA review would be the approval of water rights. The SEPA actions for the Supplemental Feed Routes would be the issuance of permits by Ecology (or other agencies), including the Hydraulic Project Approval (HPA) and construction storm water permits. While Ecology intends to proceed with these actions as soon as possible after completion of this programmatic EIS, the Supplemental Feed Route project and the Lake Roosevelt drawdown project will require subsequent SEPA threshold determinations and supplemental environmental analysis.

The CSRIA VRA would undergo phased SEPA review as provided for in WAC 197-11-060(5). The initial action to be addressed would be Ecology's decision whether to sign the VRA. That step in the process would represent a nonproject action and is addressed in this programmatic EIS. The subsequent phase of SEPA review for the VRA would address finalization of the VRA implementation plan and subsequent updates of that plan. A third phase of SEPA environmental review would address some of the specific projects associated with the CSRIA VRA, such as large regional conservation projects or the proposed Kennewick Irrigation District pump exchange. Similarly, some water right decisions associated with the CSRIA VRA may trigger additional SEPA review.

As part of the Memorandum of Understanding between the state of Washington, Reclamation, and the major Columbia River irrigation districts (Section 1.3.1.1), Reclamation will file appropriate water right applications with Ecology to divert a total of 132,500 acre-feet from Lake Roosevelt (Figure 2-3). The water is proposed to be diverted from Reclamation's existing 6.4 million acre-foot storage right for water behind Grand Coulee Dam. Ecology and Reclamation are currently discussing whether the additional water for instream flow, municipal/industrial uses, and interruptible water rights should be issued as a water right in perpetuity or as a water service contract with a long, but limited duration. That discussion will continue as Ecology processes the water rights applications. Prior to decision making regarding Reclamation's applications, both Ecology and Reclamation will work with the Confederated Tribes of the Colville Reservation, the Spokane Tribe of Indians, and the National Park Service to address issues regarding the diversion. A comprehensive Memorandum of Agreement would be developed with the Confederated Tribes.

The Lake Roosevelt Drawdown Project will involve withdrawals that would occur every year and withdrawals that would occur only during drought years. For the purposes of this proposal, a drought year is defined by Ecology as any year when the March 1 forecast for April through September runoff at The Dalles Dam is less than 60 million acre-feet (WAC 173-563-056). The

forecast is made by the National Weather Service. For drought-year conditions to apply, Ecology must also make a formal request in accordance with the Reclamation States Drought Relief Act of 1991 (P.L. 102-250). By this definition, a drought year occurs on average once every 26 years (Slattery 2002).

2.6.1.1 Description of Proposed Non-Drought and Drought Year Diversions

During non-drought years, Reclamation would divert or release an additional 82,500 acre-feet from Lake Roosevelt to provide the following:

- 25,000 acre-feet of municipal/industrial supply,
- 30,000 acre-feet of irrigation water for replacement of ground water supplies in the Odessa Subarea, and
- 27,500 acre-feet for stream flow enhancement downstream of Grand Coulee Dam.

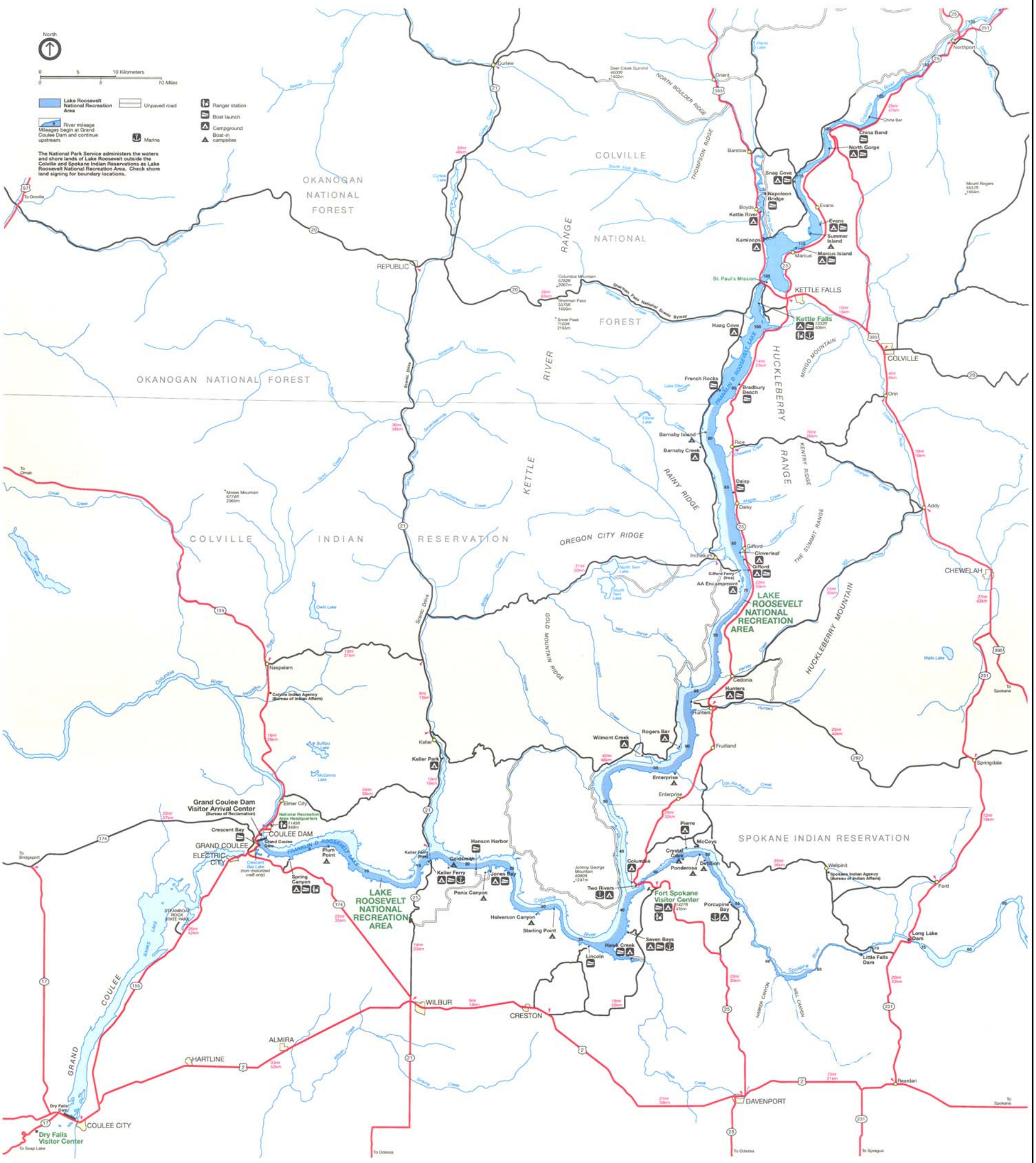
After perfection of the water right, the water for instream flow and municipal and industrial uses will be transferred to the Trust Water Rights Program for the duration of a water service contract between the state and Reclamation. A party that wants to use water for municipal and industrial purposes will be required to file an application with Ecology to obtain a water right permit.

The non-drought year diversion would result in an additional drawdown of the reservoir of approximately 1 foot at the end of the irrigation season. Under current operations, the Lake Roosevelt drawdown in early spring is approximately 40 feet in an average year and as much as 80 feet in a high flow year to provide flood control storage. The reservoir fills up to a normal operating level by July. The additional drawdown would occur after July. These maximum drawdown levels occur primarily in the months of April and May. However, during the months of the year when diversions associated with the Lake Roosevelt drawdown project could occur, July and August, lake levels are maintained at a relatively stable 1,278 to 1,290 feet above sea level.

During drought years, Reclamation would release 50,000 acre-feet from Lake Roosevelt in addition to the non-drought year diversion or release of 82,500 acre-feet. This diversion would provide:

- 33,000 acre-feet of water for Columbia River mainstem interruptible water right holders; and
- 17,000 additional acre-feet for flow augmentation downstream of Grand Coulee Dam.

Use of the 33,000 acre-feet by parties holding interruptible water rights would require the parties to obtain a permit from Ecology. The drought-year diversion would add an approximately 0.5 foot drawdown in addition to the 1-foot drawdown during non-drought years. Drawdowns for interruptible water rights would occur primarily during July and August. The water for stream flow augmentation would also likely occur during those months.



ADOLFSON	File name: Fig02-3_LkRoos.ai Created/last edited by: JAB Date last updated: 09/26/06 Reference #: 26068	N	**FIGURE 2-3** LAKE ROOSEVELT AREA COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS WASHINGTON
	Map data are the property of the sources listed below. Inaccuracies may exist, and Adolfson Associates, Inc. implies no warranties or guarantees regarding any aspect of data depiction. SOURCE: National Park Service.		

At time of publication of this EIS, it was anticipated that Reclamation will submit two water right applications to Ecology to address the 82,500 acre-foot of annual diversions or releases. One application would be for the 30,000 acre-feet of water for Odessa Subarea ground water replacement and for 15,000 acre-feet of the flow augmentation water. A second application would be made for the 25,000 acre-feet of municipal/industrial supply and for the remaining 12,500 acre-feet of flow augmentation water. Water for the drought year diversions and releases would be made available through a service contract between Reclamation and Ecology.

Table 2-1 summarizes the estimated additional stream flows to Columbia River that would result from the drawdown proposals.

Table 2-1. Lake Roosevelt Drawdown Flows

	Lake Roosevelt Withdrawal (AF)	Flow Release (AF)	Flow Rate (cfs) One Month (31 days) - July	Flow Rate (cfs) Two Months (62 days) - July and August
Non-Drought Years				
Municipal/Industrial Supply	25,000	25,000	407	203
Instream Flow Augmentation	27,500	27,500	447	224
Odessa Subarea	30,000	0*	0	0
Interruptible Water Rights	0	0	0	0
Total	*82,500*	*52,500*	*854*	*427*
Drought Years				
Municipal/Industrial Supply	25,000	25,000	407	203
Instream Flow Augmentation	44,500	44,500	724	362
Odessa Subarea	30,000	0*	0	0
Interruptible Water Rights	33,000	33,000	537	268
Total	*132,500*	*102,500*	*1,667*	*834*

* The 30,000 acre-feet for the Odessa Subarea is not considered to be additional stream flows because it would not enter the Columbia River.

2.6.1.2 No Action Alternative: Lake Roosevelt Drawdown

Under the No Action Alternative for the Lake Roosevelt drawdown, no additional drawdown of Lake Roosevelt would occur. Water for municipal/industrial supply and stream-flow enhancement would continue to be limited during non-drought years. Lake Roosevelt water would not be available to help replace ground water used in the Odessa Subarea during non-drought years. During drought years, interruptible water rights would not be met unless additional sources of supply are developed and stream-flows would not be augmented. Other entities may propose reservoir drawdowns which would be evaluated under separate environmental review.

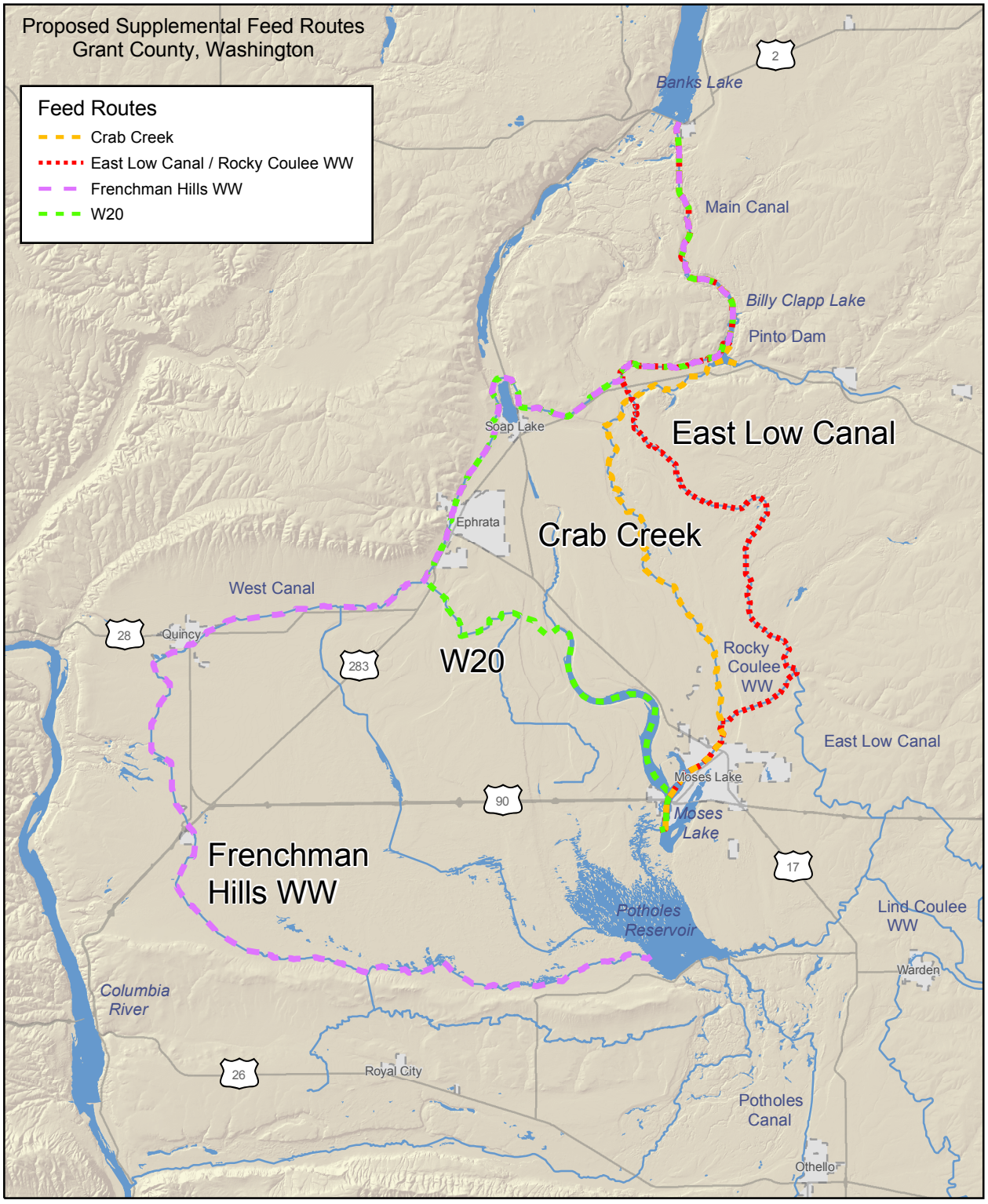
2.6.2 Supplemental Feed Route

Reclamation, in cooperation with the state of Washington, is studying possible Supplemental Feed Routes to convey water from Banks Lake to Potholes Reservoir for purposes of supplying parts of the East and South Columbia Basin Irrigation Districts (Reclamation 2006e). Potholes Reservoir, is located just south of Moses Lake. It has 332,200 acre-feet of active storage capacity and a total capacity of 511,700 acre-feet.

Water for Reclamation's Columbia Basin Project is diverted from Lake Roosevelt at Grand Coulee Dam and pumped to Banks Lake (Figure 2-1). Irrigation water is distributed from Banks Lake through the Main Canal, which flows south to Billy Clapp Lake. The Main Canal continues south from Pinto Dam at the south end of Billy Clapp Lake. The Main Canal divides into the West and East Low Canals at a point southwest of Pinto Dam. The West Canal flows around the northwest edge of the Columbia Basin Project boundary and flows south toward Frenchman Hills Wasteway. The East Low Canal flows south, passing near the cities of Moses Lake and Warden, and ending east of the Scooteney Reservoir south of Othello.

The Columbia Basin Project is designed so that return flows from irrigation in the northern half of the project, generally the area north of Potholes Reservoir, would flow to Potholes Reservoir and supply the southern portion of the project, which is generally the area south of Potholes Reservoir. Potholes Reservoir receives and stores runoff water from the Upper Crab Creek Basin and return flows from irrigated land served by the West and East Low Canals. Water is released from Potholes Reservoir through the Potholes Canal to supply the South Columbia Basin Irrigation District. Because the Columbia Basin Project has not been completely developed, there is not adequate return flow in the northern portion of the project to provide a reliable supply of irrigation water to the South Columbia Basin Irrigation and East Columbia Irrigation Districts. To help meet that need, water is diverted from Banks Lake to Potholes Reservoir. This diverted water is called feed water. At present, the Potholes Canal serves approximately 231,000 acres, requiring up to 990,000 acre-feet of water annually from Potholes Reservoir. Of that amount, about 350,000 acre-feet is feed water from Banks Lake.

There are currently three feed routes that use canals and existing waterways (Figures 2-1 and 2-4). The primary route is through the East Low Canal to Rocky Coulee Wasteway then into Upper Crab Creek, Moses Lake and finally into Potholes Reservoir. The two secondary routes are through Lind Coulee Wasteway and through Frenchman Hills Wasteway. Water is spilled from the East Low Canal to Lind Coulee Wasteway, which flows directly to Potholes Reservoir. The other secondary route spills water from the West Canal to the Frenchman Hills Wasteway, which also flows directly to Potholes Reservoir.



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SOURCE: Bureau of Reclamation.

FIGURE 2-4

SUPPLEMENTAL FEED ROUTES

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Table 2-2 shows the annual amounts of feed water supplied to Potholes Reservoir over the last 10 years via each route.

Table 2-2. Annual Feed Volumes in Acre-Feet, Between 1996 and 2005.

Year	Rocky Coulee WW Feed Spring (Acre-Feet)	Rocky Coulee WW Feed Fall (Acre-Feet	Lind Coulee WW Feed Spring (Acre-Feet)	Frenchman Hills WW Feed Spring (Acre-Feet)	Total Feed (Acre-Feet)
1996	55,600	0	32,500	0	88,100
1997	9,500	0	8,100	0	17,600
1998	9,531	89,158	16,261	0	114,950
1999	154,294	18,407	33,738	0	206,439
2000	224,901	0	33,920	0	258,821
2001	139,556	90,927	36,455	0	266,938
2002	256,017	45,296	27,581	15,213	344,107
2003	254,725	63,494	20,920	26,573	365,712
2004	290,934	69,363	30,193	30,367	420,857
2005	190,982	119,575	25,234	20,363	356,154

Source: Sonnichsen, 2006

The existing canal system only has feed capacity during spring and fall, so no feed water can be delivered during the summer. During low runoff years, the spring feed capacity is insufficient to fill Potholes Reservoir, necessitating a fall feed. Fall feed is limited by the need to leave space in Potholes Reservoir for winter return flows and spring runoff. These factors have led Reclamation to consider alternatives to supplement the supply of feed water to Potholes Reservoir.

To address the capacity issues associated with supplying feed water to Potholes Reservoir, Reclamation, in cooperation with Ecology, is in the process of developing a Supplemental Feed Route. The purpose of the Supplemental Feed Route Project is to improve the reliability and safety in the ability to supply feed water to Potholes Reservoir. A supplemental route is needed to increase the feed capacity from the end of the runoff period until fall without impacting the Potholes Reservoir winter storage capacity. A minimum fall feed water program conducted in conjunction with maximum spring feed and some level of summer feed would allow the Columbia Basin Project to be operated with the greatest degree of flexibility and least likelihood of unnecessary Potholes Reservoir spill. Runoff from winter precipitation that exceeds the established end-of-month maximum reservoir elevation targets for Potholes Reservoir is spilled to lower Crab Creek, which discharges to the Columbia River at Priest Rapids Lake. Reclamation's objective for the Supplemental Feed Route is to develop the capacity to provide at least 25 percent of the current annual maximum feed water contribution to Potholes Reservoir of 350,000 acre-feet (Blanchard 2006).

Development of a Supplemental Feed Route could also support future efforts to replace ground water currently being used for irrigated agriculture with surface water in portions of the Odessa Ground Water Management Subarea that are located within the authorized boundaries of the Columbia Basin Project (Odessa Subarea Special Study in Section 2.1.2.1). A Supplemental

Feed Route would reduce the reliance on the East Low Canal for providing water to the southern portion of the project.

Reclamation is considering three alternative routes for supplementing the flow of feed water to Potholes Reservoir. They are designated as the Crab Creek, W20 Canal, and Frenchman Hills Wasteway routes and are shown in Figure 2-4. For all three alternatives, feed water would flow from Banks Lake to Billy Clapp Lake behind Pinto Dam. The Supplemental Feed Routes are described below.

2.6.2.1 Crab Creek Route Alternative

Upper Crab Creek is a natural stream that begins near Davenport in Lincoln County and discharges to Moses Lake and Potholes Reservoir (Figure 2-4). East of Brook Lake, Upper Crab Creek flows year round. However, south of Brook Lake, the stream has intermittent flows south to Moses Lake. Under this alternative, feed water would be released from Billy Clapp Lake at an outlet structure in Pinto Dam into Brook Lake, a natural water body within the Crab Creek channel. The water would then be conveyed down the natural Crab Creek channel to Moses Lake. The feed water would then flow to Potholes Reservoir through the Moses Lake Outlet Structure.

This alternative would have several construction elements. The outlet structure at Pinto Dam would be reconstructed to minimize the potential for erosion. The outlet of Brook Lake would need to be lowered to prevent inundation of the toe drains at Pinto Dam. The culverts at Stratford Road would need to be reconstructed. The Crab Creek channel would be deepened from the Brook Lake outlet to a point about .05 mile downstream in order to facilitate flow of the feed water. In addition, a measuring location would be added near the Brook Lake outlet. The Road 16 NE crossing would need to be modified. The overflow channel area south of Farm Lake Unit would be modified, including the road crossings at Road 10 NE, Walker Road, and Stratford Road.

There are currently two flow strategies for the Crab Creek route alternative. One is to provide a base rate of water flow from Billy Clapp Lake of around 100 cubic feet per second (cfs) year round, with larger discharges, not to exceed 500 cfs, during spring and summer as needed. In total, this could provide about 160,000 acre-feet of feed water flow. To implement this alternative, Billy Clapp Reservoir would be drawn down to an elevation of 1,300 feet above mean sea level (msl) by March 1, but would be refilled to 1,326 feet by March 18.

The second strategy would be to release water from Billy Clapp Reservoir only during spring months as needed. The total spring release at any given time would not exceed 650 cfs. The exact amount would vary due to the volume of runoff from Upper Crab Creek and irrigation demands. This option could provide over 115,000 acre-feet of feed water in the spring.

2.6.2.2 W20 Canal Route Alternative

Under this alternative, supplemental feed water would be conveyed from Billy Clapp Reservoir via the Main Canal and West Canal to the W20 lateral diversion. The W20 lateral is a canal that

currently supplies irrigation water to areas south of Ephrata. Feed water would then be conveyed down the W20 lateral and diverted to Moses Lake. The feed water would then flow to Potholes Reservoir through the Moses Lake Outlet Structure.

The diversion from the West Canal into the W20 lateral averages 150,000 acre-feet annually (approximately 380 cfs) throughout the irrigation season with a maximum of 33,000 acre-feet (approximately 540 cfs) in July (MWG 2002b). Water from the West Canal is conveyed to the W20 lateral through the Naylor Siphon. The existing Naylor Siphon, which starts at the West Canal and crosses under a railroad and State Route 28, has a capacity of 590 cfs. Below the Naylor Siphon, the W20 lateral has a capacity of 850 cfs. In order to accommodate the feed water, a second siphon would need to be constructed. In addition, since the W20 lateral does not currently discharge to Moses Lake, an approximately two-mile conveyance system would need to be constructed to connect with the lake at a point just below the discharge point of Rocky Ford Creek. A new radial gate check structure would be built on the W20 lateral approximately 6.1 miles below the Naylor Siphon to divert water to Moses Lake.

With construction of an additional siphon, the W20 lateral would have the capacity to add a maximum of 50,100 acre-feet to the spring supplemental. However, because of capacity limitations in the West Canal, the W20 lateral route would not add to the summer feed or fall supplemental feed. Thus, feed would be limited to the April to mid-May period.

2.6.2.3 Frenchman Hills Route Alternative

Under this alternative, feed water would be conveyed from Billy Clapp Lake via the Main Canal and West Canal to the Frenchman Hills Wasteway (Figure 2-4). The feed water would then be discharged through the Frenchman Hills Wasteway, a combination of undefined channels and pothole lakes, into Potholes Reservoir.

Frenchman Hills Wasteway crosses under two county roads, Dodson Road and Road C SE. The existing Dodson Road crossing has a capacity of 1,100 cfs and the Road C SE crossing has a capacity of 500 cfs. Frenchman Hills Wasteway is currently used during the spring feed operation. Currently feed water supply from Frenchman Hills Wasteway is limited to 100 to 150 cfs because of the limited capacity of the Road C SE culvert to convey feed water and return flows. Return flows during April and May usually range from 350 to 400 cfs.

In order to increase the amount of feed water capacity, both the Dodson Road and Road C SE culverts would need to be replaced. Assuming a maximum feed of 700 cfs, the Frenchman Hills Wasteway route would have a capacity to feed a total of 46,000 acre-feet in the spring via Frenchman Hills Wasteway. The Frenchman Hills Wasteway route would not have any capacity to add to summer feed and would not be used for fall feed.

2.6.2.4 No Action Alternative: Supplemental Feed Route

Under the No Action Alternative for the Supplemental Feed Route, there would be no supplemental route to deliver feed water to Potholes Reservoir. The existing feed routes would continue to be used with no increased flexibility in delivery.

2.6.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The Columbia-Snake River Irrigators Association (CSRIA) submitted a VRA to Ecology following passage of the Columbia River Water Management Act. The Draft CSRIA VRA can be viewed at http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/ecy_csria_drft_vra.pdf. The CSRIA represents farming operations in eastern Washington that irrigate about 250,000 acres of row crops, vineyards, and orchards. Its members have farming operations along the Columbia-Snake River system from Brewster on the north to the John Day and McNary Pools of the Columbia River on the south. Some of the members own farming operations in the Yakima Valley and within the Columbia Basin Project area. The membership also includes several municipal service irrigators, including Brewster, Kennewick, West Richland, and the Kennewick Irrigation and Hospital Districts.

2.6.3.1 Description of the Proposal

The CSRIA proposes to undertake conservation and other measures such as pump exchanges, aquifer storage and recovery projects, and surface storage projects to create new sources of water. That water would be used for new water rights on the Columbia River mainstem and lower Snake River (at or below Ice Harbor Pool). Under the proposed VRA, the conserved water would be transferred to Ecology's Trust 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 CSRIA VRA, as proposed, addresses two groups of water users or potential water users: existing water right holders with interruptible certificated water rights, and new applicants. There are approximately 340 water right holders on the Columbia River and 33 water right holders on the Snake River whose rights are interruptible. That means that during years when flows in the Columbia River at The Dalles for the period April through September are forecasted to fall below 60 million acre-feet, the interruptible water right holders must curtail their use of water.

Under the proposed VRA, Ecology would commit to issue supplemental drought permits to interruptible water right holders that are CSRIA members, provided that mitigation water from efficiency measures and other measures is available to offset their water use during July and August. In exchange, participating members would commit to implementing and maintaining state-of-the-art water use efficiency measures and best management practices, and submit their water rights to Ecology for "recalibration" (determination of extent and validity) of actual beneficial use. Any water saved through the recalibration would be placed into Ecology's Trust Water Right Program. Ecology would be obligated to make a "good faith" effort to provide mitigation water necessary to ensure that any new rights issued in the form of supplemental drought permits will not impair flows in the Columbia River during the months of July and August in years covered by the permits.

For CSRIA members that are applying for new water rights, applicants would receive new interruptible water rights in exchange for agreeing to install or maintain water use efficiency practices, submit any existing water rights to Ecology for recalibration, and permanently transfer

any resulting conserved water to Ecology's Trust Program. CSRIA members would commit to pay $10 per acre-foot annually for the full amount of water used under the permit. The initial payment would cover the first three years of use. Subsequent payments would be required for each year water is used under the permit. Such payments would be adjusted annually for inflation by Ecology using a methodology mutually agreed to by the parties to the agreement. Revenues received from CSRIA members would be placed in the Columbia River Water Supply Development Account.

CSRIA would work with Ecology to identify the most cost-effective and feasible water projects that could be implemented in a time-frame and at locations that would provide mitigation for new water rights to be issued by Ecology. In applications for new water rights, CSRIA or its members would document that the applications meet the requirements of the Columbia River Water Management Act and applicable water law, including RCW 90.03.290. Some of the provisions of the VRA, including the $10 per acre-foot payment, are taken from the Settlement Agreement with Ecology on the 2000 CSRIA lawsuit against Ecology (Section 1.3). The VRA states that none of the provisions of the VRA shall supersede the terms of the Settlement Agreement. Pursuant to the requirements of Chapter 90.90.030, a formal 60-day government consultation process regarding the Draft CSRIA was initiated on October 16, 2006, and ended on December 15, 2006. Included in the consultation were county legislative authorities, watershed planning groups with jurisdiction over the area where the water rights included in the agreement are located, the Washington Department of Fish and Wildlife, affected tribal governments, and federal agencies. Some of the issues raised during the consultation period include:

- Watershed Planning Units and Salmon Recovery Boards should be included in the process to identify projects and in decisions to use state funds for conservation projects;
- Mitigation to "achieve no net loss" should be required for impacts during months outside the July to August period for the Columbia River and April to August period for the Snake River;
- Instream flows will be put at further risk if interruptible rights are made non-interruptible;
- Best management practices must be well documented and "government endorsed";
- The $10 per acre-foot per year mitigation fee is inadequate;
- It is not clear who and what number of individuals would be covered by the agreement;
- The geographic area covered by the agreement is not well defined;
- The locations of sites where conservation and efficiency programs would be implemented are not specified; and
- The locations where new water rights would be issued and the amount of water involved are not known.

Issues raised in the consultation will be the subject of negotiations with CSRIA to determine if modifications to the Draft VRA are warranted. Subsequent to those negotiations, the VRA will undergo a 30-day public comment period prior to a decision by Ecology whether to enter into the agreement.

In addition, if Ecology enters into the VRA, Ecology is committing to prepare an implementation plan for the VRA. The implementation plan would cover projects associated with the VRA for some specified time period and would be periodically updated. The implementation plan and subsequent updates would be subject to environmental review under SEPA. In addition, some of the individual projects and actions undertaken as part of the VRA would trigger environmental review under SEPA.

2.6.3.2 No Action Alternative: Columbia-Snake River Irrigators Association Voluntary Regional Agreement

Under the No Action Alternative for the CSRIA VRA, Ecology would not process the VRA. The conservation projects proposed by the VRA could be undertaken independently of the Management Program by irrigators or irrigation districts.

CHAPTER 3.0 AFFECTED ENVIRONMENT

3.1 Project Area Description

The Columbia River Water Management Act created the Management Program to manage water within the portion of the Columbia River Basin in the state of Washington from the U.S.-Canada border to the river mouth at the Pacific Ocean (Figure 3-1). The VRA and information system portion of the legislation only applies to the portion of the basin between the Canadian border and Bonneville Dam. Below Bonneville Dam, the character of the Columbia River changes from a flowing river to a tidally influenced river. For this EIS, the project area is the portion of the Columbia River Basin within the state of Washington. Because most of the projects proposed under the Management Program are likely to be located in the area of eastern Washington east and south of the Columbia River, the affected environment focuses on that area.

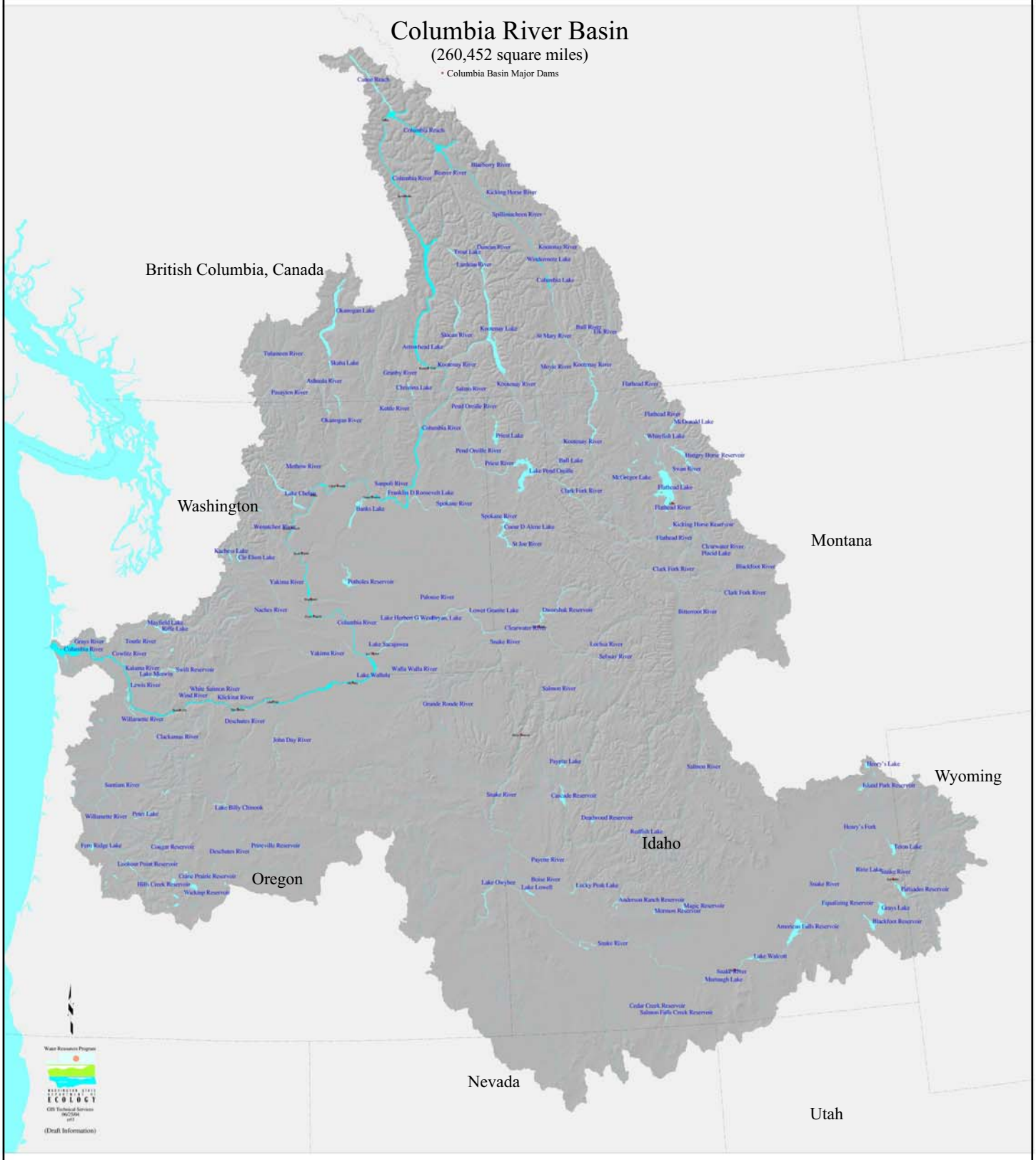
Section 3.1 presents a general description of the project area. Sections 3.2 through 3.13 provide more detailed information about specific aspects of the project area.

3.1.1 Columbia River Basin

The Columbia River watershed extends from the Canadian Rockies in British Columbia to the Pacific Ocean and encompasses portions of the states of Washington, Oregon, Idaho, Montana, Wyoming and Nevada in addition to portions of the province of British Columbia. The majority of the Columbia River Basin in Washington is arid to semi-arid. Dominant vegetation in the area is shrub-steppe in the lowlands and forest in mountainous areas. At the Washington-Oregon border, the Columbia River turns to flow west through an entrenched channel through the Cascade Range known as the Columbia River Gorge. The eastern end of the Gorge is arid and becomes increasing humid to the west, with vegetation changing from shrub-steppe to coniferous forest.

Most of the project area is farmed or ranched. A wide variety of crops are raised including potatoes, sugar beets, hops, fruit, vegetables, mint, wine grapes, hay, corn, wheat, barley, and lentils. Most of these crops are irrigated. A variety of livestock are also raised in the project area. Logging was historically important in the mountains that fringe the basin and in the Columbia River Gorge area, and forest management practices are still active in many areas.

The Columbia River is home to a rich variety of salmon species and fish and wildlife populations. Historically salmon were very abundant in the basin and were the foundation of the diets, culture, and economy of native people (National Research Council 2004). Salmon numbers have declined significantly since the late 1800s and several species and populations are listed as threatened or endangered under the Endangered Species Act (ESA). The construction of dams and land use changes have blocked access to habitat and altered streamflows and vegetation, contributing to the decline of salmon.



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SOURCE: Washington Department of Ecology, 2006.

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FIGURE 3-1

COLUMBIA RIVER BASIN

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

In Washington, the Columbia River Basin includes 25 counties (see Table 3-1 and Figure 3-2). Major cities in the Columbia River Basin in Washington include Spokane, Moses Lake, Wenatchee, Yakima, Richland, Pasco, Kennewick, Walla Walla, Vancouver, and Longview. The last two cities are located downstream of Bonneville Dam.

Table 3-1. Washington Counties in the Columbia River Basin

Adams	Klickitat
Asotin	Lincoln
Benton	Okanogan
Chelan	Pacific*
Clark*	Pend Oreille
Columbia	Skamania
Cowlitz*	Spokane
Douglas	Stevens
Ferry	Wakiakum*
Franklin	Walla Walla
Garfield	Whitman
Grant	Yakima
Kittitas	

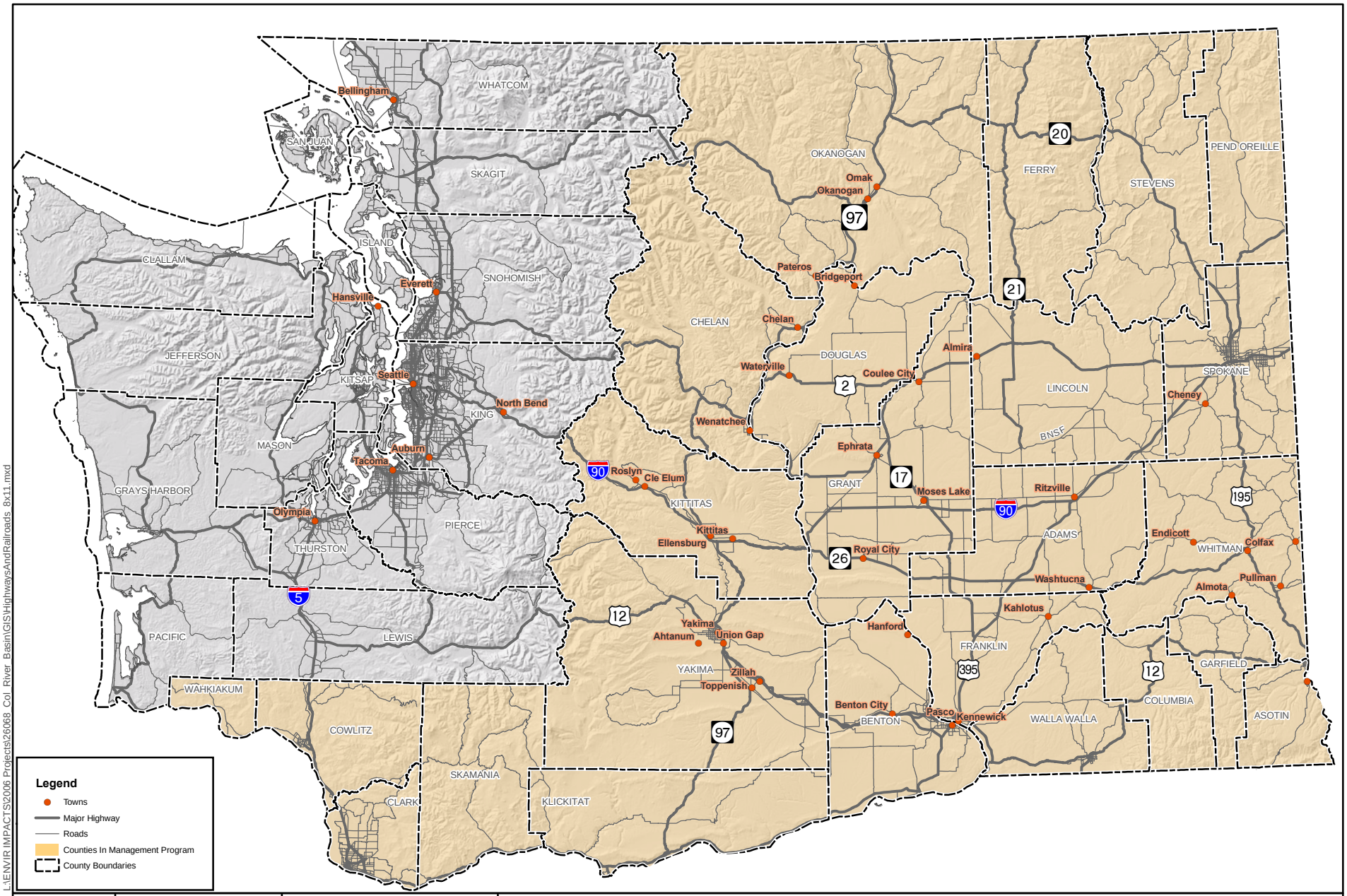
*These counties are downstream of Bonneville Dam

For purposes of water management, the state of Washington has designated the major drainage basins in the state as Water Resource Inventory Areas (WRIA) (Figure 3-3). Of the 62 WRIAs in the state, 39 are located within the Management Program project area. In 1998, the Washington Legislature established a process for local interests within the WRIAs to develop watershed plans to manage water resources. Many of the WRIAs in the Columbia River Basin have participated in the planning process and have completed watershed plans (Figure 3-4). The WRIAs currently served by the Columbia Basin Project are not included in the WRIA planning process.

3.1.2 Water Development in the Columbia River Basin

The Columbia River has been extensively modified for a variety of beneficial uses including flood control, hydropower, navigation, irrigation, and recreation. Major development began in the 1930s with the construction of Bonneville Dam on the lower Columbia River east of Portland, Oregon, and Grand Coulee Dam on the upper river west of Spokane, Washington. Although constructed to serve multiple purposes, the driving force behind the development of Columbia River dams was hydropower, and to a lesser extent, flood control. With its solid rock channel, low levels of silt, and relative steepness, the Columbia River was well suited for large-scale hydropower development. World War II increased pressure to further tap the river's hydroelectric power production potential, and between 1944 and 1945, Congress authorized several water projects in the basin. In the five years following the war, Chief Joseph, Albeni Falls, Libby, John Day, and The Dalles Dams were all authorized (Volkman 1997; National Research Council 2004).

Figure 3-5 shows the primary dams constructed within the Columbia River Basin. Support for federal dams in the Columbia River Basin declined during the 1950s, but licenses were issued to county public utility districts to construct Priest Rapids, Rocky Reach, Wanapum, and Wells Dams (Figure 3-5).



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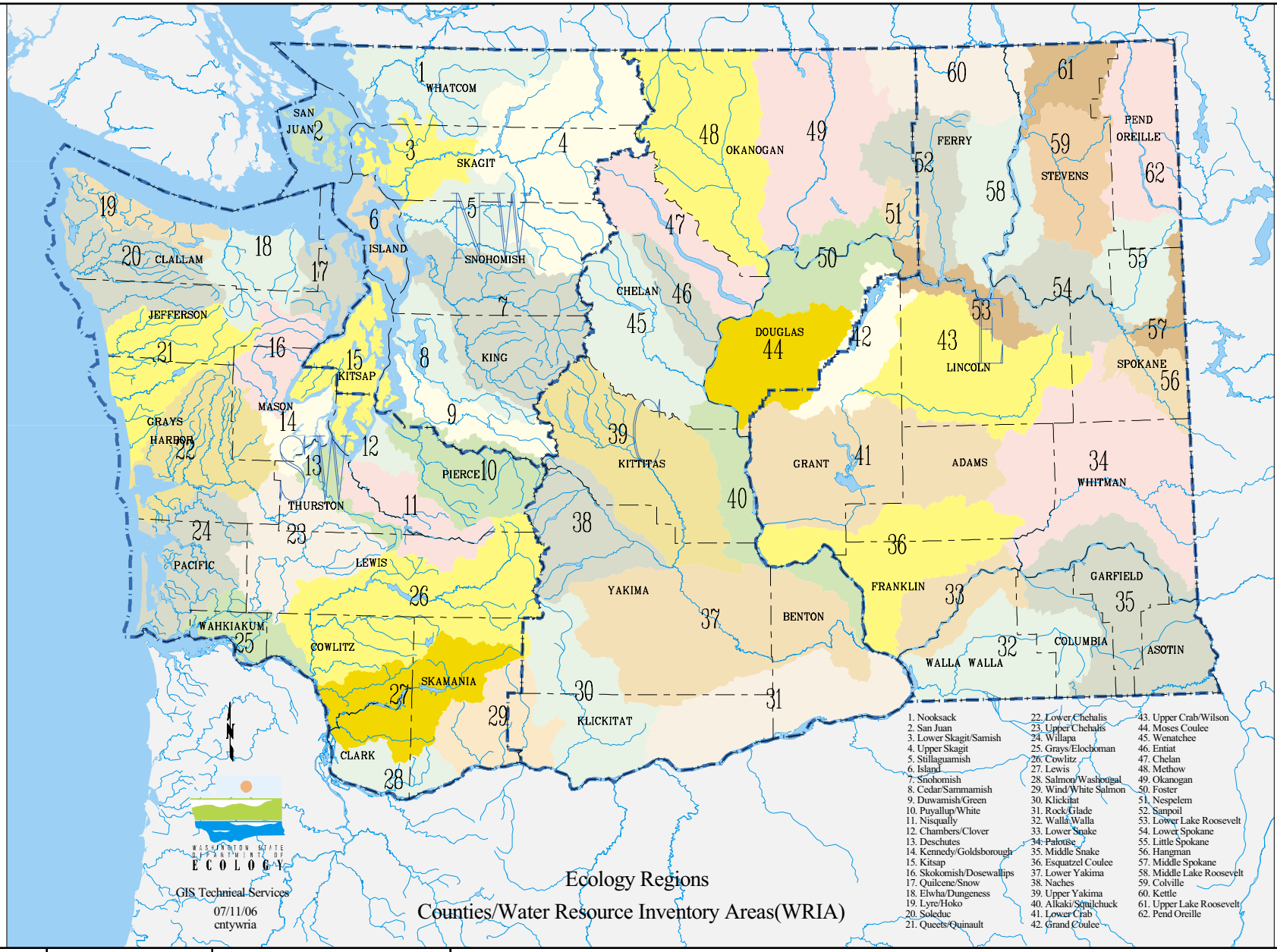
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FIGURE 3-2

MAJOR CITIES AND COUNTIES IN THE PROJECT AREA

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON



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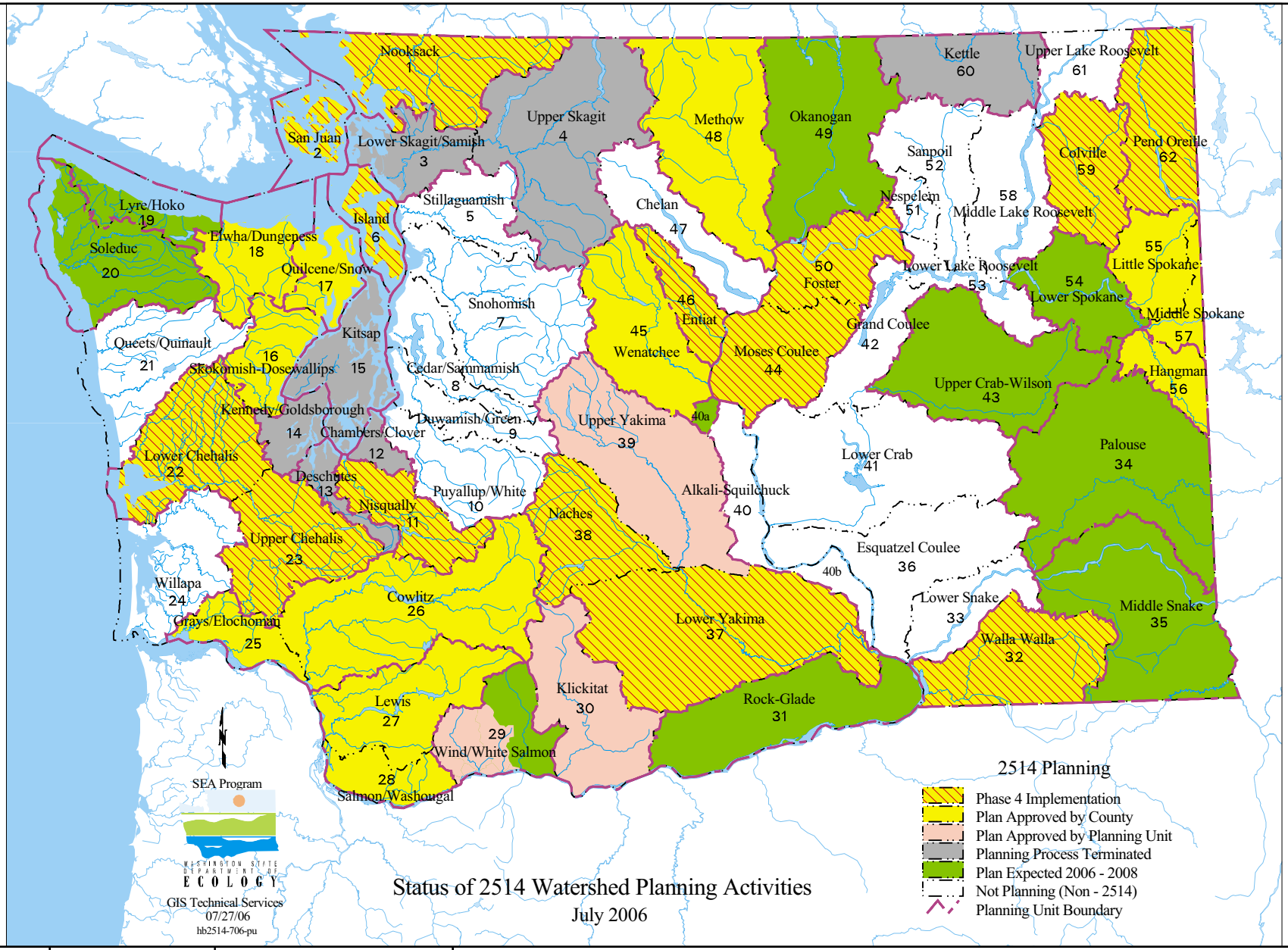
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SOURCE: Washington State Department of Ecology, 2006.

FIGURE 3-3

WATER RESOURCE INVENTORY AREAS (WRIA) IN WASHINGTON

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON



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SOURCE: Washington State Department of Ecology, 2006.

FIGURE 3-4

WATER RESOURCE INVENTORY AREAS WITH COMPLETED WATERSHED PLANS

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON



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SOURCE: Bonneville Power Administration.

FIGURE 3-5

MAJOR DAMS IN THE COLUMBIA RIVER BASIN

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Upstream dams that augmented storage and power production capabilities were constructed pursuant to the Columbia River Treaty signed between Canada and the U.S. in 1961. These dams included Libby Dam in Montana and Arrow Lakes, Duncan, and Mica Dams in Canada. The treaty focused primarily on addressing two main water uses: hydropower and flood control (National Research Council 2004). Hydropower dams in the Columbia Basin are part of the Federal Columbia River Power System (FCRPS) and are managed and operated by Bonneville Power Administration (BPA), Reclamation, and the Corps of Engineers. The Federal Columbia River Power System is a coordinated system for operating the dams on the river to maximize power production while meeting the other requirements of treaties, federal flood control statutes, and fish and wildlife statutes (BPA 2001).

Grand Coulee Dam is managed by Reclamation and was authorized for both hydropower and irrigation. Because of World War II, work on the irrigation system was delayed and the first project water deliveries did not occur until 1952. Irrigation water is pumped from Grand Coulee Dam to Banks Lake to supply the Columbia Basin Project. The Columbia Basin Project irrigates approximately 671,000 acres in an area southeast of the Columbia River extending to Pasco, Washington, at the junction of the Columbia and Snake Rivers.

Lake Roosevelt, the reservoir formed by Grand Coulee Dam, extends approximately 150 miles northeast from the dam toward Canada. Lake Roosevelt has a capacity of 9.4 million acre-feet and an active capacity of 5.2 million acre-feet. Most of the south and east shore of the lake is managed as the Lake Roosevelt National Recreation Area.

3.1.3 Management of the Columbia River

The Columbia River has been developed into a highly regulated river system. A variety of federal and state agencies and private utilities operate dams on the river for a variety of uses. In addition, there are international and tribal interests involved in managing the river. Several treaties, statutes, and management agreements guide river management and operations (Federal Columbia River Power System 2001).

The major owners and/or operators of water developments in the Columbia River Basin and their primary roles are shown in Table 3-2. Other agencies that act in regulatory or advisory capacities are presented in Table 3-3.

Table 3-2. Columbia River Water Managers

Owner/Operator	Primary Role
U.S. Army Corps of Engineers	Federal project operator Power generation, flood control, navigation Operates Columbia River Treaty reservoirs
U.S. Bureau of Reclamation	Federal project operator Power generation, irrigation Columbia Basin Project
Irrigation Districts (private)	Irrigation
Public and Private Utilities	Power generation and distribution
British Columbia Hydro and Power Authority	Flood control, power generation
Bonneville Power Administration	Power marketing, transmission facilities Funds fish and wildlife mitigation programs under the Northwest Power Planning and Conservation Act

Table 3-3. Agencies with Regulatory or Advisory Capacities

Agency	Primary Role
Federal Energy Regulatory Commission	Regulates interstate activities of electric and natural gas utilities and non-Federal hydropower producers
U.S. Department of State	Interacts with Canada on international treaty matters
National Marine Fisheries Service and U.S. Fish and Wildlife Service	Enforces Endangered Species Act and implements recovery plans
Environmental Protection Agency	Regulates water quality
State resource agencies	Water rights, land use, fish and wildlife management

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, hunt, and gather 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. Tribal rights and uses of the Columbia River Basin are described in more detail in Sections 3.6.1.3 and 3.10. The tribes implement fish and wildlife management programs in the Columbia River Basin and participate in river governance decisions.

Operation of the federal reservoirs is regulated by the authorizing legislation, which specifies the purpose of each reservoir. Federal flood control statutes also regulate uses of reservoirs authorized for flood control. Other laws and agreements that influence Columbia River Water Management are shown in Table 3-4.

Table 3-4. Laws and Agreements Influencing River Management

Law or Agreement	Effect on River Management
Endangered Species Act	A Biological Opinion has been developed to recover listed salmon species, but is the subject of on-going legislation. The Biological Opinion includes increased and more carefully timed flows, increased spill and reservoir drawdown.
Columbia River Treaty	The treaty between the United States and Canada affects flood control and hydropower production.
Pacific Northwest Coordination Agreement	The Coordination Agreement establishes a coordinated planning process to implement the Columbia River Treaty. It coordinates Canadian storage operations with federal and non-federal project operations.
Columbia Storage Power Exchange and the Canadian Entitlement Allocation Agreements	The Agreements divide the power benefits from the Columbia River Treaty between the federal and non-federal power generators in the United States.
Non-Treaty Storage Agreement	The Agreement allocates the additional power generated at Mica Dam that is not part of the Columbia River Treaty.
Pacific Northwest Electric Power Planning and Conservation Act, 1980	The Northwest Power and Conservation Council, composed of representatives appointed by the governors of Montana, Idaho, Washington and Oregon, developed a Fish and Wildlife Program and a Regional Electric Power and Conservation Plan that changed how the Coordinated Columbia River System is operated.

To implement these varied management objectives, the river system is operated as the Coordinated Columbia River System. Implementation of many of the components of the Management Program will require coordination with the various managing agencies to avoid conflicting with the Coordinated Columbia River System.

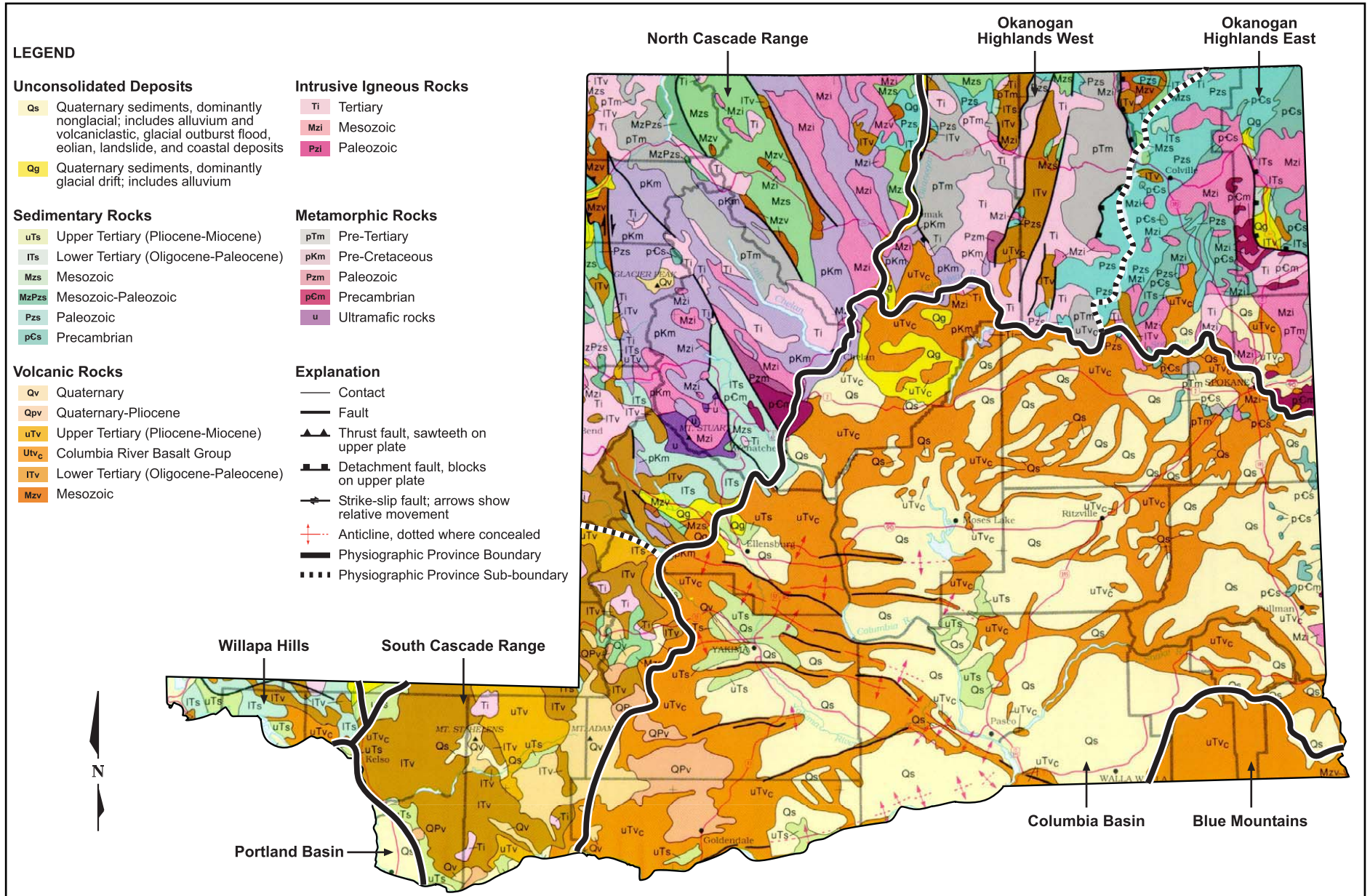
The following sections describe the elements of the environment potentially affected by the Management Program.

3.2 Earth

3.2.1 Geology and Physiography

The project area contains three major physiographic provinces (Columbia Basin, Okanogan Highlands, and Blue Mountains) and small portions of the Southern Cascades physiographic province. Figure 3-6 is a map of the geology and physiographic provinces in the Columbia Basin. The Washington State Department of Natural Resources (DNR) (2001) describes these provinces based on work by Lasmanis (1991), and the description below is based on the DNR summary.

The Columbia Basin physiographic province 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).



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SOURCE: Golder Associates, 2006.

FIGURE 3-6

GEOLOGY AND PHYSIOGRAPHY OF THE PROJECT AREA

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

The Columbia River Basalt Group is composed of more than 300 lava flows, although only a few flows are exposed in the stream corridors. During the Miocene epoch, the Columbia River basalts erupted out of immense fissures near the Idaho/Washington border. The lava spread across a vast area of Idaho, Washington, and Oregon, in some instances reaching as far as the Oregon coast (Orr and Orr 1996; USGS 2006a). Toward the end of the Pleistocene epoch (also known as the Ice Age, 1.65 million until 10,000 years ago), massive continental glaciers advanced south from Canada into the northern portions of the Columbia River Basin and Okanogan Highlands. One lobe of continental ice blocked the Clark Fork River near the Idaho-Montana border and formed an immense lake (Lake Missoula), which spanned approximately 3,000 square miles. The ice dam bordering the lake failed and reformed repeatedly, releasing flood waters as many as 89 times across the Columbia Plateau (Benito and O'Connor 2003; USGS 2006a). These massive floods scoured the overlying loess (windblown soil) and eroded the Columbia River basalt, forming what is now known as "scablands."

The Okanogan Highlands physiographic province is situated east of the Cascade Range and north of the Columbia River. To the east and north, the highlands extend into northern Idaho and southern British Columbia, respectively, and are characterized by rounded mountains with elevations up to 8,000 feet above sea level and deep, narrow valleys. The Columbia River divides the Okanogan Highlands into two geographic regions: to the east of the river are the Selkirk, Chewelah, and Huckleberry Mountains; to the west are the Kettle, Sanpoil, and other mountains (DNR 2001). The eastern portion of the Okanogan Highlands contains the oldest sedimentary and metamorphic rocks in the state. To the west, the Okanogan Highlands are separated from the Cascades and the fold-thrust belt of the Methow terrain by a geological structure called the Pasayten fault zone (DNR 2001).

The Blue Mountains physiographic province is located south of the Snake River in the southeast corner of Washington. The Blue Mountains are characterized by a broad uplift, reaching elevations of more than 6,000 feet above sea level. Windows of Paleozoic or Mesozoic (543 million to 65 million years ago) eras metamorphic rocks are exposed where streams and rivers have incised deep canyons through the overlying rocks of the Columbia River Basalt Group. The basement rocks consist of Triassic-Jurassic periods (about 250 to 145 million years ago) limestone lenses, amphibole-quartz schist, greenstone, graywacke, sandstones, cherty dark argillite, and diorite (DNR 2001).

3.2.2 Soils

The soils in the project area are varied and include deep forested soils with volcanic-rich layers, drier silty loess, channels of stony scabland soils, and volcanic ash deposits (WSU 2006). Due to the combination of a relatively dry climate, high winds, soil that is typically composed of silt or fine sand sized particles, and thin vegetative cover, soils in the project area are typically highly susceptible to wind erosion (Saxton et al. 2001). Ground subsidence can occur from decaying or compacting organic deposits (such as peat or fill with abundant organics). The risk from ground subsidence in the project area is generally low (Walsh and Logan 1989).

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).

The soil pattern in the Okanogan Highlands physiographic province generally varies with elevation. Soils in the higher elevations are gravelly sandy loams. Lower elevations located along the margins of river valleys and the southern boundary of the province originate from glacial till and have a sandy loam to loam texture (Franklin and Dyrness 1988). Soils in the terraces and floodplains are coarse-textured glacial outwash sands and gravels that are well to excessively drained (Franklin and Dyrness 1988).

The soils in the Blue Mountains physiographic province also vary with elevation. Moderate-to-high elevations have a dark brown, fine sandy loam to silt loam (from loess) along the north-facing slopes. North-facing slopes in the eastern and western parts of the province are covered in a layer of volcanic ash and fine pumice. Lake-deposited sediments, which are present in the western part of the province, have created a silt loam at the surface and clay loam below. Well-drained to poorly drained soils with a silt loam to silty clay loam texture are found along major streams (Franklin and Dyrness 1988).

3.2.3 Geologic Hazards

Seismicity

The Columbia River Basin is located in a region of active tectonics where earthquakes occur. The largest historical earthquake reported (magnitude 6.8 to 7.4) in Washington happened in 1872 on a crustal fault near Lake Chelan (U.S. Geological Survey 2006b). Within the Columbia River Basin, the U.S. Geological Survey (2006c) report the following active faults:

- The Wallula Gap and Hite fault zones near Walla Walla;
- Several east-west trending fold and fault groups located between Moses Lake and the Oregon-Washington border, centered roughly around Yakima, known informally as the Yakima fold belt;
- The Straight Creek fault located north of Highway 2 in the Cascades; and
- Several relatively small northwest-southeast trending faults located roughly between The Dalles (in Oregon) and Walla Walla.

Active faults are defined by the U.S. Geological Survey (USGS) as faults that are "…believed to be sources of earthquakes greater than magnitude 6 during the Quaternary (the past 1,600,000 years)." The Wallula Gap fault zone is believed to be the source of the damaging Milton-Freewater (Oregon) earthquake in 1936 (Mann and Meyer 1993).

The primary risk from a large earthquake is strong ground motion. Based on USGS maps, the highest risk for strong ground motion can be expected at the western end of the Columbia River Basin project area, near Bonneville Dam. Generally, the risk of ground motion increases from east to west, except for a localized area of higher risk near Walla Walla (due to the presence of the Wallula fault). Earthquakes can also trigger landslides, as discussed in the following section.

Landslides

The project area encompasses an area of active landslides that can often damage or destroy structures and transportation routes.

The Columbia River Gorge has experienced a number of large landslides on the Washington side of the river. More than 50 square miles of landslides are found in the Columbia Gorge, and dams or other structures in the gorge are built on active or dormant landslides (Thorsen 1989). Examples include:

- The Cascade slide covering the five miles between North Bonneville and Stevenson. Bonneville Dam was built on part of the old slide material (Alt and Hyndman 1984).
- The active Wind Mountain slide, which has caused a hotel and spa to be abandoned, power lines to be rerouted, extensive maintenance problems on State Highway 14, and maintenance problems on a rail line (Thorsen 1989).

Landslides also commonly occur in the Okanogan Highlands, especially in the reservoirs behind Grand Coulee and Chief Joseph Dams. Filling and subsequent drawdown of the reservoirs causes extensive slope failures of unconsolidated Pleistocene sediments deposited by the Lake Missoula floods, which extend for hundreds of miles of shoreline along the reservoirs (Thorsen 1989).

Thorsen (1989) notes that landslide problems in the Columbia River Basin have dramatically increased with the advent of widespread irrigation. The increase in irrigation (as of 1989) has simulated a tenfold increase in precipitation and caused a corresponding increase in the volume and number of landslides in the basin.

3.3 Air and Climate

While neither air quality nor climate are expected to be substantially affected by the Management Program, climate plays an important part in the need for the water supplies that the Management Program aims to provide and in the effects that the program would have on other elements of the environment, such as water quality and fish and wildlife habitat. This section provides background on the region's climate and predicted changes in climate over the coming decades.

The North Pacific Current offshore of western Washington and associated warm maritime air masses moderate temperatures throughout the Pacific Northwest region. Washington's climate varies dramatically from west to east due to elevation, prevailing winds, proximity to marine water bodies and other factors. The majority of the Columbia River Basin is located in the eastern part of the state, where precipitation is a limiting factor for plant growth on most non-irrigated lands. A portion of the lower Columbia River Basin is in western Washington, where rainfall is higher and temperatures are more moderate.

3.3.1 Eastern Washington Climate

Many portions of eastern Washington receive less than 10 inches of total annual precipitation, and much of that precipitation falls in the form of snow. Total precipitation approaches 20 inches per year in areas closest to the Cascade Range and the Selkirk Mountains (Spatial Climate Analysis Service 2000).

Precipitation increases dramatically near the Cascade Range and other mountain ranges in eastern Washington. Spokane, at the eastern edge of the Columbia Plateau, receives approximately 20 inches of precipitation per year.

Temperature ranges in eastern Washington are more extreme than areas of the state moderated by the North Pacific offshore currents and associated warm maritime air masses. Characteristic eastern Washington average maximum temperatures in July are in the mid-80s° F to near 90° F. Average minimum temperatures in July are generally in the mid- to upper 50s° F. Average maximum temperatures in January are in the low to mid-30s° F, except in southeast Washington, where the average maximum temperatures are closer to 40° F. Average minimum temperatures in January are typically in the teens to mid-20s° F.

3.3.2 Western Washington Climate

Western Washington has frequent cloud cover and considerable fog and rain in the winter. Precipitation in the Puget trough, which intersects the Columbia River near Vancouver, Washington, typically ranges around 40 to 50 inches per year, with approximately 60 to 80 percent of that total falling in the six-month period between October and March. Near the mouth of the Columbia River, rainfall ranges up to 100 inches per year.

Precipitation also increases dramatically near the Cascade Mountains. Many areas on or near the west side of the Cascade crest receive annual average precipitation of 90 to 140 inches, most of which comes in the form of snow (Spatial Climate Analysis Service 2000).

Temperatures in western Washington are moderate. Typical average maximum temperatures in July for western Washington are about 70° F in coastal areas, and 5 to 10 degrees warmer inland. Average minimum temperatures in July are generally in the low to mid-50s° F. Average maximum temperatures in January are in the mid-40s° F with average minimum temperatures in the low 30s° F.

3.3.3 Climate Variability

As is the case with the Pacific Northwest as a whole, the climate of Washington has exhibited considerable variability over time. The two principal factors affecting climate variability are the El Niño Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO).

ENSO involves a cyclical warming or cooling of sea surface temperatures in the equatorial Pacific Ocean to an extent sufficient to affect global weather patterns. ENSO episodes usually last 6 to 18 months and recur on a 2 to 7 year cycle (JISAO/SMA Climate Impact Group 1999). The effects of ENSO are most pronounced during late fall and winter. ENSO has a warm phase (El Niño) and a cold phase (La Niña). During the years in which El Niño is expressed, Northwest winters tend to be warmer and drier than average. During La Niña episodes, winters are typically cooler and wetter than average.

PDO involves cyclical changes in sea surface temperatures of the northern Pacific Ocean. PDO has two phases: a warm phase and a cool phase. These phases generally alternate approximately every 20 to 30 years. The warm phase PDO results from relatively warm sea surface temperatures in the north Pacific and influences Washington's climate towards a warm and dry

pattern. The cool phase results from relatively cool sea surface temperatures in the north Pacific and has a cool and wet influence on the climate. The PDO phases have a more prolonged influence on Washington's climate than ENSO episodes. Generally, during the warm phase PDO, snow depth, precipitation, and stream flows are below average, while higher than average snow depth, precipitation, and stream flows are experienced during cool phases (JISAO/SMA Climate Impact Group 1999).

3.3.4 Climate Change

While the topic is subject to debate, a number of scientific assessments have concluded the Earth's average temperature will likely increase during the twenty-first century (Hamlet et al. 2001). Climate models used in these assessments predict that both temperature and precipitation will significantly increase in the Pacific Northwest over the next 50 years. The potential consequences to water resources in the Pacific Northwest associated with warmer temperatures, greater precipitation, and a shift in winter precipitation type from snow to rain include reduced snow packs, higher winter stream flows and accompanying increased flood potential, earlier snowmelt-generated peak flows, and lower summer flows (Hamlet et al. 2001). Similarly, rivers fed by glacial melt waters may be adversely affected by climate change. Pronounced reductions in the volume and amount of area covered by glaciers can result in significant reductions in the amount of water released to downstream rivers (Environment Canada 2003).

3.3.5 Air Quality in the Lake Roosevelt Area

Lake Roosevelt has received trace elements that were discharged as slag material from a smelter in Canada; approximately 360 metric tons were discharged per day from 1900 to 1998. While the majority of existing studies have focused on contaminants in water, sediment, and fish, there is recent concern over the potential threat of airborne contaminants to human health. Trace metal concentrations in exposed, formerly inundated, shoreline areas have the potential to become airborne in the lower atmosphere due to wind gusts. Once airborne, the dust particles are carried downwind various distances depending on their size and the magnitude and duration of the prevailing winds. During the spring, the reservoir water level decreases substantially and may expose reaches of contaminated sediments that, upon drying, may be transported via the prevailing wind throughout the Lake Roosevelt area. The U.S. EPA recently stated that airborne contaminants in Lake Roosevelt area may be of concern to human health and has recommended additional studies (USGS 2006c).

3.4 Surface Water

3.4.1 Surface Water Quantity

3.4.1.1 Streamflow

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 (Figure 3-1). 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).

The Columbia River's annual discharge rate at The Dalles fluctuates with precipitation, ranging from 120,000 cubic feet per second (cfs) in a low water year to 260,000 cfs in a high water year (Ecology 2006). Average annual discharge at The Dalles is 138 million acre-feet or about 190,000 cfs (U.S. Army Corps 2006). Tributaries to the Columbia River Basin are primarily snow-fed (i.e., precipitation falls mainly as snow). These tributaries typically have low winter flows and strong spring and summer peaks with snow melt, which concentrates about 60 percent of the natural runoff to the Columbia River during May, June, and July (Ecology and WDFW 2004; USGS 2002). Tributaries that are fed by glacial melt in addition to snow pack along the Cascade Range or in Canada exhibit a different flow pattern. Glaciers contribute a considerable amount of flow to rivers during late summer and early fall after the snow has melted and when precipitation is normally low (Ecology and WDFW 2004).

The largest tributary to the Columbia River in the U.S. is the Snake River, which originates in Yellowstone National Park in Wyoming and drains 109,000 square miles in Wyoming, Idaho, Nevada, Utah, Oregon, and Washington (Ecology 1995). The Snake River flows for 180 miles in Washington and flows into the Columbia River near Pasco in Water Resource Inventory Area (WRIA) 33 (Ecology 1995). The largest tributary to the Columbia River in Canada is the Kootenai River, which originates in Kootenai National Park in Canada (British Columbia) and drains 16,180 square miles within the U.S. and Canada (NPCC 2004). The Kootenai River flows north and west east of the Selkirk Mountains and joins the Columbia River near Castelgar, British Columbia.

Other major tributaries to the Columbia River in Washington (with the river mile of their confluence in parenthesis) are listed in Table 3-5 (Ecology and WDFW 2004).

Table 3-5. Major Tributaries to the Columbia River

Eastern Washington	Cascade Range Crest to Pacific Ocean	Confluence of Snake River to Pacific Ocean
Pend Oreille (735.1)	Wind (154.5)	Umatilla River (289.0)
Kettle (706.4)	Washougal (120.7)	John Day River (218.0)
Colville (661.0)	Lewis (87.0)	Deschutes River (204.1)
Spokane (638.9)	Kalama (73.1)	Hood River (169.4)
Sanpoil (615.0)	Cowlitz (68.0)	Sandy River (120.5)
Okanogan (533.5)	Elochman (39.1)	Willamette River (101.5)
Methow (523.9)	Grays (20.8)	
Chelan (503.3)		
Entiat (483.7)		
Wenatchee (468.4)		
Crab Creek (410.8)		
Yakima (335.2)		
Walla Walla (314.6)		

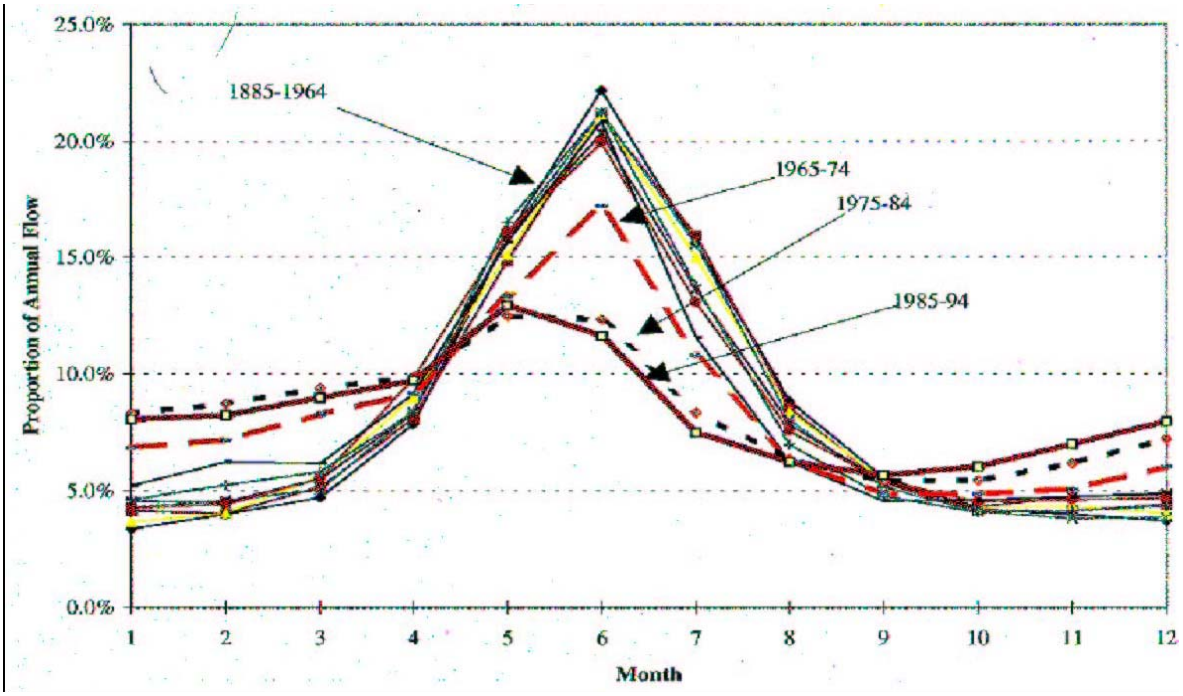
Eastern Washington	Cascade Range Crest to Pacific Ocean	Confluence of Snake River to Pacific Ocean
Klickitat (180.4)		
White Salmon (168.3)		
Little White Salmon (162.0)		

Hydropower Development

The construction and operation of the Columbia River dam and reservoir system have affected the hydrograph of the Columbia River. Figures 3-7 through 3-9 illustrate these changes. Figure 3-7 shows how Columbia River hydrologic seasonality has "flattened," as historical high seasonal (summer) flows have decreased and low seasonal (winter) flows have increased. Figure 3-8 shows how the distribution of flows between summer (April-September) and winter has changed since the late 1800s. Operation of the Columbia River hydropower system has evened out the natural summer-to-winter flow variations. In addition to the smoothing of the hydrograph, water velocities have decreased (National Research Council 2004).

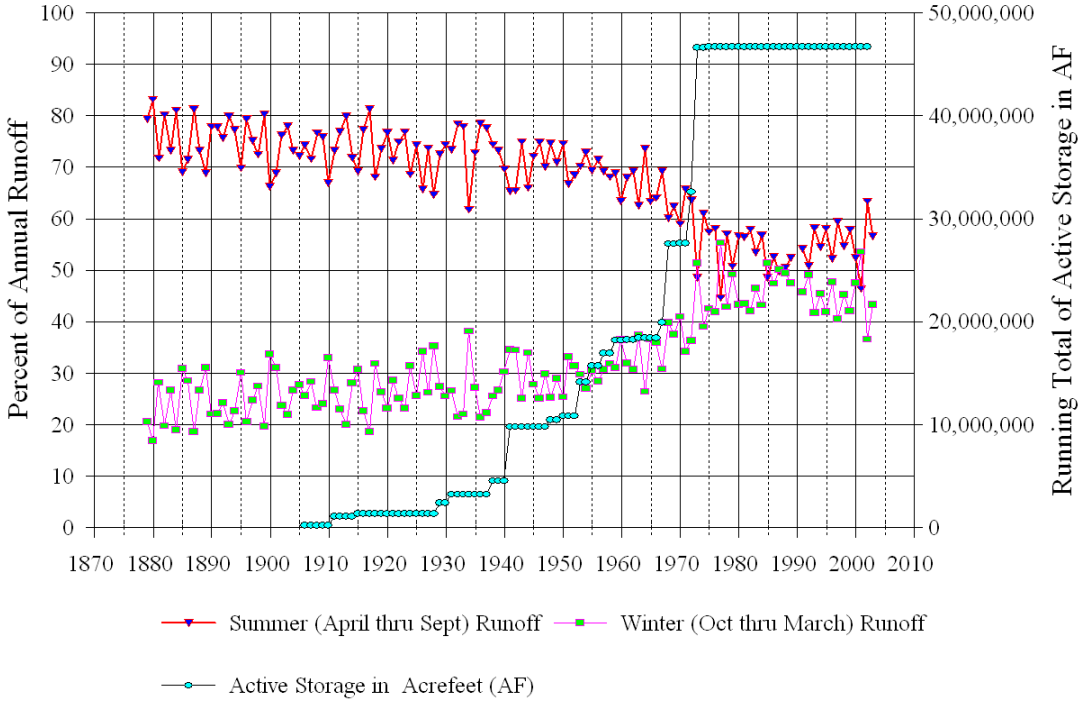
The hydrologic changes caused by Columbia River dams have not eliminated all variability of Columbia River flows. Figure 3-9 demonstrates that considerable variability of annual Columbia River discharge exists between years. Flows also continue to vary on other time scales; for example, daily flow patterns below hydropower dams often vary substantially as flows are adjusted to match demand for hydroelectric power (National Research Council 2004).

Figure 3-7. Annual Distribution of Monthly Flow at The Dalles by 10-year blocks.



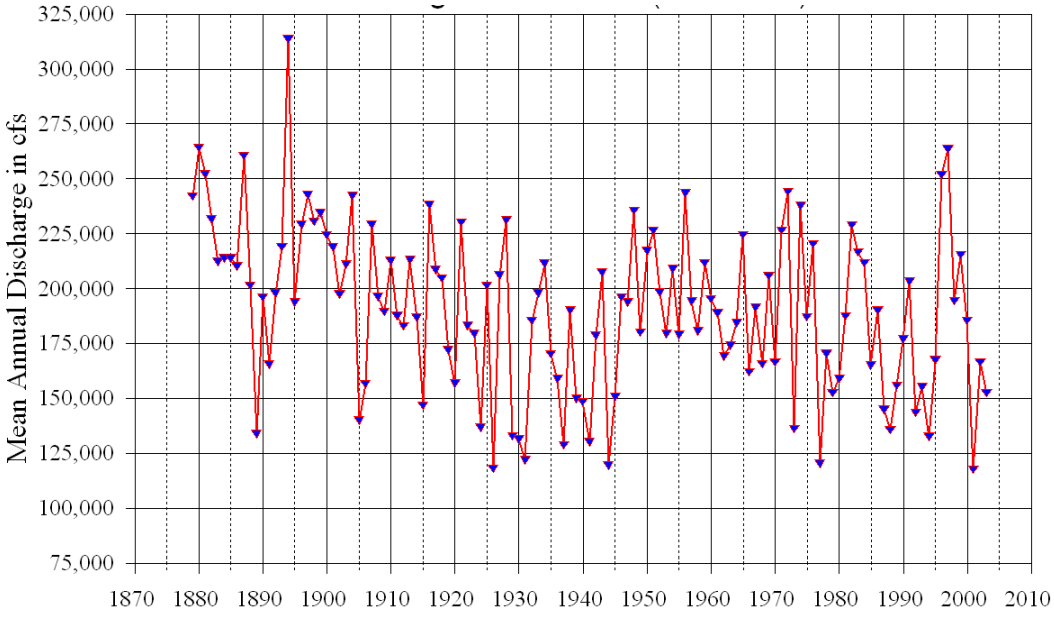
Source: Volkman (1997). (NRCNA 2004)

Figure 3-8. Change in Columbia River Hydrograph at The Dalles, 1879-2004.



Source Ecology and WDFW 2004

Figure 3-9. Columbia River Discharge, 1878-2004 at The Dalles, Oregon



Source: Ecology and WDFW 2004

Agreements, Laws, and Requirements that Affect Streamflow

Streamflow is affected by various instream and out-of-stream flow agreements. These laws and requirements regulate flows for instream and out-of-stream uses along the length of the Columbia River. This section outlines the various flow levels that are specified by instream flow agreements, laws, and requirements. See Section 3.6 for a description and discussion of the legal and policy implications of streamflow agreements, laws, and requirements.

International, Tribal, and Interstate Agreements

With the exception of the 2,500 cfs requirement for Canada to deliver under the Columbia River Treaty (National Research Council 2004), there are no other quantified international, interstate, or tribal instream or out-of-stream flow requirements (see Table 3-6).

Table 3-6. International, Tribal, and Interstate Agreements Affecting Columbia River Basin Streamflows

Agreement	Agreement Type	Quantity	Expiration
Boundary Waters Treaty of 1909	International	Not specified	None
Columbia River Treaty (signed 1961; ratified 1964)	International	2,500 cfs (from Kootenai River) provided by Canada	U.S. & Canada have option to terminate in 2024 with 10-years notice
Pacific Salmon Treaty of 1985	International	Not specified – adequate quantity and quality to sustain salmon fisheries	None
Tribal Reservations formalized through Treaties with the United States or by Executive Order[1]	Tribal	Not specified – fishing in Usual and Accustomed places; and hunting on open and unclaimed lands; practicably irrigable acres	None
Columbia River Compact	Interstate	Not specified – protect salmon fisheries	None

[1] References in this EIS to "treaty tribes" or treaty fishing and hunting rights refer to those tribes whose reservations were established by Executive Order as well as those established by treaty.

State Laws (WAC 173-563)

Ecology passed an administrative instream flow rule (WAC 173-563) for the Columbia River mainstem in 1980, which was amended in 1998. Implications of the flow rule and subsequent amendments on the interruptibility of water right holders are indicated in Table 3-7. The flows are measured at the Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, McNary, and John Day Dams. Appendix E presents the state administrative flows set at these control points under Washington Administrative Code (WAC) and flow objectives specified in the 2004 NOAA Fisheries Service Biological Opinion issued for the Federal Columbia River Power System (FCRPS) at the same location.

Table 3-7. Washington State Instream Flow Rule WAC 173-563 and Effects on Water Right Holders

Priority Date of Water Right	Source Water Associated with Water Right	Use	Interruptibility	Notes
1938	Columbia Basin Project	All	Uninterruptible	WAC 173-563-12-(5)
Pre-1980	Mainstem surface water and hydraulically connected ground water	All	Uninterruptible	--
Post-1980 to July 26, 1997	Mainstem surface water and hydraulically connected ground water	All except municipal and domestic	Interruptible	WAC 173-563-020(1) WAC 173-563-040: Interruptibility based on forecasts at The Dalles (See Table 3-3).
	John Day and McNary Pools of the Columbia River and the Lower Snake River Reservation	All except municipal and domestic	Interruptible	WAC 173-561A-060
On or after July 27, 1997	Mainstem surface water and hydraulically connected ground water	All	Determined on a case-by-case basis	WAC 173-563-020(4): Water right application evaluated for possible impacts on fish and existing water rights
	John Day and McNary Pools of the Columbia River and the Lower Snake River Reservation	All	Determined on a case-by-case basis	WAC 173-561A-060 – Subject to WAC 173-563-020(4): Water right application evaluated for possible impacts on fish and existing water rights

Notes: The Columbia Basin Project was authorized to irrigate 1,029,000 acres at its completion but currently irrigates 671,000 acres. The remainder is referred to as the "Second Half of the CBP".

Federal Requirements on FCRPS Management of Reservoirs

The 2004 NOAA Fisheries Service Biological Opinion issued for the Federal Columbia River Power System in November 2004 established flow targets for the Columbia River that were intended to protect threatened and endangered fish species (NMFS 2004). The Biological Opinion was remanded and a reconsultation is currently underway. Table 3-8 lists the flow objectives specified in the 2004 Biological Opinion.

Table 3-8. 2004 Biological Opinion Flow Objectives

Location	Spring		Summer	
	Dates	Flow Objective (kcfs)	Dates	Flow Objective (kcfs)
Snake River at Lower Granite Dam	4/03-6/20	85-100[1]	6/21-8/31	50-55[1]
Columbia River at McNary Dam	4/10-6/30	220-260[1]	7/01-8/31	200
Columbia River at Priest Rapids Dam	4/10-6/30	135	N/A	N/A
Columbia River at Bonneville Dam	11/1-emergence	125-160[2]	N/A	N/A

1 Objective varies according to water volume forecasts.
2 Objective varies based on actual and forecasted water conditions.
Kfcs=thousand cubic feet per second

3.4.1.2 Surface Water Bodies in the Region

The Columbia River Basin's surface water bodies include naturally formed lakes, constructed reservoirs on rivers and streams, and natural lakes that are artificially raised and/or controlled through constructed impoundments. Lakes are typically fed by water from in-flowing rivers or creeks but may also be fed by ground water and direct precipitation. Another source of water for some water bodies in the Columbia River Basin is irrigation return flow and direct discharge of irrigation water.

The largest natural lake in the Columbia River Basin is Lake Chelan, an approximately 55-mile-long glacial lake in north-central Washington that covers approximately 33,000 acres (Dion et al. 1976a). Other large lakes and reservoirs in the basin include Lake Roosevelt (83,200 acres), Potholes Reservoir (28,000 acres), Banks Lake (27,000 acres), Moses Lake (6,800 acres), Lake Osoyoos (5,800 acres; 35 percent in U.S.), Lake Spokane (also known as Long Lake, 25 miles long), Lake Wenatchee (2,500 acres), and Lenore Lake (1,300 acres).

3.4.1.3 Existing Storage Facilities

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 (Ecology and WDFW 2004). This volume is equivalent to one-third of the mean annual flow of the Columbia River at The Dalles, Oregon. This storage capacity occurs in four projects in excess of 5 million acre-feet, in six projects with a capacity range of 1 to 4 million acre-feet, and in dozens of smaller projects (Ecology and WDFW 2004).

According to the Columbia Basin Water Management Division of the U.S. Army Corps of Engineers (Corps of Engineers), there are 61 dams on the Columbia River mainstem and its tributaries. Of the 14 reservoirs located on the mainstem, three are in Canada (Mica, Revelstoke, and Keenlyside) and the remaining reservoirs are in the U.S. (Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, McNary, John Day, The Dalles, and Bonneville). Only two of the remaining 47 dams in Washington are located off-stream from a Columbia River tributary (Salmon Lake Dam and Conconully Lake, an Okanogan Irrigation

District facility, and Mill Creek, a Corps of Engineers facility). The maximum storage capacity of the four off-stream storage reservoirs totals approximately 75,000 acre-feet, which is less than approximately 0.15 percent of the total storage in the Columbia River system (MWH 2005). The Snake River is also highly developed for hydroelectric power generation, with four dams (Lower Granite, Little Goose, Lower Monumental, and Ice Harbor) in operation within Washington that create large run-of-river reservoirs of water (Ecology 1995).

Many reservoirs also store water for irrigation projects. The largest irrigation projects include the Columbia Basin Project, the Yakima Irrigation Project, and the Chief Joseph Dam Project. The Columbia Basin Project uses Columbia River water initially stored in Lake Roosevelt and diverted to Banks Lake and the Potholes Reservoir to irrigate approximately 671,000 acres of land (Postma, personal communication, 2007). The Yakima Irrigation Project uses water diverted from the Yakima, Naches, and Tieton Rivers and stored in Keechelus, Kachess, Cle Elum, Bumping, and Rimrock Lakes to supply irrigation water to 465,000 acres of which 361,000 acres are irrigated cropland (EES 2003). See Section 3.4.1.6 for more details about the irrigation projects in the Columbia River Basin.

3.4.1.4 Aquifer Storage

Currently several municipalities in the Columbia Basin are actively pursuing aquifer storage as part of their overall water management strategy. The City of Walla Walla, Washington, started evaluation of aquifer storage and recovery (ASR) in 1999 to provide a peaking and emergency backup water supply for the City. The City relies on surface water from Mill Creek to meet most of the demand. Seven deep wells completed in the Columbia River Basalt provide a secondary source when flows in Mill Creek decline from late spring through the fall months until rain events occur on a regular basis, or during peak flows when the water is too turbid for treatment. Two of the seven wells have been converted to ASR wells, with a recharge capacity of 2,900 gallons per minute (4.2 million gallons per day). The recharge water is diverted under the City's existing rights on Mill Creek, treated using ozonation and chlorination, and recharged to the aquifer. Since the City of Walla Walla began ASR operations in 1999, over 3 billion gallons (9,200 acre-feet) of water have been stored.

The City of Pendleton, Oregon, is also currently evaluating ASR in the Columbia River Basalt using up to five wells to store about 600 million gallons (1,840 acre-feet). The Cities of Kennewick and Richland have also investigated the feasibility of ASR in the Columbia River Basalt. The City of Yakima is also studying an ASR program for municipal water supply.

Preliminary feasibility studies of aquifer storage have also been conducted as part of WRIA-based storage assessments (under Watershed Planning). These are included in the following section.

3.4.1.5 Potential Storage Opportunities by WRIA

Under the Watershed Planning Act (RCW 90.82) local governments have the opportunity to conduct storage assessments as part of the watershed planning process. The assessments include an evaluation of potential storage opportunities in a WRIA. Several WRIAs located in the Columbia Basin have completed a watershed assessment and have identified opportunities for increasing storage (see Figure 3-3 for locations of the WRIAs). The storage opportunities

include large reservoirs such as Black Rock and Wymer in the Yakima Basin, pump exchange systems, smaller off-channel facilities, and aquifer recharge and storage facilities. A summary of storage opportunities in each WRIA is presented in Appendix F.

3.4.1.6 Irrigation

There are approximately 6.8 million acres of irrigated cropland in the U.S. portion of the Columbia River Basin, including parts of Idaho, Montana, Washington, Oregon, Wyoming, Utah, and Nevada. Approximately 1.5 million acres are irrigated in Washington alone. Irrigation accounts for over 22 million acre-feet of surface water diverted in the Columbia River Basin. Table 3-9 lists the irrigated acres and amount of water that was withdrawn (ground water and surface water) within the Columbia River Basin and Washington by county in 2000 (USGS 2005).

Table 3-9. Columbia River Basin Irrigated Acres in Washington by County in 2000

County	Acres Irrigated	Ground Water Withdrawn (acre-feet/year)	Surface Water Withdrawn (acre-feet/year)	Total Water Withdrawn (acre-feet/year)
Adams	135,060	120,050	89,350	209,400
Asotin	460	40	360	400
Benton	140,440	20,400	247,100	267,500
Chelan	28,270	3,520	54,000	57,520
Clark	4,150	4,370	2,210	6,580
Columbia	3,300	310	4,600	4,910
Cowlitz	3,310	0	4,160	4,160
Douglas	19,570	3,460	24,510	27,970
Ferry	4,300	910	4,200	5,110
Franklin	201,740	134,670	355,650	490,320
Garfield	670	30	580	610
Grant	407,730	289,340	755,550	1,044,890
Kittitas	69,340	0	223,550	223,550
Klickitat	18,540	18,550	11,370	29,920
Lincoln	43,960	31,290	9,260	40,550
Okanogan	43,690	22,230	59,650	81,880
Pend Oreille	1,440	310	520	830
Skamania	450	0	560	560
Spokane	11,020	9,860	2,780	12,640
Stevens	9,240	1,730	9,160	10,890
Wahkiakum	200	90	190	280
Walla Walla	88,750	47,370	92,090	139,460
Whitman	5,140	720	2,570	3,290
Yakima	253,070	69,620	570,410	640,030
Total	**1,494,470**	**778,870**	**2,524,380**	**3,303,250**

Along the lower Columbia River and Snake River, 380,000 acres are irrigated by pumping directly from the rivers. Some of this acreage is located in Oregon and Idaho (BPA 1995).

Along the middle Columbia River, the largest diversion is for the Columbia Basin Project at Grand Coulee Dam. The Columbia Basin Project 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 Columbia Basin Project near Quincy, and the project extends east 60 miles near Odessa and Lind. The Columbia Basin Project includes land in Grant, Lincoln, Adams, Franklin, and Walla Walla Counties. The Columbia Basin Project irrigates about 671,000 acres. The average annual diversion for the Columbia Basin Project is 2.65 million acre-feet as measured at the Main Canal during the 2000 to 2004 period.

The Quincy-Columbia Basin Irrigation District, East Columbia Basin Irrigation District, and South Columbia Basin Irrigation District operate and maintain the irrigation delivery systems (MWG 2003) (see Figure 2-2). 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).

Several smaller irrigation districts located along the middle Columbia River divert surface water from the river. The Greater Wenatchee Irrigation District irrigates 9,300 acres with three diversions from the Columbia River located at Howard Flats near Chelan, Brays Landing near Entiat, and at East Wenatchee. The average diversion from the Columbia River is 29,000 acre-feet per year (MWG 2000). The Brewster Flat Irrigation District irrigates 2,400 acres with a pump station at Brewster. The average diversion is 8,000 acre-feet per year (MWG 2002). Numerous private orchards and farms also pump directly from the Columbia River. An estimate of the number of water users and acreage served along the Columbia River was obtained from water right records and is presented in Section 3.6.1.1.

Within tributary basins to the Columbia River mainstem, the Yakima Project is the largest irrigation project. The Yakima Project supplies water to approximately 465,000 acres in Kittitas, Yakima, and Benton Counties of which about 361,000 acres is irrigated cropland (EES 2003). This irrigation project diverts water from the Yakima, Naches, and Tieton Rivers. Five major reservoirs are located within the Yakima Project—Keechelus, Kachess, Cle Elum, Bumping Lake, and Rimrock Lake. These reservoirs have a total combined capacity of 1,065,000 acre-feet. Numerous smaller irrigation districts, irrigation companies, private farms, and other entities withdraw water from tributaries to the Columbia River for irrigation purposes.

3.4.2 Surface Water Quality

Surface water quality is influenced by natural geology and land cover, point and nonpoint contaminant sources, the quality of ground water that discharges to surface water, and the natural flow regime. Land use practices have increased the level of nutrients and pesticides in streams in the Central Columbia Plateau. The U.S. Geological Survey (USGS) has studied the area as part of the Central Columbia Plateau/Yakima River Basin National Water-Quality Assessment study unit. The USGS has found high nutrient loading, elevated concentrations of water-soluble

pesticides, elevated concentrations of organochlorine compounds (e.g., DDT), and other pollutants in both bed sediment and fish (USGS 2006a). Instream structures (such as dams and irrigation impoundments) can also affect surface water quality by inhibiting mixing, introducing elevated concentrations of dissolved gases, and trapping contaminated sediments.

Reclamation published a study on water quality of the Columbia Basin Project in 1982 (Reclamation 1982) that tracked water quality parameters as water moved through the project. There was a general decline in quality as water moves through the project. Reservoirs, notably Potholes, were found to strip nitrogen and phosphorus from the water through plant growth and sedimentation. Return flows to the Columbia River contained greater concentrations of dissolved salts and nutrients than the original source water. Data provided from this study include measurements of pH, temperature, bicarbonates, chlorides, boron, suspended solids, nitrate, nitrite, ammonia, orthophosphate, total phosphorus, and fecal coliform bacteria at a number of water quality monitoring stations within the Columbia Basin Project. Pesticide (22 insecticides and 3 herbicides) levels in water, sediment, and fish tissue were also measured at various locations on the project.

On June 2, 2005, Ecology submitted the 2004 federal Clean Water Act Section 303(d) list to the U.S. Environmental Protection Agency (EPA) identifying surface waters that Ecology had determined to be out of compliance with water quality standards. The Columbia River (from WRIA 28 to the Canadian border) was listed for temperature, dissolved oxygen, fecal coliform, and a number of toxins (total PCBs, chlordane, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, aldrin, Alpha BHC and mercury) (Ecology 2005c). Tributaries of the Columbia River have their own 303(d) listings. These can be found, by tributary, on the Department of Ecology website available at http://www.ecy.wa.gov/programs/wq/303d/index.html.

The EPA has also studied bioaccumulation of toxic chemicals in fish species throughout the Columbia Basin (EPA 2002a). DDE, Aroclors, zinc, and aluminum were the chemicals found in the highest concentrations throughout the Columbia Basin. DDE was the most commonly found pesticide in fish tissue. Fish collected from the Hanford Reach of the Columbia River and the Yakima River tended to have higher concentrations of organic chemicals than other study sites (EPA 2002a).

Temperature

Water temperature varies at a number of temporal and spatial scales. Water temperature varies seasonally and during the course of a day in response to air temperature and solar radiation. Water temperature often varies with water depth, with cooler water at the bottom and warmer water near the surface during the summer. Tributary inflow temperatures, shade levels, geographic aspect, water surface area, and elevation all have an influence on water temperature. The Columbia River exhibits a dynamic and variable temperature regime.

Water temperature is important for the health and survival of native fish and aquatic communities. Temperature can affect embryonic development, juvenile growth, adult migration, competition with non-native species, and the relative risk and severity of disease (Ecology and WDFW 2004). Washington is currently working with Idaho, Oregon, and the EPA in

coordination with the Columbia Basin Tribes[1] to develop a Total Maximum Daily Load (TMDL) report for temperature on the Columbia and Snake Rivers (EPA 2005).

Water temperature can be elevated above natural conditions by a number of human activities. Point sources, such as municipal waste treatment plants, or pulp and paper mills, discharge thermal energy directly to the river and can cause temperature plumes near the discharge point, but do not measurably affect the cross-sectional temperature of the Columbia River (EPA 2002b). Dams alter river temperature by changing the flow regime, stream geometry, current velocity, and floodplain interactions of the river. Dams increase the length of time the temperature exceeds the numeric criterion, and cause the Columbia River to be warmer during the late summer and fall (EPA 2002b). In addition, withdrawing water from the river can indirectly affect water temperature (Ecology and WDFW 2004).

Total Dissolved Gas

Spill events at large dams can elevate total dissolved gas in water. Water plunging from a spill entrains air and carries it to a depth where hydrostatic pressure forces gas into solution at high levels. Total dissolved gas (TDG) is generally most problematic at large, high dams with deep plunge pools. Spills can occur at any time for several reasons including fish passage operations and if the flow exceeds the powerhouse capacity. Spills can occur at all of the Columbia River mainstem dams (Pickett et al. 2004).

The water quality standards for Washington State, the Colville Tribe, and the Spokane Tribe have an identical TDG criterion: 110 percent of saturation not to be exceeded at any point of measurement. The criteria for Washington State and the Colville Tribe do not apply to flows above the seven-day, ten-year frequency flow (7Q10) flood. In addition, special limits for TDG are established as a special condition in Washington rules, to allow higher criteria with specific averaging periods during spills for fish passage, if approved within a gas abatement plan (WAC 173-201A-200(1)(f)) (Pickett et al. 2004).

The 1998 303(d) listing for TDG on the Columbia River was removed in 2004. The TMDL report associated with the 1998 listing was published in June 2004 (Pickett et al. 2004). EPA approved Ecology's submittal of total dissolved gas TMDLs for the Mid-Columbia River and Lake Roosevelt on July 27, 2004. This TMDL, developed jointly by Washington, the Spokane Tribe of Indians, and EPA, addresses total dissolved gas in the Columbia River and Lake Roosevelt from the international border with Canada to the Snake River confluence near Pasco. Elevated total dissolved gas levels, which can cause "gas bubble trauma" in fish, are caused by spills at seven dams in the Mid-Columbia and by sources upstream of the international border. Loading capacities and load allocations are set in terms of: (1) percent saturation for fish passage

[1] As listed in the Memorandum of Agreement: Columbia/Snake Rivers Total Maximum Daily Load for Total Dissolved Gas and Temperature (EPA 2000), the Columbia Basin Tribes include the Burns Paiute Tribe of the Burns Paiute Indian Colony of Oregon; Coeur d'Alene Tribe of the Coeur d'Alene Reservation, Idaho; Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana; Confederated Tribes of the Colville Reservation, Washington Confederated Tribes of the Umatilla Indian Reservation, Oregon; Confederated Tribes of the Warm Springs Reservation of Oregon; Confederated Tribes and Bands of the Yakama Nation, Washington; Kalispel Indian Community of the Kalispel Reservation, Washington; Kootenai Tribe of Idaho; Nez Perce Tribe, Idaho; Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho; Shoshone-Paiute Tribes of the Duck Valley Reservation, Nevada; and Spokane Tribe of the Spokane Reservation, Washington.

conditions, and (2) excess pressure above ambient during non-fish passage conditions. Allocations must be met below each dam at a specific distance below the spillway (near the end of the aerated zone). The implementation plan describes short-term and long-term compliance with both Endangered Species Act and TMDL requirements (Pickett et al. 2004).

The TMDL established loading capacities that range from 72 to 75 millimeters of mercury for the Mid-Columbia and Lake Roosevelt. The capacities were calculated to meet the 110 percent saturation criterion during critically low barometric pressure conditions. Loading capacity during fish passage conditions was directly based on Washington's fish passage TDG criteria for the forebay and tailrace of each of the five dams downstream of the Okanogan River confluence (Pickett et al. 2004).

Load allocations are equal to loading capacity throughout the TMDL area, including each dam's forebay and tailrace. TMDL load allocations apply year-round from the international border to Grand Coulee Dam, and from March through September downstream of Grand Coulee Dam when flows are below the 7Q10 flood flows for waters below the Spokane River confluence. Loading capacities established for Lake Roosevelt and the Mid-Columbia River were:

- 72 mm Hg above saturation: International border to Grand Coulee Dam, including Lake Roosevelt, Spokane Arm, and Grand Coulee Dam forebay;
- 73 mm Hg above saturation: Grand Coulee Dam to Okanogan River;
- 115 percent saturation (average of 12 highest hourly readings in a 24-hour period): Forebays of Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams;
- 120 percent saturation (average of 12 highest hourly readings in a 24-hour period) or 125 percent saturation (maximum one-hour average): Tailrace of Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids Dams;
- 73 mm Hg above saturation: Okanogan River to Wells Dam;
- 74 mm Hg above saturation: Wells Dam to Yakima River; and
- 75 mm Hg above saturation: Yakima River to Snake River.

When the TMDL is fully implemented, spills from dams downstream of the international border must meet the allocations (except during flows above a 7Q10 flood) (Pickett et al. 2004).

Nutrients

Nutrients are an important indicator of surface water quality. Inorganic nitrogen (nitrate and ammonia) and phosphorus affect the growth of aquatic plants and the overall aquatic conditions of surface water bodies. Excessive nutrients can increase the growth of aquatic plants such that persistent algal blooms can inhibit the beneficial uses of the lake, including recreation, habitat, and fish and other aquatic organisms. Nutrients can also affect dissolved oxygen concentrations as well as aquatic organisms.

Naturally occurring concentrations of nutrients in the environment also contribute to water quality concerns. Land use practices have added to the level of nutrients in the environment. Sources of inorganic nitrogen to streams include runoff from agriculture and residential areas and ground water. The application of fertilizers to crops can result in elevated concentrations of phosphorus due to soil erosion, which carries the phosphorus or nitrogen to the streams. Feedlots and wastewater treatment plants are also sources of nutrients (Williamson et al. 1998).

Pesticides

The USGS has studied the occurrence, distribution, and transport of pesticides in agricultural irrigation return flow from four drainage basins in the Columbia Basin Project (Wagner et al. 2006). The study describes the land use within each of the four drainage basins and provides a baseline indication of the concentration of pesticides and nutrients in the surface water due to land use practices in the Columbia Basin Project. Forty-two pesticides and five metabolites were detected in samples from the four irrigation return-flow drainage basins in the CBP from July 2002 to October 2004 (Wagner et al. 2006). See Wagner et al. (2006) for the range of concentrations detected for each pesticide.

Dissolved Oxygen

Fish and other aquatic life are sensitive to dissolved oxygen levels and thrive within a specific range. Dissolved oxygen levels are affected directly by temperature. As temperature increases, the amount of oxygen at saturation decreases. In addition, biological activity involving respiration increases with temperature, thus depleting dissolved oxygen if it is not replenished by aeration or photosynthesis. Therefore at higher temperatures, potential dissolved oxygen levels in a stream or lake are lower. Similar to temperature, dissolved oxygen levels vary at different spatial and temporal scales. The Columbia River exhibits a dynamic and variable dissolved oxygen regime. The dissolved oxygen levels in the Columbia River generally meet the dissolved oxygen standards except for violations in WRIAs 61, 53 (Lake Roosevelt area) and 41 in 2002/2004 (Ecology 2005c).

Metals

Metals are substances that have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic toxicity to the sensitive biota, or adversely affect public health. The concentrations of metals that are considered toxic to humans can differ from levels that are considered toxic to aquatic biota. For example, aquatic organisms are more sensitive to copper concentrations than humans; therefore, the regulatory limit for copper is lower for natural water bodies than it is for drinking water. A number of acute and chronic metals standards are calculated as a function of the total water hardness because the toxicity of some metal ions decreases as hardness increases. Cycling and release of metals from contaminated lakebed sediments to the water column is a complex but common phenomenon. The process is very dynamic and related to multiple physical, biological, and chemical processes that occur at the sediment-water interface.

3.4.2.1 Early Action Study Areas

Lake Roosevelt Drawdown

Water Quantity. Columbia River water is impounded in Lake Roosevelt by the Grand Coulee Dam. Lake Roosevelt extends approximately 150 miles northeast of Grand Coulee Dam 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. The average annual inflow to Lake Roosevelt is 99.3 million acre-feet. A majority of the flow into Lake Roosevelt occurs during the spring runoff season, which lasts from April to July and accounts for 65 to 70 percent of the total annual inflow volume. The annual volume inflow has varied from a minimum of 48.5 million acre-feet to a maximum of 111.8 million acre-feet.

The purposes for which the Columbia Basin Project and Lake Roosevelt were constructed are flood control, irrigation, and hydropower. For flood control, sufficient volume is maintained in Lake Roosevelt to control the flow in the Columbia River at The Dalles Dam to a maximum of 450,000 cubic feet per second. Flood control parameter curves specify the amount of storage space required based on the forecasted runoff at The Dalles and adjusted for available upstream storage capacity other than at Grand Coulee Dam. The forecast of runoff at The Dalles is made by the Corps of Engineers Reservoir Control Center at Portland, Oregon. The flood control operation for the entire Columbia River is dictated by the Corps of Engineers during the flood control season.

Lake Roosevelt is the primary source of irrigation water for the Columbia Basin Project. Water is pumped from the lake at Grand Coulee Dam to the Feeder Canal, which leads to Banks Lake, a re-regulating reservoir for the Columbia Basin Project. The average annual volume of water diverted from Lake Roosevelt and the Columbia River is 2.4 million acre-feet.

Grand Coulee Dam regulates Lake Roosevelt water levels between 1,208 feet mean sea level (minimum pool) and 1,290 feet mean sea level (full pool). Figure 3-10 illustrates Lake Roosevelt levels for three different years that represent a dry (2003), wet (1997), and average year (2002). The lake level varies throughout the year, depending on flood control, power, irrigation, fisheries, and recreational needs. For example, flood control needs mandate that by late April or early May, Lake Roosevelt must be drawn down to a level that provides a high probability that downstream flood control needs will be met. This action, however, can affect the amount of water available to supplement flows for downstream fisheries. Likewise, spring drawdowns of the reservoir must be done in a manner that ensures refill of Lake Roosevelt by summer. This refill affects not only meeting recreational needs, but the availability of water releases to assist downstream fisheries in August and September.

During July and August, lake elevations generally fluctuate between 1,278 and 1,290 feet mean sea level. Water can be released to supplement instream flows for downstream juvenile salmon migration within the guideline of not reducing the lake level below an elevation of 1,280 feet mean sea level. This guideline can be exceeded by an additional two feet in below-average water years. There is an effort to maintain lake level elevations between 1,283 and 1,285 feet during October to assist with Lake Roosevelt's kokanee fishery—specifically for collection

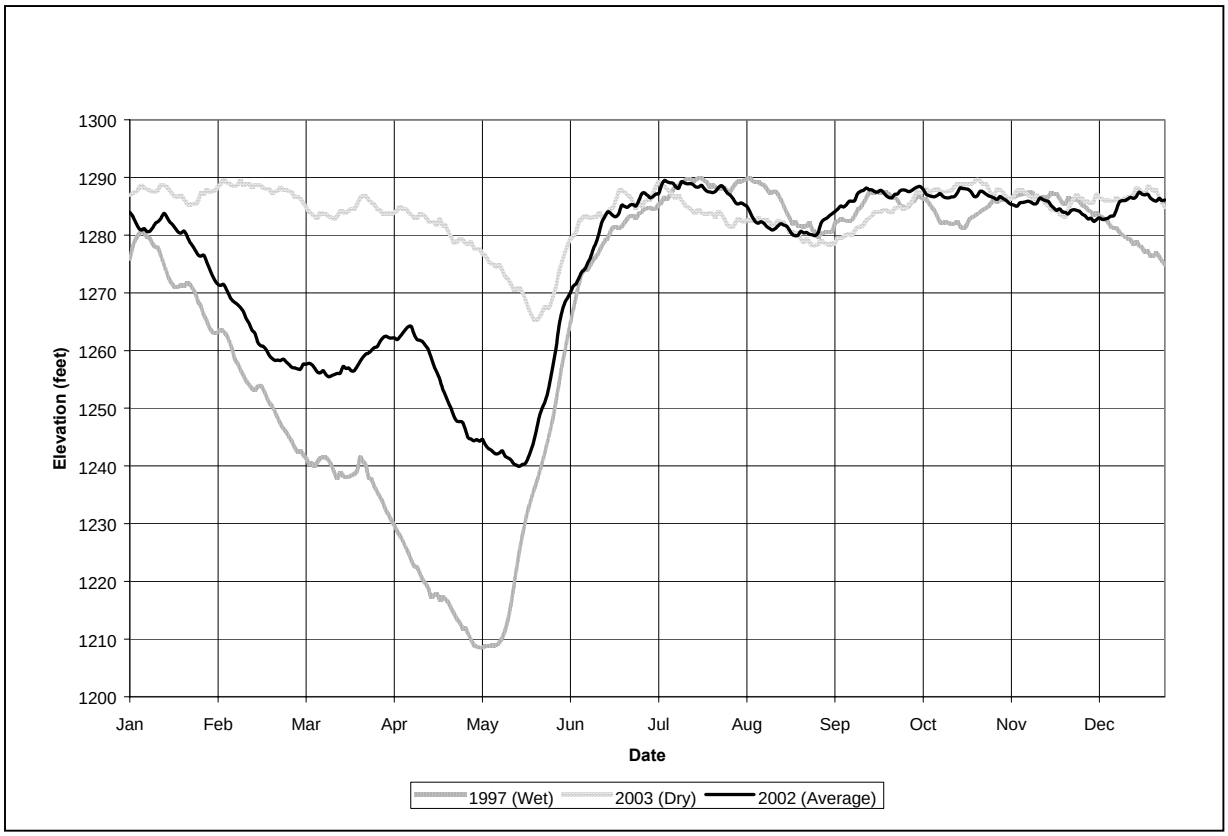
brood stock and ensuring their access to tributaries. Fall and winter lake levels may also be varied to support flows for spawning downstream chum salmon.

Water Quality. A number of technical studies related to water quality have been conducted on Lake Roosevelt. A bibliography of related studies is provided in Appendix G. The primary issues of concern with respect to water quality relate to toxic contaminants that are present in the lakebed sediments and their potential for release to the water column.

The lake is contaminated with trace elements discharged as slag material from a smelter in Canada. Approximately 360 metric tons were discharged per day from 1900 to 1998. A study by the USGS reported that Lake Roosevelt bed sediments were contaminated based on high metals concentrations, impaired benthic invertebrate communities, and laboratory sediment bioassays. The majority of previous studies have focused on contaminants in water, sediment, and fish. The potential effects to air quality are described in Section 3.3.5. Recently concern has risen over the potential threat of airborne contaminants to human health.

Lake Roosevelt, identified as Franklin D. Roosevelt Lake, is listed on Ecology's 2002/2004 303(d) list 14 times (Ecology 2005c). Category 5 parameters (water quality-limited areas that require a TMDL) include two listings for dissolved oxygen, two listings for temperature, and one listing for mercury in tissue. Other 303(d) listings include dioxins in both tissue and water, total dissolved gas, total polychlorinated biphenyls (PCBs) in tissue, mercury in tissue, pH, and arsenic.

Figure 3-10. Lake Roosevelt Water Elevations



3.4.2.2 Supplemental Feed Route

Water Quantity

The proposal for providing a Supplemental Feed Route for Potholes Reservoir is described in Section 2.6.2. At present, the Potholes Canal System serves approximately 204,000 acres, requiring up to 990,000 acre-feet annually from Potholes Reservoir. To meet this supply from Potholes Reservoir requires up to 350,000 acre-feet of feed annually. There are three feed routes being used currently (see Figures 2-1 and 2-4). The primary route is through the East Low Canal to Rocky Coulee Wasteway then into Upper Crab Creek, Moses Lake and finally into Potholes Reservoir. The two secondary routes are through Lind Coulee Wasteway and through Frenchman Hills Wasteway. Water is spilled from the East Low Canal to Lind Coulee Wasteway, which flows directly to Potholes Reservoir. The other secondary route spills water from the West Canal to the Frenchman Hills Wasteway, which also flows directly to Potholes Reservoir.

Winter and spring spill from Potholes Reservoir, if needed, is passed down Lower Crab Creek. Naturally occurring flood water can also be passed down Lower Crab Creek.

Description of Supplemental Feed Route Alternatives

The purpose of a Supplemental Feed Route is to provide flexibility in the ability to supply feed water to Potholes Reservoir. A minimum fall feed water program with maximum spring feed and small amounts of summer feed water would allow the system to be operated with the greatest degree of flexibility and least likelihood of Potholes Reservoir spill. A need exists for a Supplemental Feed Route that has the ability to increase feed water capacity after runoff until fall, without impacting Potholes Reservoir winter storage capacity. Reclamation states that the Supplemental Feed Route should have the ability to feed a minimum of 25 percent of the current maximum feed water amount of 350,000 acre-feet (Blanchard 2006).

Three alternative routes for Potholes Reservoir supplemental conveyance have been proposed. They are identified as the Crab Creek, W20 Canal, and Frenchman Hills Wasteway.

Crab Creek Alternative

This alternative would release water from Billy Clapp Lake into Brook Lake, a natural water body within the Crab Creek channel. The water would then be conveyed down the natural Crab Creek channel to Moses Lake and through Moses Lake to Potholes Reservoir. The Brook Lake outlet of Billy Clapp Lake would be improved so water will not back up on the toe of Pinto Dam. A measuring location would be added near the Brook Lake outlet. The Crab Creek channel would be modified to minimize sediment transport and capacity issues.

Table 3-10 shows the discharge of Crab Creek at the USGS Irby station (Site 12465000) located approximately 18 miles upstream of Brook Lake (USGS 2006f).

Table 3-10. Crab Creek Discharge (cfs) at Irby
Period of Record 1942-2005

Month	Discharge[1]		
	90%	50%	10%
April	19.7	78.5	202
May	11.9	38.1	96.5
June	8.4	26.5	55.7
July	4.6	18.0	32.1
August	2.6	10.6	23.3
September	1.6	7.3	19.7

[1] % is percentage of time flow is exceeded

Another gaging station is located on Crab Creek 3.5 miles upstream from Moses Lake (Site 12467000). The average monthly discharges at this gage are shown in Table 3-11 (USGS 2006f). The flows are affected by return flows from irrigated area and discharges from the East Low Canal to Rocky Coulee Wasteway to feed Potholes Reservoir.

Table 3-11. Crab Creek Discharge (cfs) at Moses Lake
Period of Record 1951-2005

Month	Discharge[1]		
	90%	50%	10%
April	10.4	41.1	217
May	21.1	32.0	111
June	19.7	41.6	82.4
July	32.5	48.2	103
August	39.7	57.7	119
September	40.4	62.2	122

[1] % is percentage of time flow is exceeded

The current proposal is to provide a base rate of water flow from Billy Clapp Lake of around 100 cubic feet per second (cfs) year-round with larger discharges during spring and summer as needed. The 100 cfs base inflow would add 72,000 acre-feet annually to Potholes Reservoir with 30,000 acre-feet added to the winter inflows. Targeting an October end-of-month storage at 1,028 feet mean sea level (msl) would still leave room for a 25-year runoff volume in Potholes Reservoir. To meet the winter releases, Billy Clapp Lake would be drawn down to an elevation of 1,300 feet msl by March 1 and be refilled to 1,326 feet by March 18. In addition to the base feed water supply, this route could also be used during the spring and summer months to increase water supply during drought years. The exact amount would vary due to the volume of runoff from Upper Crab Creek and irrigation demands. The ability to convey an additional 500 cfs from April through June, as needed, would supply 90,300 acre-feet.

West Canal

The West Canal would be used for both the W20 Canal and the Frenchman Hills Wasteway alternative. The West Canal is usually filled with water starting on March 22. The Quincy-Columbia Basin Irrigation District treats the West Canal system for aquatic weeds during its operations. Restrictions on the chemicals used require that no water can be released to a feed route while a treatment is taking place. Because of the difficulty of making large changes in

canal flows, Reclamation has assumed that large supplemental flows will not occur after the first chemical weed treatment. Chemical treatments in the West Canal start at mile 23, with the first treatment beginning on May 10. The W20 Canal is treated beginning a week later than the West Canal.

W20 Lateral Alternative

For this alternative, supplemental water would be conveyed from Billy Clapp Lake via the Main Canal and West Canal to the W20 Canal diversion. Water would then be conveyed down the W20 Canal and diverted to Moses Lake, which flows to Potholes Reservoir.

The diversion from the West Canal into the W20 Canal averages 150,000 acre-feet annually (approximately 380 cfs) throughout the irrigation season with a maximum of 33,000 acre-feet (approximately 540 cfs) in July (MWG Mar 2002).

Currently the W20 Canal below the Naylor Siphon has a capacity of 850 cfs. The existing Naylor Siphon, which starts at the West Canal and crosses under a railroad and State Route 28, has a capacity of 590 cfs. The route from the W20 Canal to Moses Lake would be designed to have a flow of 600 cfs. Flows with an enlarged Naylor Siphon would be limited to between 600 and 500 cfs due to available space in the W20 Canal. Currently, the last feed date is May 18 due to aquatic weed treatment.

Assuming a second Naylor Siphon is constructed, the W20 Canal would have the capacity to add a maximum of 50,100 acre-feet to the spring supplemental. The West Canal above the W20 Canal does not limit flow via the W20 Canal during the months of April and May, but because of West Canal constraints, the W20 Canal route would not have any capacity to add to the summer feed even if weed treatment were not a constraint. The W20 Canal would not be used in the fall.

Frenchman Hills Wasteway

Water would be conveyed from Billy Clapp Lake via the Main Canal and West Canal to the Frenchman Hills Wasteway. The water would then be discharged through the Frenchman Hills Wasteway into Potholes Reservoir.

Discharges were collected at USGS Site 12471090 within the Frenchman Hills Wasteway from October 1993 to September 1994. The discharges for April to September 1994 are listed in Table 3-12 (USGS 2006f).

Table 3-12. Frenchman Hills Wasteway Discharge April-September 1994

Month	Discharge (cfs)
April	360
May	424
June	466
July	449
August	560
September	543

Frenchman Hills Wasteway crosses under two county roads, Dodson Road and Road C SE. The existing Dodson Road crossing has a capacity of 1,100 cfs and the Road C SE crossing has a capacity of 500 cfs.

Frenchman Hills Wasteway is currently used during the spring feed operation. It is anticipated that this will continue and the use of Frenchman Hills Wasteway as a supplemental route would be in addition to the current operation. Currently feed water supply from Frenchman Hills Wasteway is limited to between 100 to 150 cfs because of Road C SE culvert flow capacity above current return flows. Return flows during April and May usually range from 350 to 400 cfs.

In addition to constraints posed by aquatic weed treatments, capacity must be maintained in the West Canal for emergency shutdown of five main pumping plants: Quincy, Babcock, Evergreen, Frenchman Springs, and Frenchman Hills. Table 3-13 shows the maximum April to May pumping rates for the years of 1996 to 2005 for each pumping plant.

Table 3-13. Large Pumping Plants on the West Canal

Pumping Plant	Maximum April-May Flow (cfs)
Quincy (Mile 26)	410
Babcock (Mile 35.9)	270
Evergreen (Mile 44)	220
Frenchman Springs (Mile 53.1)	170
Frenchman Hills (Mile 61)	300

In the event of a loss of the Quincy pumping plant, the water that was being pumped will be diverted out the Winchester Wasteway. Similarly if the Frenchman Hills pumping plant goes down, the water that was being pumped will go out the Frenchman Hills Wasteway. However, if one of the Babcock, Evergreen or Frenchman Springs pumping plants shuts down, there must be space in the West Canal for this flow, over and above any feed flows. Of these pumping plants, Babcock is the controlling pumping plant. A lateral diversion at West Canal mile 35.9 delivers water to the Babcock pumping plant. This lateral canal is just upstream of the W36 Check. The W36 Check, and the West Canal below it to Frenchman Hills Wasteway, must maintain space for 270 cfs. The capacity of the W36 Check is the controlling point for this section of canal. The W36 Check limits the maximum flow via the West Canal to 700 cfs beginning on April 1 and ending at 150 cfs on May 10. If all plants go down during feed, then it is assumed that the Winchester Wasteway, Columbia River Wasteway, and Frenchman Hills Wasteway, which have a combined capacity of over 2,000 cfs, would be used to pass the approximate total of 1,370 cfs.

Frenchman Hills Wasteway must be designed to pass the maximum feed and the maximum flow in case of canal failure in the 5th Section of the West Canal or the Royal Branch Canal. The maximum flow reported for the Royal Branch Canal is 580 cfs and for the West Canal 5th Section is 510 cfs for the period from 1996 to 2005. Frenchman Hills Wasteway should be designed to pass approximately 1,500 cfs if it is used as a feed route with the maximum feed being 700 cfs.

Currently Frenchman Hills Wasteway conveys approximately 21,000 acre-feet in the spring to Potholes Reservoir. Assuming enlarged culvert crossings, the West Canal would have a capacity to feed an additional 25,000 acre-feet in the spring via Frenchman Hills Wasteway. The Frenchman Hills Wasteway route does not have any capacity to add to summer feed. The Frenchman Hills Wasteway would not be used for fall feed.

Water Quality

The Supplemental Feed Routes would involve linking existing water bodies and waterways that have different water quality. The geographic extent of the affected environment for each of the Supplemental Feed Routes is as follows:

- Crab Creek Route Alternative: Billy Clapp Lake, Brook Lake, Upper Crab Creek from Brook Lake to Moses Lake, Moses Lake and Potholes Reservoir;
- W20 Route Alternative: West Canal, Moses Lake, and Potholes Reservoir; and
- Frenchman Hills Route Alternative: West Canal, Frenchman Hills Wasteway, and Potholes Reservoir.

These Supplemental Feed Routes are within the Columbia Basin Project area. Water quality in the Columbia Basin typically declines as the water moves through the project with the addition of agricultural return flows. The contribution of phosphorus, nitrates, and sediment from return flows in Moses Lake and Potholes Reservoir is greater than contributions upstream where there is less influence from the surrounding land use. However, some sediment settles out when it reaches slow-moving water bodies such as Moses Lake and Potholes Reservoir, and nitrate levels can be diluted with increased water inputs or from the uptake of nitrate by vegetation (Reclamation 1982).

The water quality in Billy Clapp Lake, Brook Lake, and the West Canal is generally good. Crab Creek's water quality is generally good in terms of fecal coliform and dissolved oxygen (Ecology 1996). However, Crab Creek and the Frenchman Hills Wasteway have problems with temperature and pH, which have led to their inclusion on the 2002/2004 303(d) list (Ecology 2005c).

Excess nutrients present in Moses Lake have been linked to eutrophic or hypereutrophic conditions during the summer months, resulting in persistent algal blooms that can inhibit public use of the lake (Ecology 2003). A meso-eutropic lake is one that has an adequate amount of organic material to support a variety of aquatic species (Czech 2005). An eutrophic lake has an excessive amount of organic material that inhibits the growth of aquatic species (Czech 2005). As a consequence, the lake is listed as an impaired water body on the 2002/2004 Clean Water Act 303(d) list (Ecology 2005). Moses Lake also has elevated concentrations of pesticides and is on the 2002/2004 303(d) list for 2,3,7,8-TCDD and total PCBs (Ecology 2005c).

Potholes Reservoir is generally a meso-eutrophic to eutrophic lake and has elevated concentrations of the pesticide dieldrin, which is accumulating in the tissues of the reservoir's aquatic life. The reservoir was listed as an impaired water body on the 2002/2004 303(d) list for the dieldrin violations (Ecology 2005c).

3.4.2.3 Voluntary Regional Agreements

Volunteer Regional Agreements (VRAs) could be formed anywhere in the Columbia River Basin. The surface water quality for VRAs would be the same as described above for the Columbia River Basin (see Section 3.4.2).

3.5 Ground Water

Washington state defines ground water as:

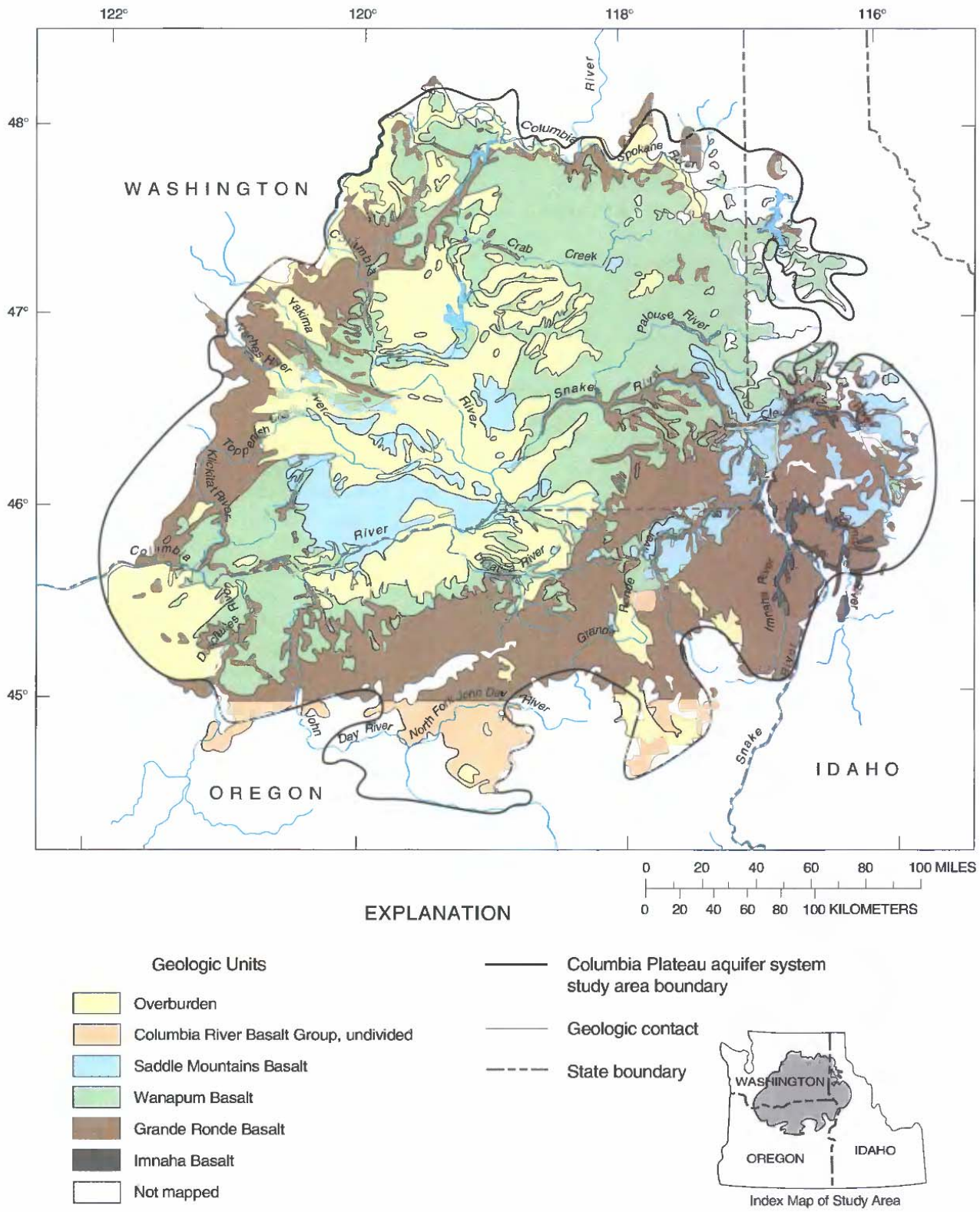
> . . . all waters that exist beneath the land surface or beneath the bed of any stream, lake or reservoir, or other body of water within the boundaries of this state, whatever may be the geological formation or structure in which such water stands or flows, percolates or otherwise moves . . . (RCW 90.44.035).

Ground water is underground water found in pore spaces between grains of soil or rock or within fractured rock formations. Ground water 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 a supply well. 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).

Surface water bodies and aquifers, particularly shallow aquifers, are often interconnected. Stream flow derived from ground water 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).

Ground water 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 (Figure 3-11) (Bauer 2000).

A large portion of this area is included in the Central Columbia Plateau/Yakima River Basin National Water-Quality Assessment study unit that has generated numerous ground water technical investigations by the USGS. Work in the study unit is intended to focus on separating the mechanisms and effects of various agricultural management practices on ground water, surface water, and stream ecosystem conditions to characterize how natural and anthropogenic chemicals move through the hydrologic system. This information is intended to help local, regional, state, and federal land managers produce sound decisions regarding water and land management within the study area.



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SOURCE: Bauer, 2000.

FIGURE 3-11
LOCATION OF THE COLUMBIA PLATEAU REGIONAL AQUIFER SYSTEM
COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS
WASHINGTON

3.5.1 Ground Water Quantity

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). Results from a ground water model developed for three areas of the Columbia Basin Project indicated that between 1952 and 1958, ground water storage within the project increased by approximately 7.25 million acre-feet in the upper aquifer and 66,000 acre-feet in the lower aquifer (Reclamation 1982). Model results also indicated that the rate of increase in ground water storage was beginning to level off. This recharge supports a variety of beneficial uses. 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 ground water. The largest ground water users are irrigators in the Central Columbia Plateau area (Jones and Wagner 1995). Ground water is pumped from the Odessa aquifer to irrigate about 170,000 acres; issues associated with this use are discussed in Section 3.5.3.1. Ecology's rule, Chapter 508-14 WAC, which specifically addresses ground water management within the Columbia Basin Project and outside of the Quincy and Odessa Ground Water Management Subareas, is discussed in Section 3.6.1.2.

Ground water levels in shallow portions of the 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 ground water levels. Shallow water levels have increased in the Quincy and Pasco basins by 150 feet or more since development (Jones and Wagner 1995). Ground water levels in deeper portions of the aquifer system have declined as a result of ground water being pumped for irrigation and municipal supply. Areas east of the Columbia Basin Project have experienced ground water declines of more than 100 feet, while portions of Grant County near the Columbia River have experienced ground water declines of up to 450 feet (Whitehead 1994; Jones and Wagner 1995).

3.5.2 Ground Water Quality

Ecology's *2001 Water Quality Assessment*, an update to the 2000 Clean Water Act Section 305(b) Report (Ecology 2005c), concluded that generally, ground water quality in Washington is "good." Where ground water quality problems occur, the assessment attributed the problems primarily to nitrates, pesticides, metals, and other types of non-point pollution. Non-point pollution is created by diffuse land and water use activities such as use of onsite sewage disposal systems, commercial and non-commercial use of pesticides and fertilizer, and management of stormwater runoff (Ecology and WDFW 2004).

In Adams, Franklin, and Grant Counties, nitrate concentrations exceed the EPA maximum contaminant level for nitrate in about 20 percent of all drinking water wells (Ryker and Frans 2000).

Nitrate concentrations in the Central Columbia Plateau's ground water have generally increased since the 1950s. Although fertilizer application leveled off in about 1985, it is too early to be certain of any corresponding leveling off or decrease in nitrate concentrations in the regional

ground water system (Williamson et al. 1998). Pesticides are present in more than half of the wells in the Central Columbia Basin Plateau that contain elevated nitrate concentrations (above the "natural" or background level of 2-3 mg/L) (Williamson et al. 1998).

3.5.3 Early Action Study Areas

3.5.3.1 Lake Roosevelt Drawdown

Ground water movement from the end of Grand Coulee is controlled by an impervious basalt ridge between Soap Lake and Rocky Ford Spring. Surface and ground water north of this ridge flow toward Soap Lake (Blanchard 2006). Lake Roosevelt is the primary source of irrigation water for the Columbia Basin Project. The water from the additional drawdown will be used to augment streamflows below Lake Roosevelt and to partly replace ground water use in the Odessa Subarea. Because the application of water to the Odessa Subarea has the potential to affect ground water, ground water conditions in the Odessa Subarea are described here. Reclamation has initiated a study of the Odessa Subarea and developed a Plan of Study for the area (Reclamation 2006c,d).

Approximately 121,000 acres of the Odessa Subarea underlies the easternmost portion of the authorized Columbia Basin Project (see Figures 1-1 and 2-1). Most of the ground water is pumped from deeper water-bearing zones in the Columbia River Basalt Group.

Irrigation wells primarily pump water from aquifers at a depth of 500 to 1,000 feet below the ground surface (Luzier and Skrivan 1975). The deep aquifers are generally permeable and can sustain high levels of pumping. Based on an estimate by the Columbia Basin Development League (2005), about 170,000 acres are irrigated by ground water in the Odessa Subarea.

Ecology began permitting irrigation wells in the Odessa Subarea in the 1960s and 1970s while anticipating the completion of the Columbia Basin Project. Irrigators were advised that this source would not be permanent, but anticipated that the Columbia Basin Project would continue to be developed and eventually replace ground water with surface water. 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 ground water 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 ground water. The declining aquifer is not only of concern to irrigators, but also municipalities in the Odessa Subarea that rely on the aquifer for municipal and industrial water supply.

Ground Water Quality

In addition to water level declines, there are water quality concerns associated with the continued use of deep ground water 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 ground water in the Odessa Subarea (Reclamation 2006c,d).

3.5.3.2 Supplemental Feed Route

The ground water system underlying the Supplemental Feed Routes is located in the Columbia River Basalt Group (see Sections and 3.5.1 and 3.5.3.1 for more detail). Surface water sources interact on a local level with the shallow ground water system. Ground water contributes almost 100 percent of the Frenchman Hills Wasteway's baseflow (Williamson et al. 1998). Shallow ground water in the unconfined aquifer flows into Moses Lake along the northwestern and eastern shores (Ecology 2003c). The Potholes Reservoir also influences the direction of ground water flow (Luzier and Burt 1974).

Water quality degradation associated with shallow ground water results from land use practices that introduce excessive pollutants into the ground water through infiltration. Nitrate concentrations in the ground water flowing into the Frenchman Hills Wasteway increased between 1966 and 1990 (Williamson et al. 1998). See Section 3.5.2 for a more detailed discussion of ground water quality in the Columbia Basin Plateau.

Nitrate concentrations in the ground water flowing into the Frenchman Hills Wasteway increased between 1966 and 1990 (Williamson et al. 1998).

3.5.3.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The ground water quality affected by the CSRIA VRA would be the same as for the Management Program (see Section 3.5.2).

3.6 Water Rights

There are several special water rights issues related to the Columbia River Basin in Washington that will be involved in implementation of the Management Program. These issues are described in this section. A general discussion of water rights in Washington is included in Appendix D.

3.6.1 Special Water Rights Issues in the Columbia River Basin

3.6.1.1 Instream Flows/Interruptible Rights

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. Domestic and municipal rights were exempt from the rule. Ecology amended the rule in 1998 and provided that all water right applications filed after July 27, 1997, would be subject to evaluation for impacts on fish as well as existing water rights. Ecology is directed to consult with "appropriate local, state, and federal agencies and Indian tribes" in determining whether there would be an impact on fish (WAC 173-563-020(4)). Any permit Ecology approves may be subject to instream flow protection or mitigation as necessary, determined case-by-case (WAC 173-563-020(4)). In addition to surface water

permits, this condition may be included in ground water permits that are in hydraulic continuity with the mainstem[2].

A water right is subject to interruption if the source stream falls below flow levels established by state administrative rules. A water right is not subject to interruption based on flows in the federal Biological Opinions issued under the Endangered Species Act (ESA), although such flows are a consideration when Ecology issues a new water right or makes a decision on a change application.[3] To date, Ecology issued approximately 340 interruptible water rights on the Columbia River mainstem subsequent to the adoption of an instream flow rule for the river in 1980 (Ecology, personal communication, 2006). Table 3-14 summarizes the interruptible water rights issued by Ecology.

Table 3-14. Water Right Permits and Certificates Within One-Mile Zone of Columbia and Snake Rivers Junior to Instream Flows

Purpose of Use	Surface Water			Ground Water		
	Number of Water Rights	Q_i (cfs)	Q_a (acre-feet/year)	Number of Water Rights	Q_i (gpm)	Q_a (acre-feet/year)
Columbia River						
Commercial and industrial	1	2	50	1	1,200	1,113
Commercial, industrial, domestic	--	--	--	3	3,315	1,553
Domestic, irrigation and related uses*	11	77	1,374	23	12,634	4,782
Domestic and related uses*	5	0.1	7	4	1,785	508
Irrigation and related uses*	202	678	117,931	80	151,067	45,964
Commercial, industrial and irrigation	3	12	3,956	1	1,500	1,600
Domestic, irrigation, industrial, commercial and related uses*	1	1,140	214,000	--	--	--
Municipal	--	--	--	2	512	150
Power	3	213,400	0	--	--	--
Columbia River Total	226	215,309	337,318	114	172,013	55,670

[2] Chapter 173-564 WAC, adopted in 1993, instituted a moratorium on any new water rights from the Snake River within Washington State. The rule included a sunset provision which stated that the section imposing the moratorium would expire on July 1, 1999, or upon adoption of instream flows for the mainstem Snake River, whichever occurred first (WAC 173-564-040(6)). No instream flows were set by July 1, 1999, and, therefore, the moratorium expired. Ecology has yet to adopt instream flows for the Snake River.

[3] Section 7(a)(2) of the ESA requires federal agencies to consult with National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats. The NMFS issued Biological Opinion determined the flows needed for the threatened and endangered salmonid species in the Columbia River. These Biological Opinion flows are products of the consultation between NMFS and the federal agencies (BPA, BOR, and the U.S. Army Corps of Engineers) responsible for the configuration, operations, and maintenance of 14 sets of dams, powerhouses, and associated reservoirs on the mainstem of the Columbia and Snake Rivers known collectively as the FCRPS. *See* discussion of Biological Opinion flows in sections 3.6.1.6.

Purpose of Use	Surface Water			Ground Water		
	Number of Water Rights	Q_i (cfs)	Q_a (acre-feet/year)	Number of Water Rights	Q_i (gpm)	Q_a (acre-feet/year)
Snake River						
Irrigation and related uses*	25	398	87,978	6	12,170	7,540
Domestic	1	2	1	--	--	--
Snake River Total	26	400	87,979	6	12,170	7,540
Columbia and Snake River Total	**252**	**215,709**	**425,296**	**120**	**184,182**	**63,211**

Source: Ecology, personal communication, 2006.

*Related uses may include a combination of any of the following: fire protection, frost protection, heat protection for crops, stock water, cooling for industrial purposes, recreation/beautification, instream flow, and trust water.

Uninterruptible rights are preferred over interruptible rights because uninterruptible rights provide the water user with greater security that they will be able to divert their water every year. This security is especially important for irrigators in the Columbia River Basin who need to sustain their crops each year. However, uninterruptible water rights are not a guarantee that the user will be able to divert all the water they need because they may still be junior to another water right holder in the system (National Research Council 2004).

The Columbia River instream flow rule allows the director of Ecology to reduce the minimum instantaneous and/or average weekly flows for the Columbia River established in the rule by 25 percent if the director "deems it to be an overriding public interest requirement" to do so (WAC 173-563-050(1)).[4]

The rule also authorizes the director to approve future uses of water that would conflict with the provisions of Chapter 173-563 "only in those situations when it is clear that overriding considerations of public interest will be served" (WAC 173-563-080). This decision is to be made in consultation with the directors of the Washington Department of Fish and Wildlife (WDFW) and the state Department of Agriculture, and the state Commissioner of Public Lands.

Consideration of the public interest by the director of Ecology shall include an evaluation of all uses of the river and their impact on the state of Washington. The uses to be considered include, but are not limited to, uses of water for domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, fish and wildlife maintenance and enhancement, recreational, thermal power production, and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state (WAC 173-563-080).

Ecology established a reservation of water in the John Day/McNary Pools for future irrigation use and future municipal use (Chapter 173-531A WAC). Permits issued for these uses from the Pools after July 27, 1997, are subject to the same consultation requirements as other water right applications under WAC 173-563-020(4) and WAC 173-531A-060.

[4] In no case may the outflow from Priest Rapids Dam fall below 36,000 cfs (WAC 173-563-050(1)).

3.6.1.2 Columbia Basin Reclamation Project

The Columbia Basin Project is a major consideration in any decisions regarding management of the Columbia River.[5] The Columbia Basin Project is a federally authorized project with multiple purposes: irrigation, power production, flood control, municipal water supply, recreation, and fish and wildlife benefits. The Columbia Basin Project was authorized for 1,029,000 irrigated acres and currently provides water to approximately 671,000 acres. Water is provided to three irrigation districts: Quincy-Columbia Basin Irrigation District, East Columbia Basin Irrigation District, and South Columbia Basin Irrigation District. These districts in turn deliver water to their members (Blanchard, personal communication 2006).

Reclamation holds state-based water rights, which entitle Reclamation to store and deliver water for the multiple purposes of the Columbia Basin Project (RCW 90.40.030, RCW 90.40.090). Reclamation is authorized to deliver up to 3,158,000 acre-feet of water per year at full build-out of the Columbia Basin Project. The water withdrawn from appropriation by Reclamation for development of the Columbia Basin Project is withdrawn until "the project is declared complete or abandoned by the United States" (RCW 90.40.100). The water rights held by Reclamation are presented in Table 3-15. Reclamation will still need to acquire permits and address issues under NEPA and ESA consultation before diverting additional water for the Columbia Basin Project (National Research Council 2004).

Table 3-15. Bureau of Reclamation Columbia Basin Project Water Rights, Permits, and Withdrawals

Certificate/Permit/ Application	Priority Date	Quantity	Purpose
Irrigation			
S3-01622C	5/16/1938	13,450 cfs 2,910,000 acre-feet/year	Irrigation of 590,000 acres, hydroelectric, recreation, municipal, industrial
C-9252	12/24/1941	40 cfs	Irrigation of 1,319 acres, Block 2
S300019C	4/22/1943	212 cfs 70,000 acre-feet/year[1]	Partial irrigation of 160,000 acres
C-10703	10/27/1958	80 cfs 23,121 acre-feet/year	Irrigation of 3,303 acres, Block 3
R3-00013P	4/22/1943	200,000 acre-feet[2] plus storage of project waste, seepage, and return flow	Supplemental supply; irrigation of 234,000 acres
S3-25062C	10/27/1958	8.5 cfs 23,121 acre-feet/year	Irrigation of 350 acres, Block 3
S3-28586P	5/16/1938	1,140 cfs 214,000 acre-feet/year	Irrigation, hydroelectric, recreation, municipal, industrial
Columbia Basin Project Withdrawal	5/16/1938	10,410 cfs	Reserved for remainder of Columbia Basin Project
Withdrawal	6/16/1975	120 cfs	Block 1

[5] The CBP was authorized by the Columbia Basin Project Act, 57 Stat. 14 (1943), 16 U.S.C. 835 (1958).

Certificate/Permit/ Application	Priority Date	Quantity	Purpose
Hydropower			
C-11543	5/16/1938	75,000 cfs continuously	Hydropower left and right bank of Grand Coulee Dam
C-11793	5/16/1938	6,400,000 acre-feet	Live storage, FDR irrigation – hydropower
C-11794	8/12/70	3,162,000 acre-feet	Dead storage FDR
S3-26257C	5/9/75	22,000 cfs continuously	Hydropower – 3rd power plant - increased capacity
S3-26258C	10/16/69	184,000 cfs continuously	Hydropower – 3rd power plant - six units
S3-27615C	10/16/69	7,400 cfs continuously	Hydropower - four pump turbine units
S3-01606C	10/16/69	21,700 cfs continuously	Hydropower - increased capacity left and right bank - Grand Coulee (18,000 cfs), two pump turbines (3,700 cfs)
S3-01622C (Old Permit #15994)	5/16/38	13,450 cfs continuously March through October	Low head power generation
R3-00013P	4/22/43	200,000 ac-ft	Low head power generation

cfs = cubic feet per second; ac-ft/yr = acre-feet per year

[1] From Lind Coulee

[2] Natural flows from Rocky Ford, Upper Crab Creek, tributaries to Moses Lake, and Potholes Reservoir

Return flows from irrigation water delivered by Reclamation belong to Reclamation as long as the water is within the boundaries of the Columbia Basin Project. Once it leaves the boundaries of the project, the water continues to belong to Reclamation as long as it is under the "possession and control" of the agency (*Ecology v. Bureau of Reclamation*, 118 Wn.2d 761, 827 P.2d 275 (1992)).

Ecology has adopted a rule that specifically addresses ground water within the Columbia Basin Project outside of the Quincy Ground Water Management Subarea (Chapter 173-124 WAC), and the Odessa Ground Water Management Subarea (Odessa Subarea) (Chapter 173-128A WAC, WAC 508-14-030). In the rule, Ecology recognizes that all natural ground water and "all 'artificially stored' ground waters that have been abandoned or forfeited are public waters available for appropriation[.]" Beneath the surface of the Columbia Basin Project, naturally occurring ground water and artificially stored ground water have become commingled, and it is unknown how much is abandoned and available for appropriation. Therefore, Ecology may issue permits for withdrawal of ground water in this area subject to the condition that if Ecology subsequently discovers that there is not the quantity of ground water available that it now believes, Ecology may withdraw or modify the permit. No certificates may be issued until Ecology makes a more definitive determination of the availability of public waters (WAC 508-14-030(2)).

3.6.1.3 Tribal Rights in the Columbia River Basin

Tribal federal reserved water rights are a critical piece of the water rights picture wherever they occur. The tribal rights for out-of-stream uses have as a priority date the date the reservation was established. The rights are usually the most senior on the river and superior to all subsequently established rights. The priority date for water rights for fish is time immemorial. Tribal rights are largely unquantified and include a potentially large future increment of water under the practicably irrigated acreage (PIA) standard. Although not quantified, tribal water rights for instream flow are rights to a quantity of water necessary to maintain a fishery and protect the tribes' right to fish. Tribal rights are not subject to relinquishment. The number of tribes in Washington and the adjoining states is a significant consideration in any water planning for the Columbia River Basin. The Columbia Basin Tribal Groups and Reservations are listed in Table 3-16.

Table 3-16. Columbia River Basin Tribal Groups and Reservations

Burns Paiute Tribe (Oregon)	3,000 members; 770 acres of trust land acquired in 1935 to reestablish reservation; 11,000 acres of allotment land owned by tribal members
Coeur d'Alene Tribe (Idaho)	1,700 members; 345,000-acre reservation; rights based on treaties as early as 1873
Confederated Salish and Kootenai Tribes of the Flathead Reservation (Montana)	6,900 members; 1.3 million-acre reservation; assert rights based on 1855 Treaty of Hellgate
Confederated Tribes of the Colville Reservation (Washington)	9,500 enrolled members; 1.4 million-acre reservation; rights based on 1872 Executive Order and other agreements with U.S. (1892, 1905)[1]
Confederated Tribes of the Umatilla Indian Reservation (Oregon)	2,174 enrolled members; 180,441-acre reservation; rights based on 1855 Treaty
Confederated Tribes of the Warm Springs Indian Reservation (Oregon)	3,916 enrolled members; 650,000-acre reservation; rights based on 1855 Treaty and federal court cases
Kalispel Tribe of Indians (Washington)	280 enrolled members; 4600-acre reservation; rights based on 1914 Executive Order
Kootenai Tribe (Idaho)	67 members as of 1974; tribal members accepted 12.5 acres but do not consider it to be a final settlement
Nez Perce Tribe (Idaho)	3,200 members; 770,453-acre reservation; rights based on treaties of 1855 and 1863, and federal court decisions
Shoshone-Bannock Tribes of the Fort Hall Reservation (Idaho)	4,291 members; 544,000-acre reservation; rights based on 1867 Executive Order
Shoshone-Paiute Tribes of the Duck Valley Reservation (Nevada)	1,818 members; 289,820-acre reservation; rights based on 1863 Treaty, 1877 Executive Order, and other statutory additions to reservation
Spokane Tribe of Indians (Washington)	2,441 members, 100,000 acres held in trust; 57,370 additional acres held as allotments, deeded fee land, other government lands; rights based on 1880 Executive Order
Confederated Tribes and Bands of the Yakama Nation (Washington)	9,092 members; 1.39 million-acre reservation; rights based on 1855 Treaty

Source: National Research Council 2004. Updated as to membership in the Confederated Tribes of the Colville Reservation.
1 The Colville Tribes also hold fishing and water rights on 1.5 million acres referred to as the North Half pursuant to an agreement with the United States, which was executed in 1891 and ratified by Congress in 1906-1910.

3.6.1.4 Hanford Reach National Monument

Non-Indian federal land can also benefit from federal reserved water rights. In 2000, President Clinton signed an Executive Order creating the Hanford Reach National Monument, a 195,000-acre monument along the Columbia in south-central Washington (Proclamation 7319, Establishment of the Hanford Reach National Monument, June 9, 2000). The site includes a 51-mile stretch of the Columbia River upstream of Richland. The proclamation recognizes the importance of this reach of the river for fishery values. The "Reach supports some of the most productive spawning areas in the Northwest, where approximately 80 percent of the upper Columbia Basin's fall Chinook salmon spawn. It also supports healthy runs of naturally spawning sturgeon and other highly-valued fish species" (National Research Council 2004).

The Hanford Reach National Monument withdrawal creates a non-Indian federal reserved water right with a priority date of June 9, 2000. Among the purposes of the withdrawal is the reservation of water necessary to support spawning salmon and other fish species. This reserved right will prevent any new, upstream consumptive diversions that would leave insufficient flows in the river to maintain the fishery protected by the reservation. As such, this reservation could be a significant constraint on new diversions upstream of the Hanford Reach (National Research Council 2004).

3.6.1.5 International-Interstate Issues

Management of the Columbia River must account for water rights of upstream water users and their demands on the river. These include the province of British Columbia and the states of Montana, Idaho, and Oregon. Ecology has recognized these factors in administrative rules regarding the Columbia and Snake Rivers:

> The Columbia River is an international as well as an interstate river with its waters subject to laws of seven western states, the Province of British Columbia, Canada, and the federal governments of the United States and Canada. The flows and levels of the river are in a state of continuous change through the operation of numerous federally owned or federally licensed dams located within the River. The waters of the Columbia River are operated to support extensive irrigation development, inland navigation, municipal and industrial uses, and hydroelectric power development. Among all these uses, the anadromous fisheries of the Columbia River, which are dependent on clean flowing water, require for their survival the establishment of minimum flows of water and special actions by all agencies sharing in the management of the Columbia River (WAC 173-563-010).
>
> The Snake River is an interstate river with waters subject to laws of five states and the federal government. The flows and levels of the river in Washington are heavily influenced by the operation of federally owned and federally licensed dams located upstream from Washington and within Washington as well as by water diversions in the various states (WAC 173-564-010).

Water management depends heavily on the certainty of information regarding water rights, which in turn depends in large part on whether the rights have been adjudicated. A water rights

adjudication is a quiet title action to determine the extent and validity of existing water rights. The states that share the Snake and Columbia Rivers are in various stages of adjudicating their water rights.

Montana has required permits for surface water diversions and ground water withdrawals since 1973 and is in the process of adjudicating pre-1973 water rights statewide. The process is slow and the claims of the Salish and Kootenai Tribes of Flathead Indian Reservation have not been resolved. There is considerable uncertainty regarding the water rights in Montana (National Research Council 2004).

The Snake River Basin Adjudication in Idaho, which covers approximately 87 percent of the state, is nearing completion (Evans 2004). In 2006, the Idaho Legislature passed a bill that "authorizes the adjudication of all rights to the use of water from surface water and ground water sources whether or not hydraulically connected within the Coeur D'Alene-Spokane River Basin, the Palouse River Basin, and the Kootenay and Clark Fork-Pend Oreille River Basins. RS 15705, Statement of Purpose/Fiscal Impact." One state senator gave as a reason for voting for the bill that "the state of Washington is laying claim against North Idaho's water, and the adjudication will help Idaho defend its water" (Russell 2006).

Oregon is adjudicating all pre-1909 surface water rights and all pre-1955 ground water rights. As of 2004, the state had conducted 94 adjudications covering 70 percent of the state. Even the rights of the Warm Springs Reservation have been determined, but the Tribe has been assigned all water in excess of the 1996 non-Indian uses (National Research Council 2004).

Given the incomplete adjudication of water rights in the states with interests in the Columbia and Snake Rivers, there is substantial uncertainty regarding water rights outside of Washington and claims that maybe made to water flowing downstream through the state.

There are three international treaties that define the water rights relationship between Canada and the state of Washington. The Columbia River Treaty was signed in 1961 and ratified 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 cubic feet per second (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. This agreement is designed to prevent Canada from diverting water into the Fraser River, which Canada had proposed prior to the Treaty (National Research Council 2004).

The Boundary Waters Treaty ratified in 1909 created the bilateral International Joint Commission (IJC) to address water rights disputes between Canada and the United States. Under the terms of the Treaty, if additional Columbia River water was to be diverted by Canada, a downstream water user in Washington could contest that diversion the same as a Canadian citizen. However, the principles of jurisdiction and control over water in the Treaty are

somewhat contradictory, and any protest would have to work its way through the IJC, which is a slow process. "Canada likely has an unquantified but, for purposes of prior appropriation in Washington, a senior claim based [upon] its equitable interest in the river. Additional U.S. water diversions in the Columbia River may remain subject to additional Canadian development, the latter of which would be entitled to priority. This does not consider any water-related claims of indigenous people north of the forty-ninth parallel" (National Research Council 2004).

The Pacific Salmon Treaty does not impose any specific quantity obligations upon the United States. However, both countries have agreed to "maintain adequate water quality and quantity" to sustain salmon fisheries (National Research Council 2004).

3.6.1.6 ESA-Biological Opinion

Twelve populations of salmon and steelhead in the Columbia Basin are currently listed as endangered or threatened under the Endangered Species Act (ESA). These species are listed and described in Section 3.7.

The ESA listings have major implications for water rights. Section 9 of the ESA prohibits any person from "taking" an endangered species and defines "take" to include "harm" (16 U.S.C. 1532(19)).[6][7] Harm is defined as "an act which actually kills or injures wildlife" and may include significant habitat modification or degradation where it actually kills or injures wildlife (50 CFR Sect. 17.3). Individual water rights may cause harm when the appropriation results in or contributes to the "lack of sufficient stream flow to sustain healthy fish populations" (Pharris and McDonald 2000), as evidenced by death or injury to individuals of the listed species. Existing water rights are not likely to be an adequate defense to a take action. "ESA can potentially upset the 'natural' order by requiring that water rights, regardless of their priority date, may be restricted in order to protect listed species" (Pharris and McDonald 2000).

The ESA imposes a substantive duty on all federal agencies to "insure that any action authorized, funded, or carried out" by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or result in destructive or adverse modification of designated critical habitat (16 U.S.C. 1536(a)(2)). The 2000 and 2004 Biological Opinions issued by NOAA Fisheries regarding the operation of the Federal Columbia River Power System (FCRPS) include flows identified as reasonable and prudent alternatives to avoid jeopardy to listed fish species in the Columbia Basin. The 2000 Biological Opinion was remanded to NOAA, and the agency subsequently issued the 2004 Biological Opinion, which was also appealed. In October 2005, Judge James Redden of the U.S. District Court in Oregon remanded the 2004 Biological Opinion to NOAA to make a jeopardy determination for operation of the FCRPS that complies with ESA requirements. The Order directs that the 2004 Biological Opinion shall remain in place during the remand (*Opinion and Order on Remand*, CV 01-640-RE (Lead Case), CV 05-23-RE (Consolidated Cases) (October 7, 2005)).

[6] Regulations of the USFWS extend the prohibition on "take" to threatened species (Pharris and McDonald 2000).

[7] "Person" is defined broadly to include an individual, a corporation, a state, a municipality or any other entity subject to the jurisdiction of the U.S. (16 U.S.C. 1532(13)).

Any decisions for management of the Columbia River Basin water resources must take into account the flows set in the 2004 Biological Opinion and ensure that there is no impact on the flows that could result in the taking of a listed salmonid species.

3.7 Fish, Wildlife, and Plants

3.7.1 Fish

The aquatic communities and life history forms in the Columbia River Basin are quite diverse (Appendix H). Assorted species inhabit an equally diverse variety of habitat types ranging from freshwater mountain springs to marine waters. The variety of vertebrate (fish, amphibian, and reptile) and invertebrate (mollusk and arthropod) life in the basin prohibits an exhaustive listing of species and habitats.

This section describes the animals in each of the aquatic categories from the Washington Department of Fish and Wildlife's (WDFW) Priority Habitats and Species (PHS) program. Aquatic species that are listed as state-priority species, state-listed under Washington statue (WAC 232-12-297), or listed under the federal Endangered Species Act (ESA) are itemized below in Sections 3.7.1.1 through 3.7.1.3. These sections also present a brief life-history description, status, and habitat conditions for each of the key fish populations in the basin and any other species identified during EIS scoping. Section 3.7.1.4 describes habitat conditions in the vicinity of the proposed early actions.

3.7.1.1 Federally Listed Species

Fish species listed by the federal government as either threatened or endangered in the Columbia River Basin within Washington are listed in Table 3-17. Under the ESA, an "endangered" species is "any species which is in danger of extinction throughout all or a significant portion of its range." A threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Candidate species are under consideration for listing as an endangered or a threatened species, but not yet the subject of a proposed rule (see 50 CFR 424.02). The federal government identifies species of concern as species about which they have some concern regarding status and threats to these species, but for which insufficient information is available to indicate a need to list the species under the ESA.

Table 3-17. Federally listed fish species under the ESA in the Columbia River Basin.

Region (ESU / DPS)*	Species	Listing Status
Upper Columbia River	spring Chinook salmon (*Oncorhynchus tshawytscha*)	Endangered
	steelhead trout (*O. mykiss*)	Threatened
Mid-Columbia River	steelhead trout (*O. mykiss*)	Threatened
Snake River	sockeye salmon (*O. nerka*)	Endangered
	fall Chinook salmon (*O. tshawytscha*)	Threatened

Region (ESU / DPS)*	Species	Listing Status
	Spring/summer Chinook salmon (*O. tshawytscha*)	Threatened
	steelhead trout (*O. mykiss*)	Threatened
Lower Columbia River	Chinook salmon (*O. tshawytscha*)	Threatened
	coho salmon (*O. kisutch*)	Threatened
	steelhead trout (*O. mykiss*)	Threatened
Columbia River Basin	chum salmon (*O. keta*)	Threatened
	bull trout (*Salvelinus confluentus*)	Threatened
	eulachon (*Thaleichthys pacificus*)	Candidate
	Pacific lamprey (*Lampetra tridentatus*)	Species of Concern
	river lamprey (*L. ayresi*)	Species of Concern
	western brook lamprey (L. richardsoni)	Species of Concern
	coastal cutthroat trout (*O. clarki clarki*)	Species of Concern
	westslope cutthroat trout (*O. clarki lewisi*)	Species of Concern
	Redband trout, an interior race of rainbow trout (*O. mykiss*)	Species of Concern
	pygmy whitefish (*Prosopium coulteri*)	Species of Concern
	margined sculpin (*Cottus marginatus*)	Species of Concern
	Great Columbia River spire snail (Columbia Pebblesnail; *Fluminicola columbianus (=fuscus))*	Species of Concern
	California floater (*Anodonta californiensis*)	Species of Concern

*DPS = distinct population segment; ESU = evolutionarily significant unit

3.7.1.2 Washington State-Listed Species

The state of Washington lists species in accordance with its endangered, threatened, and sensitive wildlife species classification (WAC 232-12-297) (WDFW 2006). A state designation of "endangered" means any species native to Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state. "Threatened" means any species native to Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats. "Sensitive" means any wildlife species native to Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

State candidate species include fish and wildlife species that WDFW will review for possible listing as state endangered, threatened, or sensitive. A species will be considered for designation as a state candidate if sufficient evidence suggests that its status may meet the listing criteria defined for state endangered, threatened, or sensitive (WDFW Policy M-6001).

Most of the fish species currently on the state list are also included under the federal ESA list. However, the following four species only occur as state candidate species: lake chub (*Couesius plumbeus*), leopard and Umatilla dace (*Rhinichthys falcatus* and *R. umatilla*), and mountain sucker (*Catostomus platyrhynchus*).

3.7.1.3 State Priority Habitat and Species (PHS) Program

WDFW maintains a PHS program to provide information on important fish, wildlife, and habitat resources in the state. The program maps known locations of priority habitats and species and provides information on the conditions required to maintain healthy populations of priority species and viable, functioning priority habitats. Aquatic animals listed as state-priority species are described below in major aquatic categories, with an example of species present in the Columbia River system included in parentheses for each category.

Invertebrate

There are a few priority species of arthropods (e.g., insects, crustaceans and mollusks such as snails, freshwater clams, and mussels) or echinoderms (urchins) in the project area. Insects within the project area include the Columbia River tiger beetle (*Cicindela columbica*), a species of concern and candidate species in Washington.

Mollusks include the priority species of gastropods (giant Columbia River limpet, *Fisherola nuttalli*, and great Columbia River spire snail, *Fluminicola columbiana*), and the freshwater mussel (California floater, *Anodonta californiensis*). All three of these mollusk species are state candidate species. The great Columbia River spire snail (Columbia pebblesnail, *Fluminicola columbianus =fuscus*) and the California floater are also federal species of concern, as mentioned in Table 3-17.

Vertebrate

Fish in the project area include the priority species categories of lamprey (Pacific lamprey); sturgeon (white sturgeon); minnows (lake chub); suckers (mountain sucker); catfish (channel catfish); smelt (eulachon); trout, salmon, and whitefish (bull trout); sculpins (margined sculpin); sunfish (largemouth bass); and perches (walleye) (WDFW 2006). This list of fish includes both native and non-native as well as freshwater and anadromous species.

Key Fish Population Status and Habitat Conditions

Fish habitat and recovery efforts for ESA-listed species, especially for fish in the salmon family (salmonidae), are critical components of large-scale water resource management efforts and will be addressed in more detail below. For purposes of this document, the term “salmonid” applies to trout, char, and salmon consistent with the Governor’s *Statewide Strategy to Recover Salmon*

– *Extinction is not an Option* (WSJNRC 1999). The following discussion is segregated into salmonid fishes and non-salmonid fishes.

Resident Salmonid Fishes

Resident salmonids remain in freshwater habitat for their entire life cycle. All resident salmonids require clean, cool water to thrive. Some populations of resident salmonid fishes in Washington are declining. Such declines can be attributed to a number of factors, including loss of suitable rearing habitat, water quality degradation, and loss of clean spawning gravels.

Resident salmonids typically feed on plankton, insects, other invertebrates, and small fish. Some of the most important and widespread native species of resident salmonids are rainbow trout (including redband trout), cutthroat trout, bull trout, and mountain whitefish. These species are discussed below in more detail.

There are a number of introduced (non-native) resident salmonid species in Columbia River Basin lakes and streams, including brown trout, golden trout, lake trout, and eastern brook trout. No additional discussion of these species is included in this EIS.

Rainbow Trout. Rainbow trout are widely distributed in the Columbia River Basin and are the state's most popular game fish. Because of their popularity, natural populations are supplemented by WDFW stocking programs that add over 17 million rainbow trout each year to the state's lakes and streams. Resident rainbow trout generally grow to a length of 18 to 24 inches. Rainbow trout include the subspecies of concern known as the red-band trout that is native to Washington in the Columbia River Basin.

Cutthroat Trout. Resident coastal cutthroat trout are found in streams and ponds throughout much of the lower Columbia River Basin, whereas westslope cutthroat trout, another cutthroat subspecies, are common throughout the middle and upper Columbia and Snake River Basins in eastern Washington lakes and streams. Although cutthroat trout may grow to a length of about 18 inches, in small bodies of water they may grow no larger than 8 or 9 inches. Cutthroat trout are planted by the WDFW in a number of high-country lakes. Native populations of westslope cutthroat trout also exist in eastern Washington lakes and streams.

Bull Trout. Although commonly called trout, bull trout are members of the char subgroup of the salmon family. Bull trout living in streams may grow to about 4 pounds, while those living in lakes reach a weight of up to 20 pounds. Resident life-history forms of bull trout live their full life cycle in areas near where they were hatched, while other forms migrate from streams to lakes, reservoirs, or saltwater bodies a few weeks after emerging from their nests. While bull trout are known to live as long as 12 years, they reach sexual maturity between 4 and 7 years of age. They spawn in gentle stream reaches with cold, clean water and gravel amid cobble substrate. Spawning occurs in the fall after stream temperatures have dropped to a satisfactory level. Bull trout prefer water temperatures cooler than most other salmonid species, which makes them susceptible to warming temperature trends in the region. Ecology has altered the state's surface water quality standards (Chapter 173-201A WAC) designating specific waters of the state as native char habitat for purposes of applying a protective temperature water quality criterion (Ecology 2003a).

Dolly Varden. As with bull trout, Dolly Varden are members of the char subgroup of the salmon family (Salmonidae). Dolly Varden are common in many rivers and some lakes, especially in coastal areas of Washington. The Dolly Varden is similar in appearance to bull trout but is generally smaller. Dolly Varden populations have generally been declining, and fishing for Dolly Varden has been restricted in a number of areas by the WDFW. This species is often treated in concert with bull trout as native char under the similarity of appearances rule in the ESA.

Mountain Whitefish. Mountain whitefish are in a separate subfamily of salmonidae (Coregoninae) and may be the most numerous salmonid in Washington. They are resident in large- and medium-sized rivers, where they inhabit deep pools with strong current. They feed mainly on bottom organisms, including midge, mayfly, stonefly, and caddisfly larvae.

Anadromous Salmonid Fishes

Fish that spawn and rear in fresh water, spend a portion of their life in salt water, and then return to fresh water to begin the life cycle again are referred to as anadromous species. The Columbia River Basin has eight native species of anadromous salmonid fishes, including Chinook, coho, chum, and sockeye salmon; steelhead and sea-run coastal cutthroat trout; and native char (bull trout and Dolly Varden).

Salmon habitat extends from the smallest inland streams to the Pacific Ocean and consists of a vast network of freshwater, estuarine, and ocean habitats. Freshwater habitats are used for spawning, incubation, and juvenile rearing. In estuarine habitats, juvenile salmonid fish experience rapid growth and chemical changes as they transition between fresh water and salt water. Salmon gain most of their adult body mass in ocean habitats before returning to rivers to spawn (WDFW 2000-2001).

Salmon feed on a variety of freshwater and marine invertebrate organisms and fishes, while being fed upon by a variety of parasites, predators, and scavengers. Juvenile salmon feed on salmon carcasses, eggs, and invertebrates, including invertebrates that may have previously fed on salmon carcasses such as caddisflies, stoneflies, and midges. Thus, returning salmon provide a flow of nutrients into freshwater habitats and play a critical role in the ability of watersheds to retain overall productivity of salmon runs (WDFW 2000-2001).

Due to over-fishing, habitat loss, the effects of hydropower facilities, hatchery problems, and a changing ocean environment, salmonid fish populations have declined substantially over the past several decades. The biology of the major anadromous fish species in the Columbia River Basin is summarized below.

Chinook Salmon. Chinook salmon are the largest of all salmon. There are different seasonal “runs” or modes in the migration of Chinook salmon from the ocean to fresh water. These runs are usually identified as spring, summer, or fall, based on when the adult salmon enter fresh water to begin their spawning migration. Chinook prepare spawning beds in flowing streams with suitable gravel composition, water depth, and velocity. Juvenile Chinook may spend from three months to two years in fresh water before migrating to estuarine waters as smolts. After a period of rapid growth and physiological change to adapt to salt water in the

estuaries, they migrate to the ocean, feed, and mature. Chinook remain in the ocean for one to six years, but most commonly between two and four years.

Although a variety of juvenile life-history expressions exist within Chinook, differences in the seasonal timing of the runs generate differences with respect to the length of juvenile maturation and freshwater residence. Adult spring Chinook enter the rivers first and spawn in the high-elevation tributaries in the watersheds. Summer Chinook enter later and spawn in the mid-elevation tributaries and rivers, whereas fall Chinook enter last and are primarily low-elevation, mainstem river spawners. Based on water temperatures during incubation and juvenile rearing, most of the summer and fall Chinook juveniles mature quickly and outmigrate as young-of-the-year subyearling fish (0+ age smolts; ocean-type maturation) (Myers et al. 1998). Conversely, spring Chinook mature slowly, hold overwinter and generally migrate as yearling fish (1+ age smolts; stream-type maturation). Each of the stocks varies with respect to the proportion of subyearling and yearling outmigrants (Myers et al. 1998).

Coho Salmon. Coho salmon spend approximately half their life cycle rearing in freshwater streams and tributaries. The long freshwater rearing period makes coho salmon more dependent on flow and freshwater habitat conditions than species with short freshwater rearing times. The remainder of their life cycle up to the point of returning to their stream of origin to spawn is spent foraging in estuarine and marine waters of the Pacific Ocean. Most adults return as three-year-olds; however, a small number return after two years. A mature coho is usually about 2 feet in length and weighs an average of about 8 pounds. Existing runs of native coho salmon are limited to areas downstream of Bonneville Dam.

Chum Salmon. Chum are large salmon, second only to Chinook salmon in size. They spawn in the lower reaches of rivers and streams, typically within 60 miles of the Pacific Ocean. They outmigrate almost immediately to estuarine and ocean habitats after hatching. Thus, survival and growth of juvenile chum depends less on freshwater habitat conditions than on estuarine and marine habitat conditions. They usually arrive at their stream of origin from November to the end of December. Most chum salmon mature from three to five years. The weight of a mature chum salmon is 18 to 22 pounds. The species is not distributed upstream of Bonneville Dam.

Sockeye Salmon. Sockeye salmon exhibit a variety of life history patterns that reflect varying dependency on freshwater environments. Most sockeye salmon spawn in or near lakes where juveniles rear for one to three years before migrating to the ocean. For this reason, the major distribution and abundance of this salmon species is closely related to the location of rivers that have accessible lakes in their watersheds, such as the Wenatchee River (Lake Wenatchee), Okanogan River (Osoyoos Lake), and Snake River (Redfish Lake).

There are also non-anadromous forms of sockeye salmon (kokanee) that spend their entire life in fresh water. Occasionally, a portion of the juveniles in an anadromous population will remain in their rearing lake environment throughout their lives and will eventually spawn with their anadromous siblings.

Steelhead Trout. Steelhead are seagoing rainbow trout. They begin their lives in freshwater rivers and streams, where they rear for approximately two years before migrating to

marine waters. Consequently, they are dependent on flows and freshwater habitat. Steelhead reside in marine waters for one to six years (typically two to three years), then return to their home streams to spawn. Unlike salmon, which die after spawning, adult steelhead can return to the sea and repeat the cycle. Adult steelhead typically range from 5 to 14 pounds, although those with long ocean residence time may reach about 30 pounds.

Two distinct runs of steelhead return to fresh water at different times—winter run and summer run. However, steelhead from both runs mostly spawn from mid-winter to late spring. Wild steelhead runs have been depleted in a number of river systems in the Columbia River Basin because of habitat loss (WDFW 2001).

Sea-Run Cutthroat Trout. Sea-run cutthroat trout are the anadromous population of the coastal cutthroat trout. Like steelhead, sea-run cutthroat trout rear for two years in fresh water before migrating and thus are dependent on stream flows and freshwater habitat conditions. They spawn in lower Columbia River tributary streams. None of the coastal cutthroat trout evolutionarily significant units (ESUs) have been found to warrant listing under the federal ESA.

Bull Trout. As previously discussed, some portions of bull trout populations exhibit anadromous life history patterns. The ocean residence period of bull trout populations is typically short, with fish returning to fresh water within a year.

Non-salmonid Fishes

The discussion of non-salmonid fishes is separated into freshwater resident fish and anadromous fish species. Some of the fish described below live at least a portion of their lives in estuaries or tidal portions of rivers that are transitional between fresh water and marine waters.

Freshwater Resident Species. Approximately 70 non-salmonid fish species can be found in freshwater bodies of the Columbia River system at some point in their life cycles. Of this number, over 30 species are introduced, including some of the more popular sport fish such as largemouth bass, smallmouth bass, walleye, crappie, yellow perch, catfish, tiger muskie, and bluegill sunfish. Native freshwater species include sturgeon, the largest freshwater fish species; a variety of minnows such as northern pikeminnow, redside shiner, leopard dace, and speckled dace; burbot (a member of the cod family); largescale sucker; sandroller; western brook lamprey; and a number of sculpin species (WDFW 1997; WDFW 2001).

Anadromous Fish Species. Native and non-native species, such as white sturgeon, Pacific and river lamprey, Columbia River smelt (eulachon), and American shad are anadromous species using portions of the Columbia River Basin. Although an anadromous species, white sturgeon have been isolated in portions of the Columbia River system due to dam construction and the lack of fish passage facilities. Given their long life span that can exceed 100 years, many sturgeon remain in reservoirs and tributary waters after dam construction. For example, a large population still exists in Lake Roosevelt, which was inundated in 1948. It is unknown if this population can access tributary areas in the reservoir for flowing water that is required for successful spawning and juvenile development. Without viable spawning areas, the existing sturgeon populations are at risk of ageing and becoming extinct.

In 2000, a collaborative effort of U.S. and Canadian government agencies, tribes, industry and organizations developed a joint recovery plan for the “Upper Columbia White Sturgeon

Recovery Initiative (UCWSRI)." Efforts to reverse the decline of sturgeon in Lake Roosevelt included the first ever release of hatchery-reared white sturgeon in the spring of 2004.

American shad have benefited from hydropower development in the Columbia River Basin, which has increased both their numbers and distribution in the system. The Columbia River offers the largest annual shad migration in the world.

The lamprey species are considered in a state of decline. Much work is currently being expended to improve fish passage facilities to accommodate the lamprey species in the basin. Abundance levels of Pacific lamprey in the upper Columbia River basin are very low, with only 35 and 21 fish passing Lower Granite and Wells Dams, respectively, in 2006 (Spokane Tribe, personal communication, 2006). The peak mainstem migration for lamprey occurs in June and early July and spawning occurs during the spring.

Native Shellfish

Shellfish (mollusks) such as the giant Columbia River limpet (shortface lanx), the great Columbia River spire snail (Columbia pebblesnail, *Fluminicola columbianus (=fuscus)*), and the California floater were once common throughout the Columbia River Basin. All three species require cold, clear water habitats. The shortface lanx prefers high-velocity portions of the system, whereas the California floater prefers lower-gradient areas with soft, silty substrate.

Human alteration of the Columbia River system has limited the distribution and abundance of all three of these native shellfish species. Currently, all three mollusk species are state candidate species.

Species of Concern Identified during Scoping

During May 2006, scoping for the Management Program EIS took place during open house meetings in four cities in the project area. The public, tribal, and agency input generated during these meetings did not identify aquatic species of concern to address in the assessment of environmental effects, other than the ones discussed in the previous sections. The sole exception was the survival of juvenile carp (*Cyprinus carpio*) in the Kettle River area due to the proposed Lake Roosevelt drawdown.

A review of the biological characteristics of carp suggests the early life history stages are vulnerable to lake level fluctuations following spawning. Nevertheless, carp are an extremely successful species that can tolerate a wide range of environmental conditions and endure relatively poor habitat conditions. Carp have a relative high level of fecundity, with reports of as many as 360,000 to 1,000,000 eggs per female (Aguirre and Poss 2000). "High fecundity, fast growth rate, wide physiological tolerance, and omnivorous diet result in carp having the ability to spread into nearly any aquatic habitat" (Parkos and Wahl 2000).

Carp are an introduced species and are regarded as an invasive fish species that reportedly has adversely affected native fish communities and habitat conditions. Efforts to eradicate carp populations have been largely unsuccessful because they are able to quickly recolonize open systems. Once established in a water body, common carp are difficult to eliminate. As a result of these biological characteristics, further assessment of carp in this document is judged not to be warranted.

3.7.1.4 Early Action Study Areas

Early action study areas include the regions around Lake Roosevelt, as a function of storage and drawdown for potential water right permits; Supplemental Feed Routes from Billy Clapp Lake to the Potholes Reservoir; and the CSRIA Voluntary Regional Agreement (VRA). The local fishery resource in each of these areas is described below.

Lake Roosevelt

Lake Roosevelt currently supports 32 species of fish (20 game and 12 non-game species). Rainbow trout, kokanee (landlocked sockeye) salmon, and walleye are the three primary fish harvested in the reservoir, with smallmouth bass increasing in popularity over the past five years. White sturgeon and bull trout fishing are currently closed, and lesser fisheries exist for other species such as smallmouth bass, largemouth bass, yellow perch, lake whitefish, mountain whitefish, brown trout, brook trout, burbot, cutthroat trout, black crappie, pumpkinseed, brown bullhead, yellow bullhead, and channel catfish. Non-game fish in Lake Roosevelt, native to the upper Columbia River, include northern pikeminnow, largescale sucker, longnose sucker, bridgelip sucker, redside shiner, longnose dace, chiselmouth, peamouth, speckled dace, sculpin species, and non-native species including carp and tench.

Three major fish tournaments are held annually on Lake Roosevelt: Two Rivers Casino Trout Derby, Governor's Cup Walleye Tournament, and Washington State Qualifiers Series for smallmouth bass. The popular fishery at Lake Roosevelt brings in an estimated $5.3 million to $20.7 million annually to the economy (McLellan et al. 2003).

The Confederated Tribes of the Colville Reservation and the Spokane Tribe have interests in the resident fishery of Lake Roosevelt. Both have committed substantial resources to build and protect the resident lake fishery. The Confederated Tribes of the Colville Reservation are currently performing additional resident fish studies in Lake Roosevelt. Information from these efforts will be incorporated into the Supplemental EIS on Lake Roosevelt drawdowns.

Supplemental Feed Route

Banks Lake and Billy Clapp Lake are common to all of the Supplemental Feed Routes. Fishery resources for both lakes are described below.

Since its creation in the early 1950s, Banks Lake has been operated and maintained for the storage and delivery of irrigation water drawn from the Columbia River at Grand Coulee Dam. The Bureau of Reclamation operates the reservoir within established constraints on water surface elevation to meet contractual obligations, ensure public safety, and protect public property. Water is pumped nearly 280 feet in elevation from Lake Roosevelt and stored in Banks Lake. Banks Lake is 27 miles long and it supports a variety of non-game, warmwater and cold water game fish species, most notably walleye, bass, trout and kokanee (land-locked sockeye salmon) as the primary game fish species. Kokanee provide a valuable, year-round sport fishery. Kokanee naturally spawn in the lake during October and November, with peak spawning around the first week of November. Banks Lake is operated favorably with respect to the kokanee life cycle, and the lake supports a population sufficient to maintain a substantial recreational fishery. The WDFW supplements the kokanee population with annual fry plants from the Ford Hatchery.

Billy Clapp Lake, a 1,000-acre reservoir, steadily produces a good fishery for one- to two-pound rainbow trout. Some 15- to 16-inch kokanee are also present, along with a few walleye. The steep shoreline provides very little foot access, so most fishing occurs by boat. The fishing season is open year-round.

Three feed route alternatives have been proposed to transfer water from Billy Clapp Lake to the Potholes Reservoir. Of the three alternative routes, only the upper Crab Creek route from Brook Lake through Moses Lake and on to Potholes Reservoir supports viable production of fish.

Drawdown of Billy Clapp Lake on the order of 20 feet between January and March to accommodate supplemental feed volumes (Blanchard 2006) could have an adverse influence on rainbow trout, kokanee, and walleye fisheries in the lake. However, the drawdown is early enough in the season to minimize the influence on most game fish and forage fish spawning activities. Most of the fish species will be spawning during the refilling period when lake level elevations will be increasing approximately 2 feet per day.

Moses Lake is a 6,800-acre lake that is among the best walleye fisheries in the state, especially in April and May. Large yellow perch have also been abundant. A volunteer cooperative net-pen project has greatly improved angling for rainbow trout, many in the 2- to 3-pound range. Smallmouth bass are plentiful, with some largemouth bass also available. Moses Lake has a very large, underutilized population of 2- to 3-pound lake whitefish. Crappie and bluegill fishing also occurs. Intensive biological surveys are underway to learn more about the decline of the panfish fishery here, and to develop possible management improvements.

Crab Creek Route Alternative

Crab Creek upstream of Brook Lake maintains late summer stream flow, but the portion considered for use as a feed route alternative downstream of the lake is ephemeral. Reclamation is currently conducting flow testing to determine how much surface water in this reach is lost to ground water, and if the streambed can efficiently be used for an expanded feed route. If this alternative is proven feasible, additional water in the Crab Creek mainstem during the irrigation season could offer improved habitat conditions for aquatic species during the low flow season.

The ephemeral nature of Crab Creek historically excluded anadromous fish species access to the upper reaches. At present, rainbow, brook, and brown trout have been collected from drainages in the upper Crab Creek area, as have bridgelip sucker, speckled dace, redside shiner, northern pikeminnow, and sculpin species (EWU 2001).

Various subspecies of cutthroat trout were historically planted in the upper Crab Creek drainage. Currently, cutthroat trout are thought to be extirpated from Crab Creek (Behnke 1992; Quinn et al. 2001). However, the possibility remains that tributary streams of Crab Creek may contain remnant cutthroat populations.

Eastern Washington State University (EWU) fish survey data suggest native, interior redband rainbow trout may exist in the Crab Creek drainage along with hatchery origin rainbow trout (EWU 2001). No cutthroat trout were collected during the recent EWU surveys. Crab Creek appears to support populations of native rainbow trout, hatchery rainbow trout, and possibly native cutthroat and/or introduced cutthroat trout, as well as hybrids between the species. Anecdotal evidence suggests that the watershed supports a robust and self-sustaining population

of trout, comparable to popular blue ribbon trout streams in the northwestern United States (Kennedy/Jenks et al. 2005).

W20 Canal and Frenchman Hills Wasteway Route Alternatives

No fish species are likely to successfully reproduce and rear in any of the canals proposed for use under the W20 Canal or Frenchman Hills Wasteway Alternatives.

Potholes Reservoir

The 28,000- acre Potholes Reservoir will be the receiving storage reservoir for the additional flows from the Supplemental Feed Route. Game fish species in the reservoir include yellow perch, black crappie, largemouth and smallmouth bass, bluegill, rainbow trout, and walleye. Rainbow trout are stocked annually in the reservoir and the other species are self-sustaining. Fishing occurs year-round.

3.7.2 Plants and Vegetation Communities

The project area occupies several diverse vegetation communities ranging from coniferous forests to shrub-steppe. The major types include mixed conifer forests, shrub-steppe, mixed agriculture and pasture grasslands, and riparian wetlands (Franklin and Dyrness 1973; Cassidy 1997b). Johnson and O'Neil (2001) describe the following habitat types as occurring in the project area:

Forest & woodland habitats

- Westside lowland conifer-hardwood forest
- Westside oak and dry Douglas-fir forest and woodlands
- Montane mixed conifer forest
- Eastside (interior) mixed conifer forest
- Western juniper and mountain mahogany woodlands
- Lodgepole pine forest and woodlands
- Ponderosa pine and eastside white oak forest and woodlands
- Upland aspen forest
- Subalpine parklands

Developed habitats

- Agriculture, pasture and mixed environs
- Urban and mixed environs

Grassland & shrubland habitats

- Alpine grasslands and shrublands
- Westside grasslands
- Ceanothus-manzanita shrublands
- Eastside (interior) canyon shrublands
- Eastside (interior) grasslands
- Shrub-steppe
- Dwarf shrub-steppe
- Desert playa and salt scrub

Aquatic and riparian habitats

- Lakes, rivers, ponds and reservoirs
- Herbaceous wetlands
- Westside riparian wetlands
- Eastside (interior) riparian wetlands
- Mountain coniferous wetlands

Conifer forests dominated by ponderosa pine, Douglas-fir, grand fir, and western larch occur along the east slopes of the Cascade Mountains and the Okanogan Highlands. Ponderosa pine forests are characterized by open, park-like stands of trees with an understory generally devoid of shrubs and dominated by grasses. These forests occupy drier sites characterized by a short growing season and minimal summer precipitation. Other eastern Washington forests vary in species composition and dominance depending on elevation, temperature gradient, and aspect. In the southern Cascades, bands of conifer forest dominated by lodgepole pine are present, characterized by an open canopy and sparse understory of grasses and shrub thickets. In Klickitat and Yakima Counties, small areas of low elevation forests are dominated by Garry oak along with ponderosa pine. These oak woodlands form a mosaic with grasslands, shrub-steppe, or steppe plant communities and support a unique combination of plant species.

The majority of the Management Program project area, including the Columbia Basin and Plateau, is a historic shrub-steppe community dominated by sagebrush and native bunchgrasses (Daubenmiere 1970). Plant communities in this region are strongly shaped by the marked seasonality in precipitation. Rainfall levels range from only 6 inches in the lowest areas to 22 inches in the higher elevations and are concentrated during late autumn and winter (Vander Haegen et al. 2001). Shrub-steppe environments are composed of woody shrubs, grasses, and forbs and typically have a microbiotic crust (an assemblage of soil particles, algae, lichens, and mosses) on the soil surface. WDFW conducted an intensive mapping effort of the remaining shrub-steppe in Washington using satellite thematic mapping methods (Jacobson and Snyder 2000). The mapping study determined that approximately 50 percent of the historic shrub-steppe community has been converted to agricultural crops and grasslands used for livestock grazing or other types of land cover (Daubenmire 1970; Jacobson and Snyder 2000). The land now supports cultivated croplands, orchards, vineyards, and nurseries for over 400 agricultural crops (Vander Haegen et al. 2000). Extensive managed and unmanaged pastures are also present. Wooten suggests that the estimate of remaining shrub-steppe is overly optimistic because much of the remaining shrub-steppe is actually in poor condition or severely degraded (Wooten 2002).

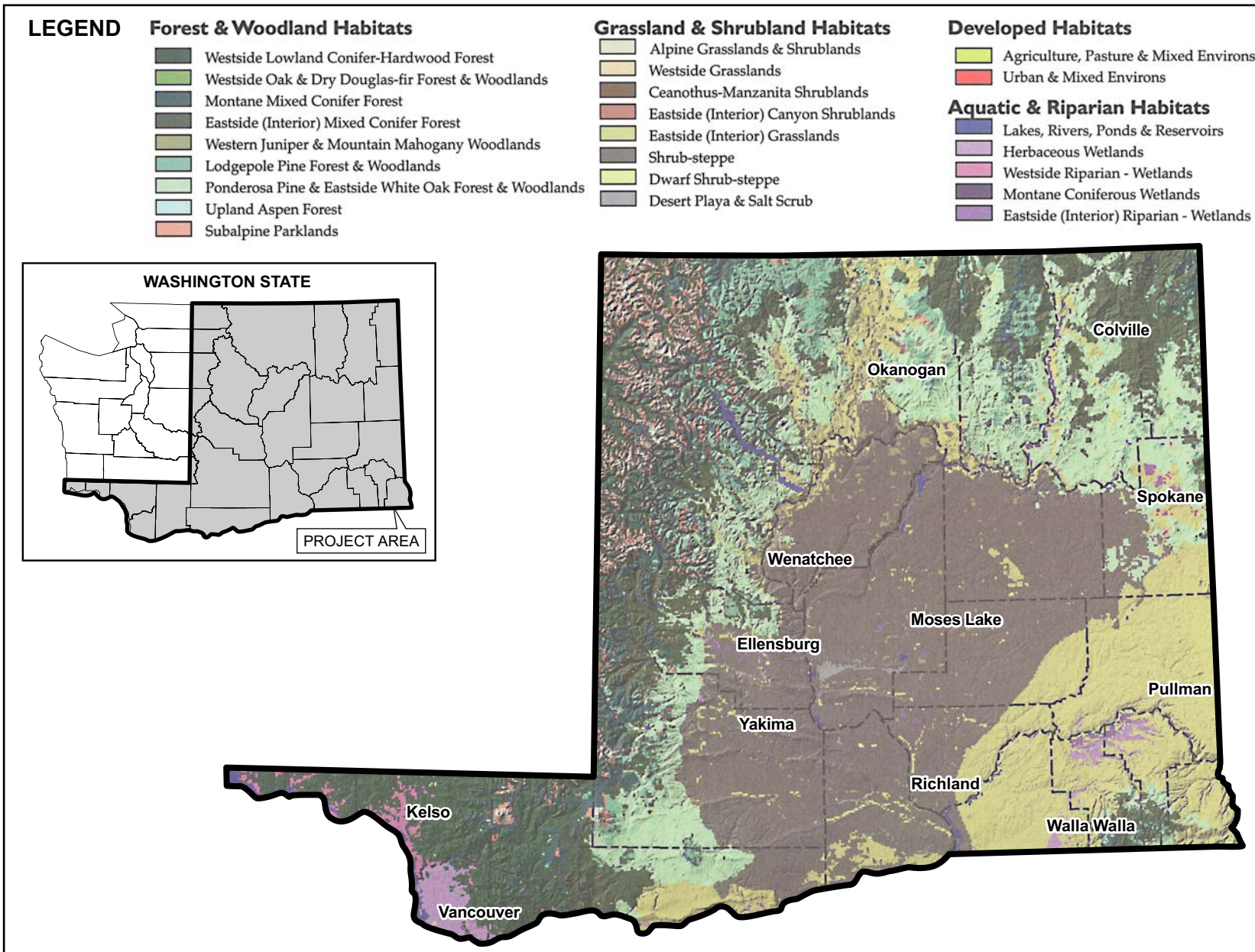
Conservation of remaining shrub-steppe habitat and restoration of disturbed lands are now top priorities for natural resource agencies. Shrub-steppe habitats are difficult to restore due to plant life histories and the slow development of microbiotic crust. Very little shrub-steppe occurs within protected areas, such as national parks or wilderness areas, and the majority is owned publicly for livestock grazing (Knick et al. 2003).

The Conservation Reserve Program (CRP) administered by the U.S. Department of Agriculture (USDA) encourages farmers to voluntarily remove fields from crop production and plant them with grasses. Farmers can enroll in the program for 10 years or more. Over 1 million acres of converted farmlands in Washington, approximately 15 percent of the state's total agricultural lands, have been planted under the CRP (Vander Haegen et al. 2005). Conservation Reserve Program lands provide habitat for many grassland and shrub-steppe species. A study of habitat use by sage-grouse and other shrub-steppe wildlife indicates that the CRP lands are providing valuable increased habitat for several threatened species (Schroeder and Vander Haegen 2006). CRP lands have been documented as providing viable nesting habitat for sage-grouse in north-central Washington and are expected to become more suitable as the sagebrush grows in size and

density. Two bird species, grasshopper and Savannah sparrow, which both suffer from long-term population declines, appear to be benefiting from this new habitat (Schroeder and Vander Haegen 2006). Other shrub-steppe associated birds, such as Brewer's and sage sparrow, also benefit from the increased suitable nesting habitat and the new contiguous landscape of CRP land and native shrub-steppe habitats.

Figures 3-12 and 3-13 show the historic and current wildlife habitat types in the project area taken from Johnson and O'Neil (2001). The maps were developed by scientific experts and utilized information from multiple vegetation classification systems, regional mapping efforts by WDFW and Oregon Department of Fish and Wildlife (ODFW), and the Interior Columbia Basin Ecosystem Management Project. The current habitat type map (Figure 3-13) represents vegetation in the project area in 1999, and the historic habitat type map (Figure 3-12) represents a modeled version of vegetation in 1850.

Wetlands in eastern Washington range from riparian areas associated with rivers and streams to potholes in the arid grasslands (Figure 3-13). The channeled scablands of the Columbia River Basin contain scattered alkaline and highly productive wetlands. Lakes, ponds, and marshes are also present in the study area. The National Wetland Inventory (NWI) maps wetlands in the study area associated with rivers, streams, and large systems such as Potholes Reservoir (USFWS various dates).



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Reference #: 26068

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SOURCE: WDFW and Northwest Habitat Institute, 1999.

FIGURE 3-12

HISTORIC WILDLIFE HABITAT TYPES

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

LEGEND

Forest & Woodland Habitats

- Westside Lowland Conifer-Hardwood Forest
- Westside Oak & Dry Douglas-fir Forest & Woodlands
- Montane Mixed Conifer Forest
- Eastside (Interior) Mixed Conifer Forest
- Western Juniper & Mountain Mahogany Woodlands
- Lodgepole Pine Forest & Woodlands
- Ponderosa Pine & Eastside White Oak Forest & Woodlands
- Upland Aspen Forest
- Subalpine Parklands

Grassland & Shrubland Habitats

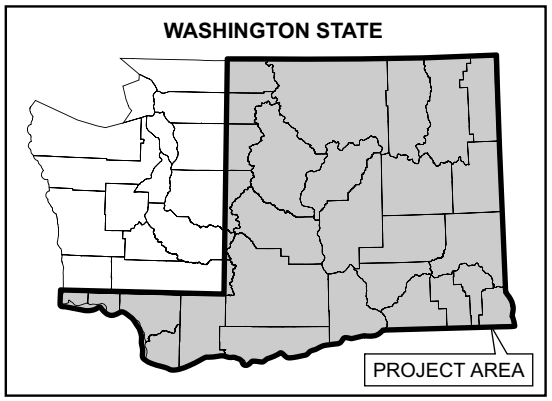
- Alpine Grasslands & Shrublands
- Westside Grasslands
- Ceanothus-Manzanita Shrublands
- Eastside (Interior) Canyon Shrublands
- Eastside (Interior) Grasslands
- Shrub-steppe
- Dwarf Shrub-steppe
- Desert Playa & Salt Scrub

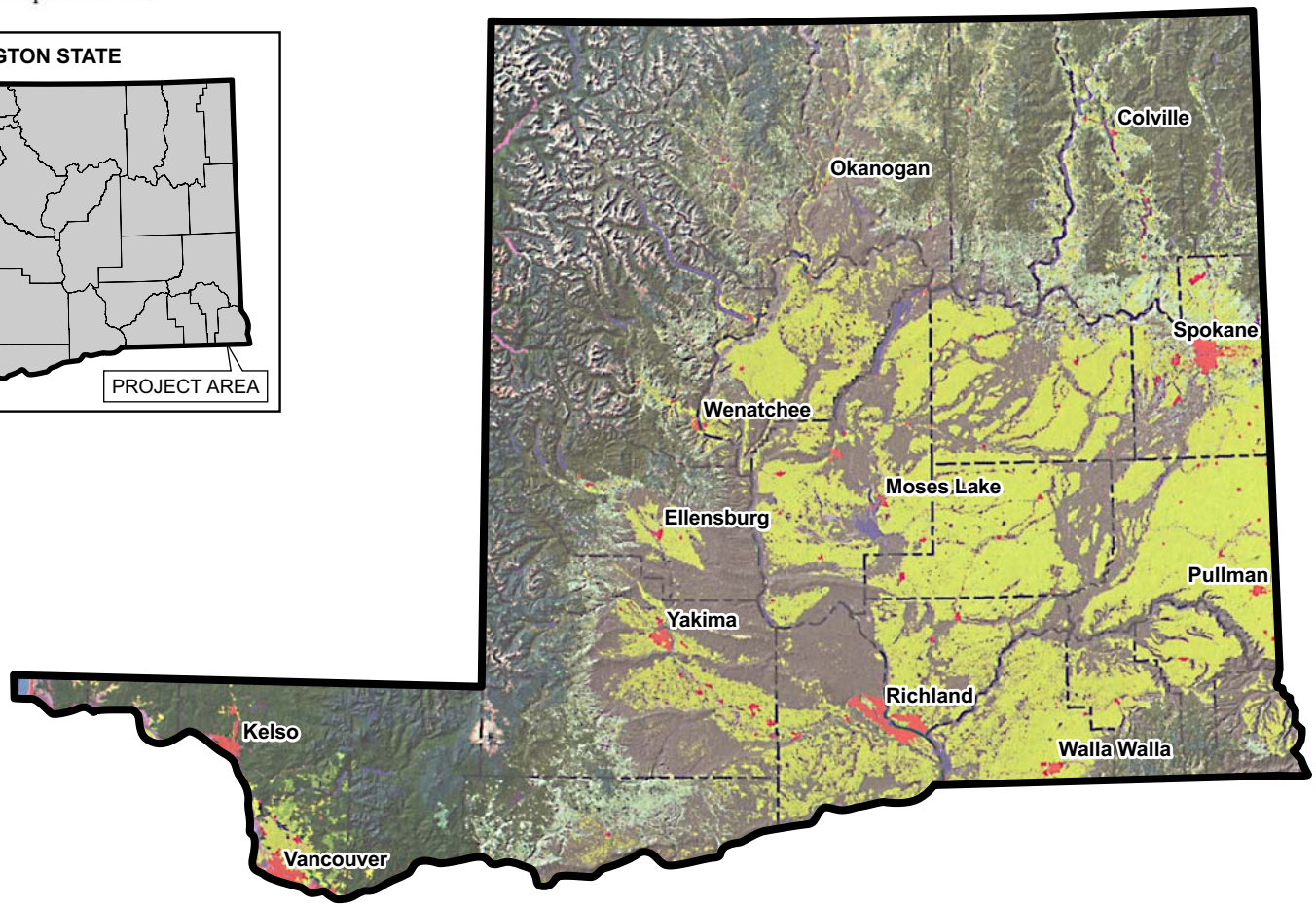
Developed Habitats

- Agriculture, Pasture & Mixed Environs
- Urban & Mixed Environs

Aquatic & Riparian Habitats

- Lakes, Rivers, Ponds & Reservoirs
- Herbaceous Wetlands
- Westside Riparian - Wetlands
- Montane Coniferous Wetlands
- Eastside (Interior) Riparian - Wetlands





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SOURCE: WDFW and Northwest Habitat Institute, 1999.

FIGURE 3-13

CURRENT WILDLIFE HABITAT TYPES

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

3.7.2.1 Federally and State-Listed Plant Species

The Management Program area contains plant species that are listed as endangered or threatened under the ESA (50 CFR Part 17). The USFWS lists seven plant species that occur in the Management Program area as endangered or threatened, and identifies an additional five species as candidates for listing (Table 3-17). (USFWS 2005a; 2005b). Forty plant species are considered federal species of concern and may occur in the project area. Table 3-18 also shows the state designation for federally listed plants. Additional state-listed species are discussed in Section 3.7.2.2.

Table 3-18. Federally Listed Plant Species

Common Name	Scientific Name	Federal Status	State Status	Habitat
Bradshaw's Lomatium	*Lomatium bradshawii*	Endangered	Endangered	Wet prairie/ grassland
Showy Stickseed	*Hackelia venusta*	Endangered	Endangered	Granite / talus
Wenatchee Mountain Checker-mallow	*Sidalcea oregana var. calva*	Endangered	Endangered	Moist meadow
Water Howellia	*Howellia aquatilis*	Threatened	Threatened	Seasonally dry areas of wetlands
Nelson's Checker-mallow	*Sidalcea nelsoniana*	Threatened	Endangered	Open grassland / moist areas
Spalding's Silene	*Silene spaldingii*	Threatened	Threatened	Open grasslands
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened	Endangered	Intermontane valley plains
Basalt Daisy	*Erigeron basalticus*	Candidate	Threatened	Basalt cliffs
Northern Wormwood	*Artemisia campestris ssp. borealis var. wormskioldii*	Candidate	Endangered	Shrub-steppe
Slender Moonwort	*Botrychium lineare*	Candidate	Threatened	Forest floodplain
Umtanum Desert Buckwheat	*Eriogonum codium*	Candidate	Endangered	Basalt cliffs
White Bluffs Bladderpod	*Lesquerella tuplashensis*	Candidate	Threatened	Sagebrush – highly alkaline/dry soil
Ames' Milk-vetch	*Astragalus pulsiferae var. suksdorfii*	Species of Concern	Endangered	Open Ponderosa Pine forest
Barrett's Beardtongue	*Penstemon barrettiae*	Species of Concern	Threatened	Basalt cliffs / talus / other rocky areas
Blue Mountain Onion	*Allium dictuon*	Species of Concern	Threatened	Steep slopes, gravelly soil
Broad-fruit Mariposa	*Calochortus nitidus*	Species of Concern	Endangered	Grassland / moist swales
Chelan Rockmat	*Petrophyton cinerascens*	Species of Concern	Endangered	Basalt cliffs
Clackamas Corydalis	*Corydalis aquae-gelidae*	Species of Concern	Sensitive	Coniferous forest – riparian
Clustered Lady's-slipper	*Cypripedium fasciculatum*	Species of Concern	Sensitive	Coniferous forest

Common Name	Scientific Name	Federal Status	State Status	Habitat
Columbia Milk-vetch	*Astragalus columbianus*	Species of Concern	Sensitive	Shrub-steppe
Crenulate Moonwort	*Botrychium crenulatum*	Species of Concern	Sensitive	Moist areas – coniferous forest
Gorge Daisy	*Erigeron oreganus*	Species of Concern	Threatened	Basalt cliffs
Gray Cryptantha	*Cryptantha leucophaea*	Species of Concern	Sensitive	Sandy soils – Columbia riparian
Hoover's Desert-parsley	*Lomatium tuberosum*	Species of Concern	Sensitive	Loose talus
Hoover's Tauschia	*Tauschia hooveri*	Species of Concern	Threatened	Shrub-steppe
Howell's Daisy	*Erigeron howellii*	Species of Concern	Threatened	Thin soils, steep slope
Jessica's Aster	*Aster jessicae*	Species of Concern	Endangered	Palouse grassland
Least Phacelia	*Phacelia minutissima*	Species of Concern	Endangered	Wet meadow
Liverwort Monkey-flower	*Mimulus jungermannioides*	Species of Concern	Extinct?	Basalt cliffs
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Species of Concern	Sensitive	Coniferous forest
Northwest Raspberry	*Rubus nigerrimus*	Species of Concern	Endangered	Wet meadow / drainages
Obscure Buttercup	*Ranunculus reconditus*	Species of Concern	Endangered	Meadow-steppe
Obscure Indian-paintbrush	*Castilleja cryptantha*	Species of Concern	Sensitive	Sub-alpine meadows / parklands – Mt. Rainier Nat'l Park
Oregon Sullivantia	*Sullivantia oregana*	Species of Concern	Endangered	Moist cliffs
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	Species of Concern	Threatened	Seasonally moist meadows
Palouse Goldenweed	*Haplopappus liatriformis*	Species of Concern	Threatened	Grasslands
Persistentsepal Yellowcress	*Rorippa columbiae*	Species of Concern	Endangered	Near water
Seely's Silene	*Silene seelyi*	Species of Concern	Sensitive	Basalt cliffs / talus
Stalked Moonwort	*Botrychium pedunculosum*	Species of Concern	Sensitive	Meadow / perennial streams / coniferous forest
Sticky Phacelia	*Phacelia lenta*	Species of Concern	Threatened	Basalt cliffs

Common Name	Scientific Name	Federal Status	State Status	Habitat
Suksdorf's Desert-parsley	*Lomatium suksdorfii*	Species of Concern	Sensitive	Rocky hillsides – moderate to steep slopes
Tall Bugbane	*Cimicifuga elata*	Species of Concern	Sensitive	Coniferous forest
Thompson's Clover	*Trifolium thompsonii*	Species of Concern	Threatened	Open coniferous forest / grassland
Torrey's Peavine	*Lathyrus torreyi*	Species of Concern	Threatened	Info not available
Triangular-lobed Moonwort	*Botrychium ascendens*	Species of Concern	Sensitive	Coniferous forest / meadows / ravines
Two-spiked Moonwort	*Botrychium paradoxum*	Species of Concern	Threatened	Forest floodplain / stream terraces
Wanapum Crazyweed	*Oxytropis campestris var. wanapum*	Species of Concern	Endangered	Open grassland / shrubland
Washington Polemonium	*Polemonium pectinatum*	Species of Concern	Threatened	Sagebrush
Wenatchee Larkspur	*Delphinium viridescens*	Species of Concern	Threatened	Moist meadows – open areas
White Meconella	*Meconella oregana*	Species of Concern	Threatened	Open grassland
Whited's Milk-vetch	*Astragalus sinuatus*	Species of Concern	Endangered	Rocky hillsides
White-top Aster	*Aster curtus*	Species of Concern	Sensitive	Open grassland

Federal Listings, under the Endangered Species Act – as published in the Federal Register:

- Endangered = Listed Endangered. In danger of extinction.
  Threatened = Listed Threatened. Likely to become endangered.
- Candidate = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.
  Species of Concern = An unofficial status. The species appears to be in jeopardy, but insufficient information exists to support listing.

State Listings, as determined by the Washington Natural Heritage Program:

- Endangered = In danger of becoming extinct or extirpated from Washington.
- Threatened = Likely to become Endangered in Washington.
- Sensitive = Vulnerable or declining and could become Endangered or Threatened in the state.

3.7.2.2 Washington State-Listed Species

The Washington Natural Heritage Program (WNHP) was created in 1981 within the state Department of Natural Resources to protect natural areas within the state (RCW 79.70.030). The WNHP classifies and maintains an inventory of rare plant species in the state. Currently, there is no state law protecting rare plant species in Washington, but many federal and state land management agencies have policies that provide protection for rare species.

Table 3-18 includes the state designation for the federally listed plant species. In addition to those species, there are 253 species designated by the state that occur in the project area. Of the 253 species, 32 are considered endangered, 86 are threatened, 125 are sensitive, and 10 are

possibly extinct in the state of Washington. Appendix I contains a complete list of these species and includes a brief description of habitat for each species.

3.7.2.3 Washington Natural Heritage Program (WNHP)

WNHP maintains a database of the information available for rare plant species and endangered ecosystems in the state. Data include the presence, population size, condition, protection status, and distribution of elements of natural diversity. Listed plant species occur in a variety of habitats in the Management Program area. The immense variety of plant communities in the project area prevents an exhaustive description of each community and associated listed species.

3.7.2.4 Early Action Study Areas

Lake Roosevelt Drawdown

Lake Roosevelt extends through multiple vegetation communities within the 150 miles between the Grand Coulee Dam and the Canadian border. The lake occurs in a transition zone between the arid steppe environment of the Columbia River Basin and the dry forest of the Okanogan Highlands. The northern portion of the lake is adjacent to conifer forests dominated by ponderosa pine, while the southern portion occurs within the developed shrub-steppe zone that contains modified shrub and grasslands. Sparse riparian wetlands are present along the banks of the lake; however, the dramatic fluctuation of lake levels during the year prevents establishment of extensive riparian vegetation.

Odessa Ground Water Management Subarea

The study area for the Odessa Subarea lies within the shrub-steppe community described above. Much of the area has been converted to agricultural land irrigated by ground water. According to Ecology, many creeks, draws, and natural springs have dried up due to the extensive ground water pumping in the area (Reclamation 2006c,d). Two listed plant species may occur in the Odessa subarea—Ute ladies'-tresses and Spalding's catchfly (Reclamation 2006c,d).

Supplemental Feed Route

The three possible Supplemental Feed Routes extend through agricultural lands that are part of the Columbia Basin Project. Scattered areas of shrub-steppe vegetation remain in a fragmented landscape, but much of this central basin contains irrigated farmlands or dry modified grassland and pasture. Natural spring-fed wetlands are present north of Moses Lake along the Crab Creek drainage, and lakes and pothole wetlands are present west of Potholes Reservoir.

Crab Creek Route Alternative

The Crab Creek route extends along a natural channel that supports ephemeral stream flow. The streambed is primarily located through native shrub-steppe with some scattered grasslands. Areas of intact microbiotic crust are present along the route in shrub-steppe areas. Pothole and marsh wetlands fed by ground water seeps and dominated by cattail, willow, sedges, and rushes are also present along the stream corridor. Much of the Crab Creek drainage is designated by WDFW as the North Columbia Basin Wildlife Area (Gloyd Seeps Unit). The area is 8,000 acres and includes thousands of small lakes, potholes, and seeps.

W20 Route Alternative

The W20 Canal route extends through irrigated agricultural areas or dry modified grasslands. Very little shrub-steppe or wetland habitat is present along this route. The proposed new conveyance route that will connect the existing W20 Canal to Moses Lake contains dry grassland dominated primarily by cheatgrass.

Frenchman Hills Route Alternative

The Frenchman Hills Route extends through two different vegetation communities. The Main Canal and West Canal are bordered by irrigated agricultural fields or dry fallow pastures. The Frenchman Hills Wasteway extends through an area containing multiple lakes, ponds, and pothole wetlands as well as scattered areas of shrub-steppe. WDFW has designated a large area north of the wasteway as the Desert Wildlife Area. The area is 35,000 acres and contains shrub-steppe, sand dunes, marsh, and lake habitats, along with wasteways and canals. According to WDFW, the area was a desert prior to the Columbia Basin Project (WDFW 2000). The basin now serves as a collector for irrigation water from upslope farmlands and contains a mosaic of wetlands and desert uplands. In addition to naturally occurring shrub-steppe communities, many acres are dominated by non-native grasses such as cheatgrass.

Potholes Reservoir and Moses Lake

The Moses Lake area includes developed areas along the lake and fringe wetland communities. The Potholes Reservoir is located in a 32,500-acre Wildlife Area managed by WDFW. According to WDFW, the water levels fluctuate widely during the year, occasionally covering sand dune areas or seasonally flooded forests dominated by willow (WDFW 2000). Higher-elevation wetlands on the northern and western fringes of the reservoir have cattail and bulrush communities. The west side of the Potholes area still has sand dunes and shrub-steppe habitat. The eastern portion is mostly sand, gravel, and round-rock soil, with shrub-steppe vegetation bordered by irrigated farmland.

The USFWS also manages the Columbia National Wildlife Refuge that includes the Potholes Reservoir and scattered lakes to the south. The refuge is 23,000 acres in the channeled scablands of the Columbia River Basin and contains numerous small- to medium-sized lakes surrounded by sagebrush and grasslands, canyons, and buttes (USFWS 2006).

3.7.3 Terrestrial Wildlife

This section describes terrestrial wildlife in the Management Program study area. The study area contains diverse habitat types of conifer and mixed forest, shrub-steppe, and wetlands that provide a wide range of microclimates, food sources, and niches for waterfowl and wildlife (Figure 3-13).

3.7.3.1 Wildlife Habitat

Eastern Washington forests provide a wide range of habitats and associated elements for numerous terrestrial wildlife species. For example, they provide snags for cavity-nesting birds and roosting bats, such as chickadees, nuthatches, woodpeckers, and myotis bats. Forests also contain downed wood for breeding salamanders, such as Larch mountain salamander, and multistory vegetation under a closed canopy for songbirds and small mammals, including

yellow-pine chipmunk and western red-backed vole. Regenerating shrub/seedling areas provide habitat elements for rodents and reptiles such as American pika and meadow vole. According to the wildlife habitat matrices produced by Johnson and O'Neil, there are 287 vertebrate wildlife species that inhabit forests and woodlands of eastern Washington (Johnson and O'Neil 2001).

Shrub-steppe habitats provide fewer vegetation layers, which results in a lower diversity of wildlife species than dry forests. However, several species are dependent on this habitat, including pygmy rabbit, Washington ground squirrel, striped whipsnake, and sagebrush vole. High temperatures and limited precipitation strongly shape the composition of plant communities in these arid and semi-arid habitats and influence the ecology and behavior of associated wildlife (Vander Haegen et al. 2001). Habitats containing woody shrubs tend to have more diverse wildlife communities than grass-dominated habitats, which is a function of increased vegetation layers for nesting and foraging. Due to their close association with this habitat, several birds are considered sagebrush obligates, including sage and Brewer's sparrows, sage thrasher, and both sage and sharp-tailed grouse (Dobler et al. 1996; USFWS 2006). Long-billed curlew and savannah sparrow are also found in shrub-steppe habitats with a larger true steppe or grassland component. According to the wildlife habitat matrices produced by Johnson and O'Neil, there are 22 birds, 12 mammals, 6 reptiles, and 1 amphibian associated with shrub-steppe habitat that require shrubs for a particular life function (Vander Haegen et al. 2001). Approximately 184 species are found in the shrub-steppe environments.

Due to the decline in shrub-steppe habitat in the Columbia Basin and Plateau, species associated with this habitat have also severely declined. Bird species associated with shrub-steppe are of high management concern to resource agencies, and conservation of remaining habitat is important for long-term survival for multiple species (Vander Haegen et al. 2005). Less is known about mammals, amphibians, and reptiles associated with shrub-steppe habitat, but declines associated with habitat loss are suspected.

Riparian areas provide critical wildlife habitat for an abundance of species. Riparian habitats occur in linear bands connecting aquatic and terrestrial habitats, thus providing natural corridors or migration routes for birds. The convergence of upland and wetland areas results in a high diversity of plant species, complex vegetation structure, microclimates, and a variety of habitat features for wildlife (Kauffman et al. 2001; Knutson and Naef 1997). Forested riparian habitat offers an abundance of snags that provide breeding habitat for cavity-nesting birds and mammals, and a food source for insect-eating birds. Amphibians and small mammals find shelter in or under downed trees and under dense vegetation and rely on the predictable water source. The high density of prey species makes riparian areas favored habitats for foraging reptiles (Kauffman et al. 2001). Large animals such as deer, elk, and moose can seek refuge from summer temperatures in relatively cool riparian zones (Knutson and Naef 1997). Riparian areas provide breeding habitat for more species of birds than any other vegetation type while comprising a small percentage of the landscape (Kauffman et al. 2001). According to the wildlife habitat matrices produced by Johnson and O'Neil, approximately 271 species are associated with riparian wetlands.

Agriculture and pasture grasslands provide habitat for a high number of wildlife species because they are widely distributed and contain a matrix of other habitats. Developed areas also provide ephemeral or man-made wetlands, wells and other water sources, shelterbelts, hedgerows, field

borders, and desert dwellings or other structures. Western meadowlark and horned lark are common grassland species that have adapted well to agricultural land. Low-intensity agriculture crops, such as wheat, corn, and barley, provide more benefit for wildlife compared to high-value crops such as orchards and vineyards (WDFW personal communication 2006). Higher value crops provide less food and are more intensely managed. Management may result in a high amount of chemical exposure to wildlife and a reduced tolerance of wildlife eating the high-value crops. According to the wildlife habitat matrices produced by Johnson and O'Neil, approximately 346 species are associated with agricultural lands that include grasslands and urban environments.

3.7.3.2 Federal and State-Listed Wildlife Species

The USFWS lists nine wildlife species that occur in the Management Program project area as endangered or threatened; eight species that are candidates for listing; and 34 species of concern (USFWS 2005a; USFWS 2005b). These species may occur in any of the counties within the project area. Table 3-19 lists all of the federally listed wildlife species and their status in Washington state.

Table 3-19. Federally Listed Wildlife Species

Common Name	Scientific Name	Federal Status	State Status	Habitat
pygmy rabbit	*Brachylagus idahoensis*	Endangered	Endangered	Shrub-steppe
gray wolf	*Canis lupus*	Endangered	Endangered	Riparian / upland forest / shrub-steppe
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	Endangered	Endangered	Upland forest
woodland caribou	*Rangifer tarandus caribou*	Endangered	Endangered	Upland forest with riparian
bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened	Large rivers
Canada lynx	*Lynx canadensis*	Threatened	Threatened	High elevation upland forest
grizzly bear	*Ursus arctos horribilis*	Threatened	Endangered	Upland forest
marbled murrelet	*Brachyramphus marmoratus*	Threatened	Threatened	Old-growth forest
northern spotted owl	*Strix occidentalis caurina*	Threatened	Endangered	Old-growth forest
Columbia spotted frog – Great Basin DPS	*Rana luteiventris*	Candidate	Candidate	Riparian / wetland
fisher – West Coast DPS (west of Okanogan River)	*Martes pennanti*	Candidate	Endangered	Upland forest
greater sage grouse – Columbia Basin DPS	*Centrocercus urophasianus*	Candidate	Threatened	Shrub-steppe
Mardon skipper	*Polites mardon*	Candidate	Endangered	Grassland / prairie
Oregon spotted frog	*Rana pretiosa*	Candidate	Endangered	Riparian / wetland

Common Name	Scientific Name	Federal Status	State Status	Habitat
Washington ground squirrel	*Spermophilus washingtoni*	Candidate	Candidate	Grassland
Mazama pocket gopher	*Thomomys mazama*	Candidate	Threatened	Grassland / prairie
streaked horned lark	*Eremophila alpestris strigata*	Candidate	Endangered	Grassland / prairie
yellow-billed cuckoo	*Eremophila alpestris*	Candidate	Candidate	Forested riparian
black swift	*Cypseloides nige*	Species of Concern		Mountainous / forested riparian
burrowing owl	*Athene cunicularia*	Species of Concern	Candidate	Grassland / prairie
California wolverine	*Gulo gulo luteus*	Species of Concern		Above timberline / forest (winter)
Cascades frog	*Rana cascadae*	Species of Concern	Monitor	Wet mountain areas / open coniferous forest
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Species of Concern	Threatened	Grassland / shrub savanna
Columbia torrent salamander	*Rhyacotriton kezeri*	Species of Concern	Endangered	Mountain stream riparian
ferruginous hawk	*Buteo regalis*	Species of Concern	Threatened	Grassland / prairie / shrub-steppe / desert
fisher (east of Okanogan River)	*Martes pennanti*	Species of Concern	Endangered	Coniferous forest
Kincaid meadow vole	*Microtus pennsylvanicus kincaidi*	Species of Concern	Monitor	Prairie
larch mountain salamander	*Plethodon larselli*	Species of Concern	Sensitive	Mossy talus slopes / caves
loggerhead shrike	*Lanius ludovicianus*	Species of Concern	Candidate	Grassland / shrub-steppe
long-eared myotis	*Myotis evotis*	Species of Concern	Monitor	Forest
long-legged myotis	*Myotis volans*	Species of Concern	Monitor	Forest
northern goshawk	*Accipiter gentilis*	Species of Concern	Candidate	Mature forest – mid/upper elevations
northern leopard frog	*Rana pipiens*	Species of Concern	Endangered	Open grassland
northwestern pond turtle	*Clemmys marmorata marmorata*	Species of Concern		Wetland areas
olive-sided flycatcher	*Contopus cooperi*	Species of Concern		Disturbed forest
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*	Species of Concern	Candidate	Caves – forest and shrub grassland

Common Name	Scientific Name	Federal Status	State Status	Habitat
pallid Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Species of Concern	Candidate	Desert / grassland – manmade structures
Preble's shrew	*Sorex preblei*	Species of Concern	Monitor	Open areas / forest
Rocky Mountain-tailed frog	*Ascaphus montanus*	Species of Concern	Candidate	Streams within forest
sagebrush lizard	*Sceloporus graciosus*	Species of Concern	Candidate	Sagebrush / desert shrub
sharptail snake	*Contia tenius*	Species of Concern	Candidate	Seasonally moist areas
slender-billed white-breasted nuthatch	*Sitta carolinensis aculeate*	Species of Concern	Candidate	Ponderosa pine / other forest
tailed frog	*Ascaphus truei*	Species of Concern	Monitor	Streams within mature forest
Townsend's ground squirrel	*Spermophilus townsendii*	Species of Concern	Candidate	Grassland / sagebrush
Van Dyke's salamander	*Plethodon vandykei*	Species of Concern	Candidate	Streams / rock outcrops
western gray squirrel	*Sciurus griseus griseus*	Species of Concern	Threatened	Oak woodland
western pond turtle	*Clemmys marmorata*	Species of Concern	Endangered	Ponds and lakes
western toad	*Bufo boreas*	Species of Concern	Candidate	Prairies / forest / grassland
wolverine	*Gulo gulo*	Species of Concern	Candidate	High elevation forest
giant Columbia spire (snail)	*Fluminicola Columbiana*	Species of Concern		Fast-moving rivers
Columbia clubtail (dragonfly)	*Gomphus lynnae*	Species of Concern	Candidate	Clear streams
Valley silverspot (butterfly)	*Speyeria zerene bremeri*	Species of Concern		Oak woodland
Willow flycatcher	*Empidonax traillii*	Species of Concern		Willow thickets / riparian
black tern	*Childonias niger*	Species of Concern	Monitor	Freshwater (nesting) / marine (winter)
Oregon vesper sparrow	*Pooecetes gramineus affinis*	Species of Concern	Candidate	Grassland / sagebrush / shrub-steppe

Endangered: Species are in danger of extinction within the foreseeable future throughout all or a significant portion of range.
Threatened: Species are likely to become endangered within the foreseeable future.
Candidate: Species is on waiting list for federal listing consideration.
Species of Concern: Species about which there is some concern regarding status and threats to the species, but for which insufficient information is available to indicate a need to list the species under the ESA.
DPS = distinct population segment

3.7.3.3 Washington State-Listed Species

In addition to the species listed in Table 3-19, the Management Program area contains several other species listed by WDFW as endangered, threatened, candidate, sensitive or monitor. These species are listed in Table 3-20 and key species are discussed in more detail in the following section.

Table 3-20. State Listed Wildlife Species

Common Name	Scientific name	State Status	Habitat
Townsend's big-eared bat	*Coryhorhinus townsendii*	Candidate	Caves / Mixed conifer forest
Keen's myotis	*Myotis keenii*	Candidate	Caves / Mixed conifer forest
fringed myotis	*Myotis thysanodes*	Monitor	Caves / Mixed conifer forest
small-footed myotis	*Myotis ciliolabrum*	Monitor	Caves / Cliffs / Talus
golden eagle	*Aquila chrysaetos*	Candidate	Cliffs / Mixed conifer forest / Shrub-steppe
western grebe	*Aechmophorus occidentalis*	Candidate	Freshwater wetlands (breeding)
American white pelican	*Pelecanus erythrorhynchos*	Endangered	Freshwater wetlands and fresh deepwater (nesting)
upland sandpiper	*Bartramia langicauda*	Endangered	Grasslands
Cathlamet pocket gopher	*Thomomys mazama louiei*	Candidate	Grasslands – Wahkiakum County
gray-tailed vole	*Microtus canicaudus*	Candidate	Grasslands / Agriculture
sandhill crane	*Grus Canadensis*	Endangered	Grasslands / Herbaceous wetlands (near forest)
peregrine falcon	*Falco peregrinus*	Sensitive	Grasslands / Urban / Cliffs
Common loon	*Gavial immer*	Sensitive	Lakes (breeding)
Beller's ground beetle	*Agonum belleri*	Candidate	Lowland sphagnum bogs
Hatch's click bettle	*Eanus hatchii*	Candidate	Lowland sphagnum bogs
long-horned leaf bettle	*Donacia idola*	Candidate	Lowland sphagnum bogs
flammulated owl	*Otus flammeolus*	Candidate	Mixed conifer forest
merlin	*Falco columbarius*	Candidate	Mixed conifer forest
pileated woodpecker	*Dryocopus pileatus*	Candidate	Mixed conifer forest
black-backed woodpecker	*Picoides arcticus*	Candidate	Mixed conifer forest (mid to high elevation)
Lewis' woodpecker	*Melanerpes lewis*	Candidate	Mixed conifer forest, Riparian, Oregon white oak forest
Aleutian Canada goose	*Branta Canadensis leucopareia*	Monitor	Offshore islands (nesting) / Grasslands, agriculture (winter)
Vaux's swift	*Chaetura vauxi*	Candidate	Old growth forest/Mature forest / Open areas (foraging)
white-headed woodpecker	*Picoides albolarvatus*	Candidate	Ponderosa pine forest and woodlands
red-legged frog	*Rana aurora*	None	Riparian

Common Name	Scientific name	State Status	Habitat
purple martin	*Progne subis*	Candidate	Rural and urban natural open space (near water)
black-tailed jackrabbit	*Lepus californicus*	Candidate	Shrub steppe
white-tailed jackrabbit	*Lepus townsendii*	Candidate	Shrub steppe
sage sparrow	*Amphispiza belli*	Candidate	Shrub steppe / Grasslands
Merriam's shrew	*Sorex merriami*	Candidate	Shrub steppe / Ponderosa pine forest and woodlands/Grasslands
sage thrasher	*Oreoscoptes montanus*	Candidate	Shrub-steppe
striped whipsnake	*Masticophis taeniatus*	Candidate	Shrub-steppe
Cascade torrent salamander	*Rhyacotriton cascade*	Candidate	Streams, rivers
Columbia river tiger beetle	*Cicindela columbica*	Candidate	Streams, rivers
Mann's mollusk-eating ground beetle	*Scaphinotus mannii*	Candidate	Streams, rivers
Dunn's salamander	*Plethodon dunni*	Candidate	Streams, rivers / Mixed conifer forest
Olympic torrent salamander	*Rhyacotriton olympicus*	Monitor	Streams, rivers / Mixed conifer forest

State Endangered Species: Any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.
State Threatened Species: Any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.
State Sensitive Species: Any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.
State Candidate Species: Include fish and wildlife species that the Department will review for possible listing as State Endangered, Threatened, or Sensitive. A species will be considered for designation as a State Candidate if sufficient evidence suggests that its status may meet the listing criteria defined for State Endangered, Threatened, or Sensitive.

3.7.3.4 State Priority Habitat and Species (PHS) Program

The WDFW PHS database contains information on wildlife and habitat resources in the Management Program area. Terrestrial wildlife listed as state priority species are described below in major priority categories, with an example of species present in the Columbia River system for each category.

The WDFW has also published management recommendations for priority habitats and species, including several that are found in the Management Program area. In general, the recommendations include suggested protective buffer distances, timing restrictions, conservation of certain habitat types near known wintering or breeding areas, restrictions on land uses and human activities adjacent to nesting sites, etc. The WDFW recommendations do not have regulatory authority, but provide scientifically based guidance for protecting priority habitats and species. The management recommendations are grouped into invertebrates, amphibians and reptiles, birds, and mammals. WDFW also provides recommendations for riparian habitats.

Amphibians

Priority species of amphibians in the project area include the spotted frog, a state endangered species and federal candidate species, and the northern leopard frog. Priority salamanders

primarily occur in the southwest portion of the project area and include five state candidate species, including Dunn's salamander, larch mountain salamander, Cascade and Olympic torrent salamanders, and Van Dyke's salamander (WDFW 2006). Van Dyke's salamander is also a federal species of concern.

Reptiles

There are several priority species of reptiles (e.g., snakes, lizards and turtles) in the project area. Reptiles within the project area include the sagebrush lizard, striped whipsnake, and sharptail snake (WDFW 2006). All three are state candidate species and the sagebrush lizard is a species of concern. The western pond turtle is a state endangered species and a federal species of concern.

Birds

Priority bird species in the project area include waterfowl (Aleutian Canada goose, common loon, western grebe); raptor (golden eagle, ferruginous hawk); upland game birds (sage grouse, sharp-tailed grouse); crane (sandhill crane); shorebird (upland sandpiper, snowy plower); owl (burrowing owl); woodpecker (Lewis' woodpecker, white-headed woodpecker, black-backed woodpecker); and perching birds (sage sparrow, sage thrasher, streaked horned lark) (WDFW 2006). There are specific WDFW PHS management recommendations for several bird species in the Management Program area, including common loon, burrowing owl, sandhill crane, great blue heron, and ferruginous hawk.

Mammals

Mammals in the project area include the priority species categories of bat (Townsend's big-eared bat); rabbit (pygmy rabbit, black-tailed jackrabbit); rodent (Washington ground squirrel, western gray squirrel, western pocket gopher, sagebrush vole); and big game ungulates (Columbian white-tailed deer) (WDFW 2006).

Key Wildlife Population Status and Habitat Conditions

Similar to ESA-listed fish species, wildlife habitat and recovery efforts are critical components of large-scale water resource management efforts and will be addressed in more detail below. The following discussion is based on available information and is segregated into species important to the management effort.

Pygmy Rabbit. Pygmy rabbits are dependent on sagebrush habitats, particularly dense stands of big sagebrush. The Columbia Basin pygmy rabbit population is genetically distinct and isolated from other pygmy rabbit populations in the Great Basin (USFWS 2004). Pygmy rabbits have declined severely in the Columbia Basin largely due to habitat loss and fragmentation (WDFW 1995). In 1997, only six populations were known, and surveys in 2004 found no rabbits at historic sites (WDFW 2003). According to WDFW (2003), less than 30 rabbits are believed to remain in the wild. In 2001, WDFW began a captive breeding program for this species.

Sage Grouse. This upland game species also inhabits shrub-steppe habitats and has declined due to conversion of shrub-steppe habitats to agricultural crop production. Degradation of habitat due to overgrazing and the increase of cheatgrass and noxious weeds into shrub-steppe habitats have also impacted populations (WDFW 2004). Two populations of sage grouse remain in Washington; one in Douglas and Grant Counties and the other on the Yakima Training Center lands (Hays et al. 1998). According to WDFW's recovery plan for this species, neither isolated population is large enough for long-term viability (WFDW 2004).

Sharp-tailed Grouse. Similar to sage grouse, sharp-tailed grouse lives in shrub-steppe communities and their populations are in decline due to habitat loss. The sharp-tailed grouse need grass-dominated habitat for nesting and deciduous shrub-dominated habitats for wintering (Shroeder et al. 2000). The current distribution of grouse is less than 3 percent of its historic distribution, composed of small and isolated populations in Okanogan, Douglas, and Lincoln Counties (Shroeder et al. 2000).

Washington Ground Squirrel. As with sage grouse, the Washington ground squirrel occupies shrub-steppe habitats and is in decline due to the loss of this habitat. The Washington ground squirrel is endemic to the Columbia Plateau, but now occurs in three disjunct areas in Washington and northeast Oregon (Betts 1999). The squirrel is closely associated with areas containing deep, silty soils with significant grass and forb cover. Tilling and other mechanisms involved in conversion of shrub-steppe habitats remove the species' food source, and render the soils necessary for burrowing unusable (Betts 1999).

Columbia Spotted Frog. The Columbia spotted frog was differentiated from the Oregon spotted frog in 1996. Their range has dramatically decreased in the last 50 years although the causes of decline are not fully understood. Spotted frogs are highly aquatic and live in or near permanent bodies of water, including lakes, ponds, slow streams and marshes (Leonard et al. 1993). Columbia spotted frogs lay their eggs in the shallows of a permanent water source between March and April in lower elevations in the Columbia Basin. The major threats to Columbia spotted frog are likely the destruction and degradation of wetlands and the introduction of non-native predators such as bullfrogs (Leonard 2006).

Northern Leopard Frog. This frog is a state endangered species and a federal species of concern. The northern leopard frog has declined in Washington due to habitat loss, agricultural chemicals, and non-native species such as bullfrog. In 1999, WDFW found the remaining leopard frogs in Washington occurring in the Crab Creek drainage (WDFW 1999).

Sandhill Crane. Two populations of sandhill cranes occur in Washington. A large migratory population, comprised of about 23,000 birds, stops in eastern Washington during migration between winter grounds in California and breeding grounds in Alaska or Canada (Littlefield and Ivey 2002). An additional 3,000 birds stop on the lower Columbia River in the southwest portion of the state. These wintering birds feed in open prairie, agricultural fields, and river valleys.

A small breeding population of sandhill crane occurs in the state, but is currently restricted to Klickitat and Yakima Counties. These birds nest in emergent wetlands surrounded by conifer forest. A decline in breeding birds is attributed to habitat loss and predation. Habitat loss is due

to industrial development, conversion of agricultural lands to cottonwood plantations, tree nurseries, or other incompatible uses (Littlefield and Ivey 2002).

American White Pelican. American white pelicans breed and summer in the Columbia River Basin of eastern Washington. Although most individuals winter along the Pacific Coast, a small number of breeding birds stay and winter in eastern Washington. Many non-breeding individuals remain in eastern Washington year-round, utilizing inland waters. This species requires shallow water for foraging on amphibians, crustaceans, and warmwater fish. Breeding colonies are found on isolated islands in freshwater lakes and occasionally on islands in rivers. Habitat destruction is one of the most important limiting factors for the American white pelican. Water depth fluctuations may adversely affect habitat quality. High water levels have potential to flood the ground nests in the breeding colonies (Larsen et al. 2004 and references therein). Changes in water depth and temperature may change the prey base this species requires.

3.7.3.5 Early Action Study Areas

Lake Roosevelt Drawdown

The shoreline around Lake Roosevelt contains grass and shrub habitats adjacent to conifer forests and riparian wetlands. These habitats support an estimated 75 mammal species (including mule deer, coyote, and black bear); 200 species of birds (including bald eagle, osprey, and western meadowlark); 10 species of amphibians; and 15 species of reptiles (NPS 2005).

Supplemental Feed Route

The three possible Supplemental Feed Routes extend through agricultural and pasture habitats, shrub-steppe habitat, and wetlands.

Crab Creek Route Alternative. Wildlife species typical of shrub-steppe, grassland, and wetland habitats are present along the Crab Creek route. The mosaic of habitats along the stream corridor provides suitable nesting and foraging for a large number of species. According to WDFW (2000), the Gloyd Seeps Unit supports abundant waterfowl, such as Canada geese, redheads, canvasbacks, ruddy ducks, blue- and green-winged teal, and pintail (WDFW 2000). Shorebirds and Caspian terns, pelicans, sandhill cranes, and swans are associated with open water areas. Ring-billed gulls; Brewer's, red-winged, and yellow-headed blackbirds; killdeer; meadowlarks; and horned larks occur in grassland habitats. Raptors such as prairie falcons, ferruginous hawks, red-tailed and Swainson's hawks, and golden eagles are present. Game birds including pheasant, chukar and Hungarian partridge, and quail are common. Mammals include coyote, jackrabbit, marmot, ground squirrel, muskrat, mice, and shrew. Mule deer occur in fringe areas where suitable habitat exists. Amphibians, including northern leopard frog, also occur in wetland habitats.

W20 Route Alternative. Wildlife species along the W20 route are primarily associated with dry grasslands and developed areas. Wildlife adapted to agriculture, including white-crowned sparrow and blackbird, are present along this route.

Frenchman Hills Route Alternative. Wildlife species along the Main Canal and West Canal are typical of irrigated fields or dry pastures. A diverse assemblage of wildlife is present

along the Frenchman Hills Wasteway portion of the route. Multiple species of ducks breed in the lakes and ponds, as well as shorebirds such as black-necked stilt, American avocet, and Wilson's phalarope. The Desert Wildlife Area provides a mosaic of habitats for over 150 species of wildlife similar to those species described for Crab Creek.

Potholes Reservoir and Moses Lake. The Moses Lake area includes developed habitats along the lake and fringe wetland habitats. The Columbia National Wildlife Refuge that includes the Potholes Reservoir also provides a mosaic of habitats for over 150 species of wildlife similar to those species described for Crab Creek. The refuge is a wintering area for an average population of more than 100,000 ducks and Canada geese (USFWS 2006).

Odessa Ground Water Management Subarea. Wildlife in the Odessa Subarea is typical of agricultural and modified grassland habitat types. Due to the significant modification of historic shrub-steppe habitats, only fragmented patches remain. In addition to the 13 anadromous fish species listed under the ESA by NOAA Fisheries, listed terrestrial wildlife that may occur in the study area include the bald eagle and pygmy rabbit (Reclamation 2006c,d). A large population of migratory mule deer is also present in the area (WDFW personal communication 2006).

3.8 Socioeconomics

The proposed alternatives might affect five distinct components of socioeconomic conditions in Washington: (1) the value of water-related goods and services; (2) the level and composition of jobs and incomes; (3) the distribution among different groups of the costs and benefits resulting from management of water resources; (4) the socioeconomic structure; and (5) economic risk and uncertainty. These factors are discussed below.

While not an element required under SEPA, this analysis of socioeconomics is included in this EIS to provide a general understanding of the potential economic impacts of the proposed Management Program. More detailed economic evaluations would be conducted for some specific projects, including a cost-benefit analysis for major storage projects.

3.8.1 Regional Economic Setting

3.8.1.1 Value of Goods and Services

Water and related resources are economically important when, as part of an ecosystem, they produce *goods and services*, such as those illustrated in Table 3-21, that benefit people, impose costs on them, or both (National Research Council 2005). The value of a good or service generally is measured in terms of the amount of money people are willing to pay to acquire it or the amount they require as compensation to relinquish it. Some goods and services have value when people use the basin's water and related resources, as when irrigators remove water from the river to irrigate crops, anglers fish in a reservoir, or developers build homes overlooking a pleasant view of the river and surrounding lands. Some goods and services have value even though people are not aware that they are using the basin's resources, as when wetlands and soils remove undesirable substances from ground water and vegetation removes them from the air.

Sometimes people place a value on a good or service even though they do not use the resources or intend to use them. These so-called non-use values materialize, for example, when people want to maintain for future generations the existence of species threatened with extinction, or to maintain a particular characteristic of a resource that they believe has cultural or ecological significance.

Today, the Columbia Basin's ability to provide water for irrigation and hydroelectricity is clearly important. Other valuable goods and services have long been associated with salmon and steelhead. These fish have been an important food for local residents, became products exported outside the basin, generated jobs and income, and constituted a central cultural, spiritual, and economic component of life within the basin's tribal communities. The fish also have been linked (Cederholm et al. 2000) to the ecosystem's ability to produce many other species and related goods and services. In a review of studies of the economic value the region has lost because of declines in fish populations, Corum (1987) concluded that, over the period 1960–1980, the aggregate loss associated with just commercial and recreational fishing was about $6.5 billion, expressed in 1980 dollars. This estimate does not include losses in the cultural, spiritual, and other non-use values incurred by members of the basin's tribes and by others, or the losses in values associated with the ecosystem's ability to produce other species and related goods and services.

The Management Program will affect socioeconomic conditions in the state insofar as it alters the supply and, hence, the value of individual goods and services, or if it affects the amount of money in the state's economy. An increase will be a benefit for the economy, while a decrease will be a cost.

Table 3-21. Functions, Goods, and Services of Water-Related Ecosystem

Functions	Examples of Goods and Services Produced
Production and regulation of water	Natural and human-built features capture precipitation; filter, retain, and store water; regulate levels and timing of runoff.
Formation and retention of soil	Wetlands and biota accumulate organic matter, and prevent erosion to help maintain productivity of soils.
Regulation of atmosphere and climate	Biota produce oxygen, and help maintain good air quality and a favorable climate.
Regulation of disturbances	Wetlands and reservoirs reduce flood damage by storing flood waters, and reducing and slowing flooding.
Regulation of nutrients and pollution	Wetlands improve water quality by trapping pollutants before they reach streams and aquifers.
Provision of habitat	Streams and reservoirs provide habitat for fish and wildlife.
Food production	Biota convert solar energy into edible plants and animals.
Production of raw materials	Streams possess energy convertible to electricity.
Pollination	Insects facilitate pollination of wild plants and agricultural crops.
Biological control	Birds, bats, and microorganisms control pests and diseases.
Production of genetic and medicinal resources	Genetic material in wild plants and animals provides potential basis for drugs and pharmaceuticals.
Production of ornamental resources	Products from plants and animals provide materials for handicraft, jewelry, worship, decoration, and souvenirs.
Production of aesthetic resources	Wetlands, riparian vegetation, streams, and reservoirs provide basis for enjoyment of scenery.
Production of recreational resources	Streams, reservoirs, riparian vegetation, fish, and wildlife provide basis for outdoor sports, eco-tourism, etc.

Functions	Examples of Goods and Services Produced
Production of spiritual, historic, and cultural resources	Wetlands, riparian vegetation, streams, and reservoirs serve as basis for spiritual renewal, folklore, group identity, etc.
Production of scientific and educational resources	Wetlands, riparian vegetation, streams, and reservoirs provide inputs for research and focus for on-site education.

3.8.1.2 Jobs and Incomes

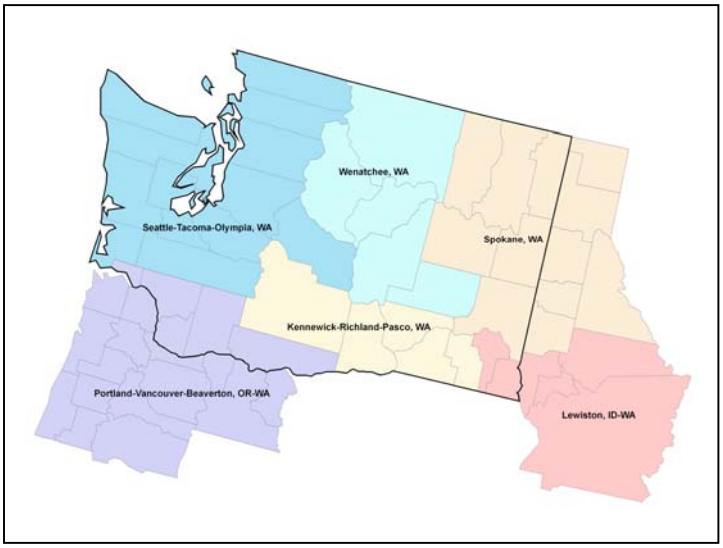
Water and related resources influence jobs and incomes through three mechanisms: providing goods and services that are inputs to commercial activities; producing goods and services that create a quality of life that influences household-location decisions; and providing other valuable ecosystem goods and services.

Commercial impacts materialize in the context of the state's six distinct regional markets for labor and local commerce, shown in Figure 3-14. Although municipal-industrial and other commercial uses of water are important, agriculture is the largest commercial user. However, Figures 3-15 and 3-16 show that agriculture's share of jobs and personal income has been declining for several decades, but less so in the Wenatchee and Tri-Cities regions. Expansion of irrigation historically has boosted the acreage and hence the jobs and income associated with small grain and forage crops, but generated little increase in the acreage of higher valued crops, because new acreage has displaced existing acreage of these crops (Hamilton et al. 1991).

Quality-of-life impacts materialize when amenities, such as water-related recreational opportunities, induce households to live nearby, and businesses expand to take advantage of the resulting increases in labor supply and consumer buying. Quality-of-life impacts have become more important in recent decades and now account for about one-half the interstate variation in job growth (Partridge and Rickman 2003).

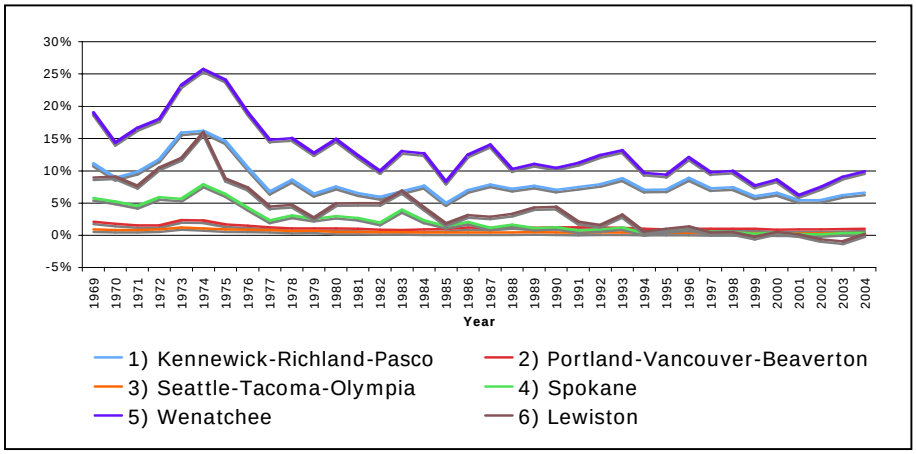
Radke and Davis (1995) estimated that if the Columbia Basin's populations of salmon and steelhead were at levels that existed prior to the development of dams and other activities that have had adverse effects, commercial and recreational fishing, plus related activities, would support 13,000–25,000 jobs and generate $254 million–$507 million of personal income annually, expressed in 1994 dollars. This estimate does not reflect jobs, incomes, and values associated with salmon-related recreational activities other than fishing, other salmon-related amenities that affect economic activity, salmon-related obligations to the basin's tribes, or resources other than salmon. Some water-related goods and services can influence jobs and incomes even though they are not direct inputs for commerce or amenities for households. Wetlands and floodplains, for example, can influence the risk of flood damage to downstream communities (Daily 1997).

Figure 3-14. Agriculture's Role in Washington's Regional Economies
Washington's Economic Regions



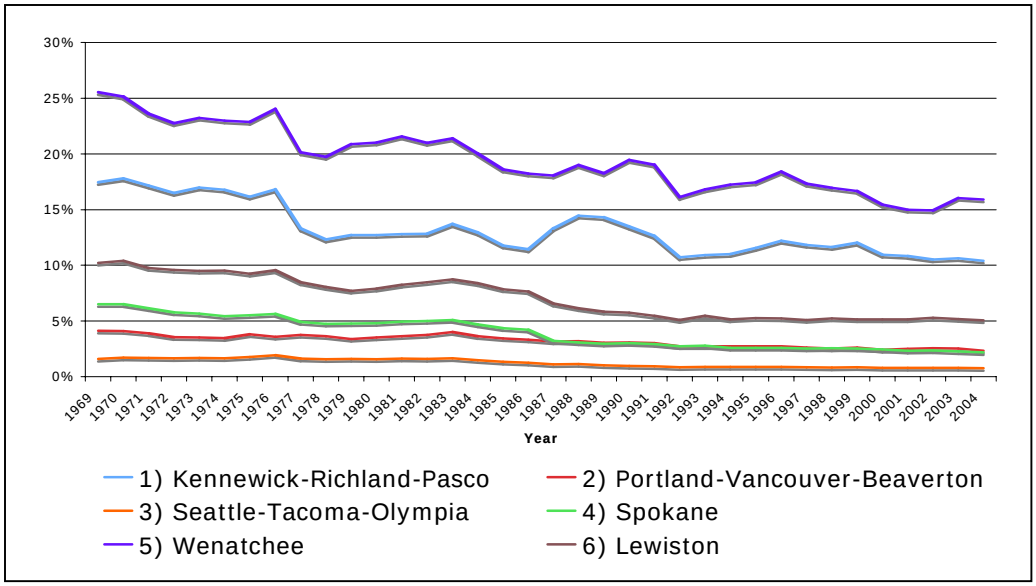
Source: Johnson and Kort (2004); Bureau of Economic Analysis (2006)

Figure 3-15. Farm Income as Percent of Total



Source: Johnson and Kort (2004); Bureau of Economic Analysis (2006)

Figure 3-16. Farm Employment as Percent of Total



Source: Johnson and Kort (2004); Bureau of Economic Analysis (2006)

Distribution of Costs and Benefits

The costs and benefits of water management decisions are sometimes not distributed equally among different groups. Decisions affecting salmon and steelhead, for example, can have important distributional effects governed by treaties, laws, and regulations (Independent Economic Analysis Board 2005). Also important is the unequal distribution resulting whenever those who enjoy the benefits of a good or service do not bear the full costs of its production. This outcome, which can arise from subsidies, the emission of pollutants, and other factors, increases jobs, incomes, and economic well-being for those who enjoy the benefits, and has negative effects on those who bear the costs. It also encourages the beneficiaries to consume the goods and services beyond optimal levels (Corps 1991).

Irrigators in the Columbia Basin receive subsidies as they fail to bear the full costs they impose on the overall economy when they divert water from streams and deliver polluted return flows to streams. Additional subsidies occur as irrigators use water without incurring the costs associated with these uses. Ortolano et al. (2000) estimated the subsidies that arise as irrigators in the Columbia Basin Project avoid paying the full costs of the intake structures, canals, pumps and other infrastructure that gather and deliver water to their fields, as well as the costs when diverted water is not available to generate hydroelectricity. They found the total to be at least $39 million, or about $17,000 per farm family, per year. Additional subsidies exist as irrigation activities adversely affect fish populations and the supply of other goods and services. In addition, many farms in the basin receive federal farm subsidies as well as subsidies for conservation of farm land. The Environmental Working Group (2006) has compiled federal data showing that federal subsidies of more than $2 billion were paid between 1995 and 2005 to farmers in 15 counties (Adams, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Grant,

Kittitas, Klickitat, Lincoln, Okanogan, Stevens, Whitman, and Yakima). The extent to which these subsidies are associated with irrigated farm lands is not known.

Socioeconomic Structure

Water management affects and is affected by the socioeconomic structure along legal, financial, and other dimensions. An important element of this structure is the state's water rights system, which gives priority to the oldest uses and users (refer to Appendix D for a discussion of water rights in Washington state). Though this system generates some types of economic growth, it also can impede growth by resisting innovation and water reallocation (Huppert et al. 2004; National Research Council 2004). Federal guidelines limit use of federal funds for water resource projects that would benefit one region at the expense of another, with no net gain in the national economy (U.S. Water Resources Council 1983).

Uncertainty and Risk

Risk is the probability that a decision will generate an outcome less desirable than intended. Sometimes risk can be quantified, but often it remains uncertain. Uncertainty and risk are economically undesirable, and, all else equal, decisions that reduce them are preferred over those that do not. Farmers and other water users often take steps to reduce or compensate for the risk of water shortage. For example, in the Walla Walla Basin, Willis and Whittlesey (1998) found that farmers facing uncertainty over the amount of water crops require and the availability of future water supplies typically apply 28 percent more water than crops require, on average, to reduce the risk that crops will become stressed between irrigations.

Uncertainty and risk also can affect the value of other goods and services. An increase in uncertainty about the future viability of a species and the risk that it might go extinct, for example, typically leads to an increase in the value of incremental changes in the species' population. Similar increases in incremental value can accompany an increase in uncertainty and risk regarding the future supply of fish and other resources that tribes and other groups consider essential for sustaining their cultural identity.

3.8.2 Columbia Basin Specifics

Several recent studies describe some of the Columbia Basin's water-related socioeconomic conditions. These include an analysis of the Columbia River Initiative by economists from the University of Washington and Seattle University (Huppert et al. 2004) and a derivative analysis by an economist at Ecology (Zhang 2004). These analyses prompted two critiques (Griffin 2005; Williams and Capps, Jr. 2005). Another recent study examined a potential water shortage in the Odessa Basin (Bhattacharjee and Holland 2005). Two additional reports (Olsen and White 2004; Olsen 2006) generally address the economics of water and water rights in the basin, and another report (Resource Dimensions 2006) examines the likelihood that different levels of fees paid to the state in return for new water diversions will yield sufficient funds for the state to purchase water to meet instream flow requirements during future droughts.

Other literature helps define the appropriate perspective for examining socioeconomic conditions in the basin (Griffin 2006; National Research Council 2005; U.S. Water Resources Council 1983). This perspective emphasizes describing the incremental, or marginal, changes in the

economy attributable solely to the Management Program, taking into account the economy's adaptive response to it.

3.8.2.1 Value of Goods and Services

The Columbia Basin's water and related resources produce many goods and services, but there exists no accounting of their overall value. Economists have, however, estimated the overall value of irrigation and the value of marginal (incremental) changes in the supply for irrigation and a few other goods and services. Table 3-22 shows, by major crop, the current acreage and the average per-acre irrigation, gross economic return, and net economic return (revenues minus production costs). Net economic return ranges from negative $12 for hay to positive $464 for potatoes (Huppert et al. 2004). Table 3-23 shows the net economic return per acre-foot of water diverted for irrigation ranges from negative $91 to positive $147 per acre-foot, depending on crop, for the basin as a whole, and from negative $82 to positive $129 within the Columbia Basin Project (Huppert et al. 2004). For hay, wheat, and "other crops", the production cost exceeds the gross value of the crop and the net return is negative. Farmers continue to grow these crops, though, because from a cash-accounting basis, they are able to overlook some costs, such as the costs of using equipment and property that have already been paid for (Huppert et al. 2004).

Table 3-22. Estimated Acreage, Average per-Acre Irrigation, and Local Economic Returns, by Crop

	Hay	Orchards	Vegetables	Other	Potatoes	Wheat
Acres	319,707	200,689	141,939	195,934	159,100	224,668
Irrigation (acre-feet)	4.43	3.53	2.59	2.82	2.97	2.77
Gross economic return per acre	$877	$5,485	$1,408	$961	$3,122	$344
Net economic return per acre	-$25	$312	$276	-$271	$464	-$99

Source: Huppert et al. 2004

Table 3-23. Estimated Average Net Economic Return per Acre-Foot of Water Diverted

	Hay	Orchards	Vegetables	Other	Potatoes	Wheat
Entire region	-$5	$82	$89	-$91	$147	-$34
Columbia Basin Project	-$5	$67	$96	-$82	$129	-$29

Source: Huppert et al. 2004

Table 3-24 shows recent estimates of the marginal value of some water-related goods and services. The top portion focuses on irrigation. Ecology has estimated the cost of developing new water sources (728,000 acre-feet) at $17 per acre-foot (Zhang 2004). To the extent that Washingtonians provide the money, then the development would impose a cost on the state's economy. However, if residents of other states provide the money, their contributions would benefit the economy. Taking into account only the local effects, and assuming marginal changes will have the same characteristics as current averages, the value of marginal changes in irrigation water ranges from negative $91 to positive $147 per acre-foot for the basin as a whole, and from negative $82 to positive $129 within the Columbia Basin Project (Huppert et al. 2004).

Table 3-24. Estimates of Marginal Value of Selected Water-Related Variables

Variable	Marginal Value	Source
Development cost of new water	($17/ac-ft)	Zhang (2004)
Water for irrigation, local perspective		
Entire basin	($91) – $147/ac-ft	Huppert et al. (2004)
Columbia Basin Project	($82) – 129/ac-ft	Huppert et al. (2004)
Water for irrigation, state perspective	($60) – ($70)/ac-ft	Williams and Capps, Jr. (2005)
Water for municipal-industrial use	$65 – $452/ac-ft	Zhang (2004)
Water for hydropower (Lake Roosevelt downstream)	$37.39/ac-ft	Huppert et al. (2004)
Water for hydropower (Wells Dam downstream)	$15.65/ac-ft	Huppert et al. (2004)
Water for hydropower (McNary Dam downstream)	$7.46/ac-ft	Huppert et al. (2004)
Water for navigation	$5.60/ac-ft	NRC (2004)
Water for general recreation	$7.70 – $130/ac-ft	NRC (2004)
Water for waste assimilation	$0.20–$0.28/ac-ft	NRC (2004)
Water for ecosystem functions	$21	Brown (2004)
Salmon & steelhead population	$715/fish	Huppert et al. (2004)
Sediment pollution in streams	($12)/ton	Ribaudo (1989); Pimentel et al. (1995)
Nitrogen pollution in streams	($1,930) – ($16,000)/ton	Hey et al (2005)
Phosphorus pollution in streams	($1,830) – ($3,400)/ton	Hey et al. (2005)

These values account only for the direct effects on irrigators who would benefit from an increased supply of water, assuming that any increase in supply of irrigated crops would have no impact on the overall market. Williams and Capps Jr. (2005) relaxed this assumption and considered the likelihood that, all else equal, for most crops an increase in supply would cause prices to fall. They concluded that the increase in the supply of irrigation water examined by Huppert et al. (2004) would be large enough to cause the prices of most irrigated crops to decline significantly. As a consequence, the earnings of existing producers of irrigated crops would fall below what they would be without the increase in irrigation. They further concluded that the increase in irrigation would result in a negative effect on the earnings of farmers as a whole: the overall impact on farmers' earnings would be between negative $60 and negative $70 per acre-foot of additional irrigation water. These findings do not necessarily contradict the findings of Huppert et al. (2004), who acknowledged the importance of, but did not calculate, the downward pressure that an increase in irrigation supplies would exert on prices and farmers' overall earnings. Negative price effects have been seen previously, for example, between 1997 and 2002, when irrigated acreage in Washington increased 20 percent but the value of the crops grown on these acres grew only 4 percent (Wines no date) or, when adjusted for inflation, decreased.

Olsen (2006) says several "problems/issues" in the analysis by Williams and Capps Jr. (2005) affect their conclusions, but he provides little or no support for this assertion. For example, he asserts that any increase in the supply of water for irrigation would "be primarily used for high value crops" but provides no supporting data and does not address, let alone disprove, the contrary evidence provided by Williams and Capps Jr. (2005).

The middle rows of Table 3-24 show the estimated, marginal value per acre-foot of water for municipal-industrial use, hydropower, navigation, general recreation, waste assimilation, and ecosystem functions. The estimate for municipal-industrial use exceeds the others. The hydropower values represent all the electricity that would be generated at all dams downstream from the indicated point on the Columbia River. The estimates for navigation, recreation, and waste assimilation are typical for the region and are not site-specific. The estimate for ecosystem functions represents the marginal value of water protected or acquired for environmental purposes on national forest lands in the Pacific Northwest.

The bottom of Table 3-24 shows estimates of marginal values for fish populations and pollution. The marginal value of salmon and steelhead has been estimated to be $715 per fish, reflecting Washingtonians' current willingness to pay to diminish the risk of extinction and to restore healthy fish populations. This estimate updates smaller values reported earlier by Olsen and White (2004). The marginal value is not fixed. It probably would rise (or fall) in the future with increases (or decreases) in the state's human population, for example, or with decreases (or increases) in fish populations. The marginal value does not represent the aggregate value of existing fish populations, past reductions in fish populations, or greater-than-marginal future changes in fish populations. In a presentation to the committee that produced Huppert et al. (2004), Olsen and White (2004) stated that, with water levels equal or above the average of recent years, a marginal change in instream flow would be too small, relative to total flow, to have a perceptible impact on fish populations and, hence, the fish-related impact would have zero economic value.

Pollutants in streams and rivers have a negative value. Agriculture and some urban-industrial areas in the basin contribute heat energy, sediment, nutrients, pesticides, and pharmaceuticals into the basin's water supplies (National Research Council 2004; Ribaudo and Johansson 2006). Estimates of marginal value are available only for sediment, nitrogen, and phosphorus in streams. The estimate for sediment reflects the on-site loss of agricultural soil productivity and some off-site damages, such as costs to clean clogged stream channels, but not the costs of impacts on salmon and other environmental impacts. The estimates for nitrogen and phosphorus, derived in the Midwest, reflect the cost of removing these pollutants from streams using either wetlands and riparian forests (less expensive) or treatment plants (more expensive).

Incremental changes in water use in the basin might affect the value of goods and services beyond just those shown in Table 3-25. Increases in agricultural, municipal, and industrial uses, for example, might result in increased emission of pollutants (including total dissolved gases) that would diminish water quality downstream, and increases in hydropower generation might increase the mortality of young salmon. A possible overall effect is that water temperatures could be adversely impacted. Decreases in these uses might have the opposite effects. The estimates in Table 3-25 of the marginal values associated with different water uses do not reflect these spillover effects, or environmental externalities. Externalities are economic consequences of one's actions that accrue to somebody else. This omission does not mean the externalities do not exist, only that economists have not estimated them.

Table 3-25. Estimated Statewide Employment per 1,000,000 Acre-Feet Diverted in the Columbia River Basin (Huppert et al. 2004)

	Employment	
	Direct	**Total**
Agriculture	18,420	44,841
Hydropower, statewide	- -	154 – 205

3.8.2.2 Jobs and Incomes

The basin's water and related resources affect jobs and income when they are used commercially, influence household-location decisions, and provide environmental services that influence the cost of living and working in the area. Commercial effects arise primarily from agricultural use of water. Table 3-25 shows a recent estimate by Huppert et al. of the employment created from the diversion of 1 million acre-feet (Huppert et al. 2004). Employment in industries (field and seed crops, vegetables and fruit, canning and preserving, grain milling, and beverages) directly involved in producing and processing irrigated crops totals 18,420 jobs. Additional employment is generated through the multiplier effect, as the purchases of farms and farm workers generate jobs in other industries, for example, and raises the total to 44,841. Insofar as the diversion of water for irrigation reduces the amount of water available to generate hydropower, it reduces statewide hydropower-related employment by 154 – 205 jobs.

Water used for other purposes, such as recreation and commercial fishing, also affects jobs, but these impacts have not been estimated, even though their contribution to the local and regional economy is far from negligible. The 2002 agricultural census, for example, found that farms and ranches in Washington produced crops and livestock with a commercial net value, exclusive of government subsidies, of about $5.3 billion (USDA 2004). In comparison, a 2001 survey found that the resources supporting fishing, hunting, and wildlife-watching activities in the state had a value of about $2.2 billion (USFWS and U.S. Census 2003). The U.S. Forest Service (Haynes and Horne 1997) has estimated that the average, net economic value of fishing on federal lands in eastern Washington was $1.22 – $6.58 per acre, in 1994 dollars. The study also estimated per-acre values for other resource-related, recreational activities on federal lands in Eastern Washington: hunting ($3.22 – $1.47); viewing wildlife ($0.32 – $0.60); day use ($0.68 – $4.20); trail use ($0.48 – $9.28); viewing natural resources from a motor vehicle ($0.19 – $5.09); motor boating ($0.04 – $0.02); and non-motor boating ($0.05 – $0.07). The same study stated that, between 1991 and 1993, recreation activities supported 18,640 jobs in the Tri-Cities area, of which 45 jobs were related to fishing, 145 to hunting, 9 to viewing wildlife, 70 to day-use recreation, 50 to trail use, 190 to viewing natural resources from a motor vehicle, 15 to motor boating, and 7 to non-motor boating.

Water-related and other natural resource amenities appear to affect the location decisions of some households in the basin (McGranahan 1999) but their influence on jobs and incomes has not been quantified. Similarly, the basin's water-related ecosystem provides services, such as absorbing and removing impurities from water and mitigating flooding, that affect the cost of living and working in the basin, but their effects have not been quantified (National Research Council 2004).

3.8.2.3 Distribution of Costs and Benefits

There are pervasive opportunities for one individual, business, or group to enjoy economic benefits derived from the basin's water and related resources with some or all of the costs falling on others. These opportunities arise, in large part, because these resources are not managed through mechanisms comparable to those that exist in markets (National Research Council 2004; Houston et al. 2002). Hence, recreationists, irrigators, commercial fishers, households, municipalities, electric utilities, barge owners, and industries can use water without having to pay the equivalent of a market price for what they use. Activities that produce agricultural, hydropower, or other benefits but degrade habitat for salmon and habitat can impose costs on anglers and commercial fishers, in the basin and throughout the northeast Pacific region, and on individuals who place a non-use value on the species and may live locally or far away (Fluharty 2000; National Research Council 2004). Conversely, persons successful in constraining activities harmful to fish can enjoy the benefits of their success without compensating those whose activities are constrained. Irrigators and others can enjoy the benefits of water extracted from a constrained aquifer without compensating others, including future generations, who would use it.

Economists have recommended further development of markets or market-like institutions to manage water and related resource in the basin, but to date there has been little progress (Fluharty 2000; Houston et al. 2002; National Research Council 2004). Environmental regulations and voluntary actions sometimes have the effect of bringing the costs of water uses closer to the benefits, as when irrigators, municipalities, and industries incur the costs of reducing their water use and their emissions of pollutants to water bodies. Significant opportunities for conserving water and protecting water quality go unrealized, however, even when the benefits to a water user of seizing such an opportunity would more than compensate for the costs. Schaible (2000), for example, found that irrigators in the Pacific Northwest (Idaho, Washington, and Oregon) have not taken steps toward conservation that would reduce water diversions by 1.7 million acre-feet per year, even though economic analysis indicates that taking these steps would generate substantial net economic benefits or minimal net costs. Several factors slow the pace of conservation: many believe water laws force them to use the water to which they are entitled or lose the entitlement; they would lose control over any conserved water and hence, the benefits would accrue to and benefit others; they lack sufficient financial resources and/or would incur significant financial risk to implement conservation measures; and the cost of resolving uncertainty surrounding conservation is too high to overcome (National Research Council 2004; Schaible 2000).

3.8.2.4 Socioeconomic Structure

Many aspects of economic activity and social organization in the basin have long been tied directly to water. Harvest of salmon and steelhead has provided a cultural focus and the basis for much economic activity for the members of tribal groups, non-tribal commercial fisheries, and recreational fisheries (Fluharty 2000). Irrigation has enabled the expansion of agriculture, and hydropower has enabled the flow of electricity to homes and businesses throughout the western states. Water for municipal and industrial uses supports urban development. The federal government plays a dominant role in managing the river, the state oversees management of water rights, local utilities and irrigation districts manage water within their control, and tribes exercise their treaty rights over some river resources.

3.8.2.5 Risk and Uncertainty

Major concerns about risk and uncertainty have been expressed regarding habitat for salmon and steelhead, especially during critical times and conditions, and for irrigators, especially during times of drought for those who have invested in orchards and other perennial crops (Huppert et al. 2004; National Research Council 2004). Withdrawals of surface water increase the risk to salmon and steelhead, but the levels of risk are understood only in broad, qualitative terms and, hence, water management decisions in the basin necessarily must be made in the face of uncertainties. To avoid risks to salmon and steelhead that are unacceptable within the current regulatory climate, if additional withdrawals are allowed they should be terminated during periods when habitat conditions are critical for fish conservation (National Research Council 2004). Refer to Section 3.7 for a discussion of the effects of water management on fisheries.

Resource Dimensions (2006) examined the likelihood that potential fees paid to the state in return for permission to withdraw additional surface water for irrigation and other uses would yield sufficient funds for the state to secure water to increase stream flows during future drought years. The authors concluded that several uncertainties and risks would affect the sufficiency of the accumulated funds. Among the most important are the length of time funds accumulate before a drought occurs, the duration and intensity of future droughts, the extent to which water would be available during future droughts for the state to acquire, and the management of the accumulated funds. Given these uncertainties and risks, the authors recommend charging a fee of $30 per acre-foot until there is sufficient evidence indicating that a lower fee would provide funds to secure sufficient water for instream flow during future droughts. They also recommended that the state commit to supplement the accumulated funds if they prove insufficient to mitigate future droughts.

Farmers and state agencies have demonstrated an extensive ability to adapt to drought. Farmers leave land fallow, shift water from low- to high-value crops, and obtain water from emergency sources, such as new wells. Ecology and other agencies can lower minimum streamflow requirements, allow emergency wells, and lease water from irrigators to increase streamflows. In the 2001 drought, 330 farmers in the Columbia Basin had to curtail water use. Apple and potato production declined 10 percent and 2 percent, but prices rose 42 percent and 38 percent, and total value rose 20 percent and 24 percent, respectively (Washington State Department of Community, Trade and Economic Development et al. 2005).

3.8.3 Early Action Study Areas

Until the 1960s, farming in the Odessa area involved dryland production of wheat. Since then farmers have irrigated 170,000 acres with ground water from deep wells, but withdrawals have caused the water level to decline and future declines may render irrigation infeasible (Bhattacharjee and Holland 2005). Concern has been expressed especially for the future production of potatoes, among the most water-intensive crops, on 36,000 acres with an annual yield of about 21 million hundredweight, worth about $100 million (Bhattacharjee and Holland 2005) or about 20 to 25 percent of the statewide total.

3.9 Land and Shoreline Use

Land use in the project area is highly diverse. Portions of the Cascade Mountains are federally owned wilderness areas, national parks, national recreation areas, and national forests. The national forests are managed for multiple uses, including commercial timber production and recreation. Private forest lands are also common in these mountainous areas as well as in northeastern Washington.

Areas around Spokane, Richland, Kennewick, Pasco, Yakima, and Wenatchee in eastern Washington, and around Vancouver in southern Washington, are characterized by urban levels of development. These urbanized areas host much of the project area's population, as well as its manufacturing, commercial, and service industry base.

The project area also contains extensive agricultural development, especially in eastern Washington. The Yakima, Wenatchee, and Okanogan River valleys and the central Columbia River Basin include large-scale irrigated agriculture. Southeastern Washington is extensively developed for dry-land farming, primarily wheat.

In the portions of the project area north and east of Lake Roosevelt, in the Cascade Mountains, and west of the Cascades to the mouth of the Columbia River, the predominant land use is forest, ranging from 53 to 91 percent of the land area. In the central portion of the project area—the area most likely to be affected by the Management Program—the predominant land uses are agriculture and rangeland. Agricultural uses in the central portion of the project area range from 30 to 73 percent of the land area, and rangelands comprise from 26 to 80 percent of the land area. Urban uses are only significant in and around Vancouver (WRIA 28) and Spokane (WRIA 57), where urban uses account for approximately 23 percent of land area. Additional information on land use in the project area can be found in Table 4-2 of the Final EIS for Watershed Planning (Ecology 2003b).

3.9.1 Future Land Use

Counties and cities that have experienced significant growth over the last several decades are required to prepare comprehensive plans under the state's Growth Management Act (GMA) (Chapter 36.70A RCW). The GMA requires affected cities and counties to designate their rural areas and urban growth areas and to conduct capital facilities planning to ensure that adequate public facilities are provided concurrent with future growth within designated urban growth areas. The GMA also requires that all counties and cities develop and adopt development regulations to protect environmentally critical areas such as wetlands, fish and wildlife habitat, and aquifer recharge areas. Regulations must also be adopted to protect natural resource lands, which include agricultural, forest, and mineral resource lands. Figure 3-17 shows counties that are required to fully plan under GMA and major urban growth boundaries in the Management Program project area.

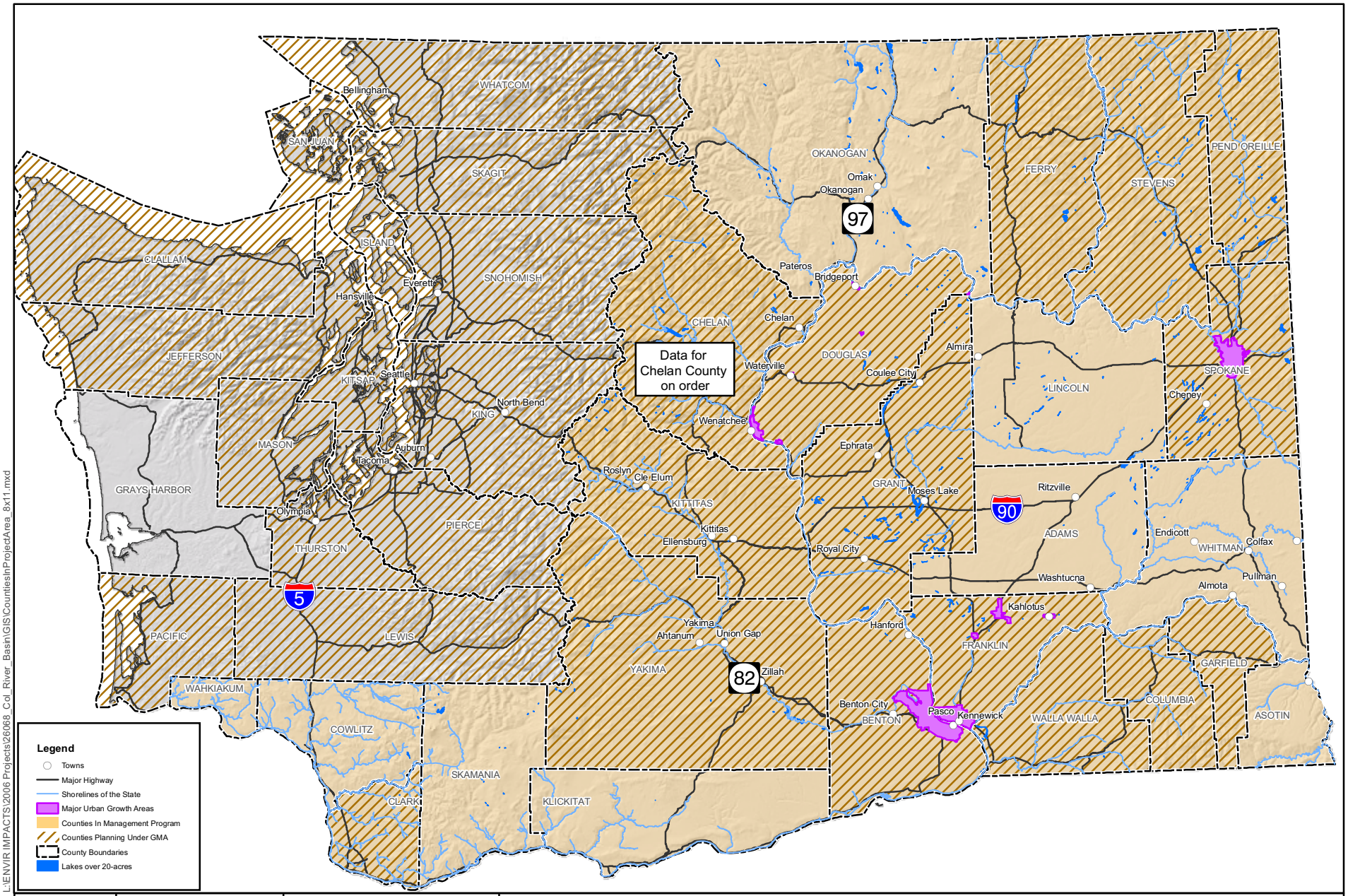


FIGURE 3-17

COUNTIES PLANNING UNDER GMA AND SHORELINES OF THE STATE

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Of the 25 counties in the Management Program project area, the 19 that are located in eastern Washington are most dependent on the water supplies that could be affected by the Management Program. The total population of the 19 counties in the project area in eastern Washington was estimated to be approximately 1.38 million people in 2006 (OFM 2006). Two of the four fastest-growing counties in the state, in terms of percent change since the 2000 U.S. Census, are in the Management Program project area in eastern Washington: Franklin County (22.6 percent) and Benton County (11.0 percent) (OFM 2005). Six counties in eastern Washington have already exceeded the estimated low end of the range for population growth through 2025. The total population of the project area's 19 counties in eastern Washington is projected to grow to between 1.45 and 2.01 million people by 2025 (OFM 2002). Most of this growth is expected to occur in within counties planning under GMA, and is planned to occur within urban growth areas.

3.9.2 Shorelines

Many of the activities that would occur under the Management Program would be located within shorelines of the state. These areas are governed under shoreline master programs developed under the authority of the state's Shoreline Management Act (Chapter 90.58 RCW). "Shorelines of the state" are the total of all "shorelines" and "shorelines of statewide significance" within the state (RCW 90.58.030(2)c.)

"Shorelines" is defined in the Shoreline Management Act as:

> *…all of the water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except (i) shorelines of statewide significance; (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less and the wetlands associated with such upstream segments; and (iii) shorelines on lakes less than twenty acres in size and wetlands associated with such small lakes;…* (RCW 90.58.030(2)d.)

"Shorelines of statewide significance" within the Management Program project area include the following water bodies and the land within 200 feet of the ordinary high water mark:

> *Those lakes, whether natural, artificial, or a combination thereof, with a surface acreage of one thousand acres or more measured at the ordinary high water mark;*
>
> *Those natural rivers or segments thereof as follows:*
>
> *Any west of the crest of the Cascade range downstream of a point where the mean annual flow is measured at one thousand cubic feet per second or more,*
>
> *Any east of the crest of the Cascade range downstream of a point where the annual flow is measured at two hundred cubic feet per second or more, or those portions of rivers east of the crest of the Cascade range downstream from the first three hundred square miles of drainage area, whichever is longer;…* (RCW 90.58.030(2)e)

Local shoreline master programs, which must be approved by Ecology, are intended to protect shoreline ecology, public access, and water-dependent uses and to require mitigation of impacts where appropriate.

3.9.3 Tribal and Federal Lands

Substantial portions of the Management Program project area are reserved under treaties with Native American tribes. These areas of the state are not subject to the GMA and Shoreline Management Act. Each tribe or confederation of tribes enacts its own laws to control land use and protect natural resources on lands within the reservation.

The federal government controls and manages a substantial area of land in the Management Program project area, including forests, rangeland, national parks, the Hanford Nuclear Reservation, the Hanford National Monument, and other lands. Federal activities on these lands are not subject to the local regulations or the Shoreline Management Act, but federal policies generally direct that activities of the federal government should be consistent with local regulations to the extent feasible within the mission of each agency.

3.9.4 Early Action Study Areas

3.9.4.1 Lake Roosevelt Drawdowns

Land Use Near Lake Roosevelt

Lake Roosevelt is approximately 140 miles long and is nearly surrounded by the Lake Roosevelt National Recreation Area (NRA) (Figure 2-3). Under the 1990 *Lake Roosevelt Cooperative Management Agreement*, the lake is jointly managed by the Bureau of Reclamation (Reclamation), National Park Service (NPS), Bureau of Indian Affairs (BIA), Confederated Tribes of the Colville Reservation (Colville Tribes), and Spokane Tribe. The NPS manages 312 acres of shoreline, 47,438 acres of the 81,389-acre water surface, and 12,936 acres of land within the NRA. With the exception of waters surrounding Grand Coulee Dam, which are overseen by Reclamation, the NRA's remaining water surface is contained within the Reservation Zone and managed by the Colville Tribes and Spokane Tribe. A substantial portion of Lake Roosevelt is within the boundaries of the Spokane and Colville Reservations.

The Colville Tribes oversee much of the NRA's western shoreline and waters, which are adjacent to the 1.4-million-acre Colville Reservation. The Spokane Tribe oversees waters and shorelines near the Spokane River's confluence with Lake Roosevelt, which are adjacent to the 157,376-acre Spokane Indian Reservation. Within the Reservation Zone, the Colville and Spokane Tribes "retain the right to beneficially develop and utilize the natural resources and to develop economic enterprises that are compatible within the character of the (Management Area), subject to federal statutory requirements" (Lake Roosevelt Cooperative Management Agreement 1990). The Tribes generally manage the area for hunting, fishing, forestry, and other natural resource-oriented purposes. In particular, the Colville Tribes retain the right to fish throughout Lake Roosevelt, and the Spokane Tribe retains the right to fish in Lake Roosevelt waters abutting the Spokane Reservation. Some irrigated agriculture lands are adjacent to the recreation area (Cassidy 1997a).

Title 16 of the United States Code Subchapter One directs the NPS to:

> *Promote and regulate the use of the Federal areas known as national parks, monuments, and reservations* (later amended to include all units of the NPS), *which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

Within the Lake Roosevelt NRA, the NPS manages 22 boat launch ramp areas, 27 campgrounds, and three concessionaire-operated marinas that provide moorage, boat rental, fuel, supplies, and other services to the public. Visitation to the NRA has been between 1.3 and 1.5 million for the last several years. Parts of the NRA have been managed for grazing since 2001, and a prescribed fire program is being developed for the fire-dependent (seral) ponderosa pine forests in the area.

Land Use in Areas to Receive Additional Water from Lake Roosevelt Drawdowns

Lands that could receive additional water from the Lake Roosevelt drawdowns fall into two major categories: lands to receive water in non-drought years, and lands to receive water in drought years. In non-drought years, municipal and industrial lands in the Columbia Basin Project area and lands within the Odessa Subarea could receive additional water.

Municipal and industrial uses that could receive additional water for use in non-drought years would be located in the Columbia Basin Project area. The Columbia Basin Project area is located east of the Columbia River in an area dominated by agricultural uses, with a number of small municipalities including Moses Lake, Ephrata, Othello, Quincy, and Ritzville (see Figure 2-2). Municipal and industrial users who would benefit from this new water supply would most likely be within existing cities and towns but could also include new uses outside of these areas. The Odessa Subarea is primarily agricultural, and lands that would receive water from the drawdowns in this subarea are existing irrigated farmland.

During drought years, land along the Columbia River with interruptible water rights could receive additional water. Water users on the Columbia River who have interruptible water rights include agricultural, residential, and industrial users. These users are located within one mile of the mainstem of the river, primarily in the central Columbia River Basin. Depending on the definition adopted for the mainstem Columbia River, this could also include a one-mile distance from the backwater areas on tributaries of the river as well (see Section 6.1.10 for additional information).

3.9.4.2 Supplemental Feed Route

Upper Crab Creek is in the area north and east of Moses Lake (Figure 2-1). Land use along Upper Crab Creek is primarily pastureland and publicly owned arid steppe lands managed for wildlife. The area around Brook Lake includes a few homes and commercial orchards. Limited areas of irrigated farmland are adjacent to the stream north of the City of Moses Lake and downstream from Brook Lake. Low-density urban residential development is near the stream as it approaches and enters the City of Moses Lake.

Land use along the existing portion of the W20 Canal is primarily irrigated farmland. The area where the W20 Canal would be extended is primarily grassland.

Land use along the Frenchman Hills Wasteway is primarily irrigated farmland. There is a small area of urban residential development adjacent to the canal in the town of Quincy, and the area near the mouth of the canal at Potholes Reservoir is arid steppe land managed as a wildlife area and as a state park. The Potholes Reservoir area is used for recreation, including camping, boating, and fishing.

Land use along the East Low Canal is a mixture of irrigated and non-irrigated farmland and arid steppe lands.

Land use in the Potholes Reservoir area includes irrigated farmland and arid steppe lands primarily managed for wildlife habitat, campgrounds, and boating facilities. The Moses Lake area includes urban uses and recreational uses along the lake, including residences and facilities for boating.

3.9.4.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The CSRIA represents farming operations in eastern Washington that irrigate about 250,000 acres of row crop, vineyard, and orchard lands. Their members have farming operations along the Columbia-Snake River system north from Brewster, reaching to the south along the John Day and McNary Pools**.** Some of the members own farming operations in the Yakima Valley and within the Columbia Basin Project area. The membership also includes several municipal service irrigators, including Brewster, Kennewick, West Richland, and the Kennewick Irrigation and Hospital Districts. Projects proposed for the CSRIA Voluntary Regional Agreement could participate in the program.

3.10 Cultural Resources

Because this is a programmatic EIS, the cultural resources overview of the large Management Program area is necessarily general. Some of the specific projects within the Management Program will require a more detailed cultural resource analysis at the project level. This section describes the legal framework for the protection of cultural resources and presents a general overview of the history and cultural resources of the area.

3.10.1 Legal Framework for Protection

Cultural resources are protected at both the state and federal level. Cultural resources are defined as buildings, objects, sites, or structures that are of historic, cultural, archaeological, scientific, and/or architectural significance.

Washington State Executive Order 05-05 establishes a review process by the Department of Archaeology and Historic Preservation (DAHP) and affected tribes for capital projects or land acquisition proposed by state agencies. Ecology has initiated the project review process for the Management Program with DAHP. Ecology may need to initiate the project review process in the future for specific projects proposed under the Management Program.

SEPA requires that cultural resources within a proposed project area must be identified, and that measures must be proposed to reduce or control impacts on these resources. Under SEPA, DAHP provides formal opinions on sites' significance and the impact of proposed projects on such sites. Other state laws governing cultural resources protect Native American graves (RCW 27.44), abandoned historic cemeteries (RCW 68.60), and archaeological sites (RCW 27.53); these laws contain clauses regarding the inadvertent discovery of cultural resources during activities such as construction.

Specific projects proposed under the Management Program may necessitate federal permits or funding, which would require compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Section 106 requires that the effects of an undertaking on historic properties within the project's Area of Potential Effects (APE) must be considered. The federal code implementing Section 106 (36 CFR 800) includes a requirement that an effort must be made to identify historic properties.

The significance of the resources that may be affected by an action must be addressed using established criteria (36 CFR 60.4) for the National Register of Historic Places (NRHP). The criteria for NRHP eligibility are listed in 36 CFR 60 as follows:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and
>
> (a) That are associated with events that have made significant contributions to the broad pattern of our history; or
>
> (b) That are associated with the lives of persons significant in our past; or
>
> (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) That have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60).

If a resource is determined to be eligible under the NRHP, then Section 106 and its implementing regulations require that effects of the proposed project on that resource must be determined. If NRHP-eligible resources are identified that would be adversely affected by the project, then prudent and feasible measures to avoid or reduce these adverse impacts must be taken. In addition, the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) must review and comment on these measures. The ACHP has adopted regulations (36 CFR 800) that implement this commenting authority.

The NHPA also requires the permitting or funding federal agency to conduct preservation-related activities in consultation with the SHPO, local governments, Indian tribes, and other interested parties.

Other federal laws that may apply at the project level include the Native American Graves Protection and Repatriation Act (PL 101-601), which regulates the inadvertent discovery of Native American human remains on federal or tribal land; the Archaeological Resources Protection Act (16 USC 470aa-470mm), which regulates excavation of sites on federal lands; and the American Indian Religious Freedom Act (42 USC §§ 1996, 1996a), which affirms the right of Native Americans to access their sacred places.

3.10.2 Overview of Cultural Resources in the Project Area

For the purposes of this programmatic EIS, the project area is considered to be all lands east of the Cascade Mountains to the Washington-Idaho border and south to the Columbia River. This encompasses all or part of 25 counties within Washington. Most of this area is within the cultural area generally known as the Columbia Plateau or Plateau region (Walker 1998); a smaller portion is considered part of the Southern Northwest Coast culture area (Suttles 1990). The area is considered rich in cultural resources because of the long history of occupation by tribal groups.

Cultural resources that might be potentially identified in the project area could represent any aspect of 11,000 years of human occupation and land use. Physical property types and landscape elements directly associated with past and present human behavior could include buried archaeological deposits and above-ground, built features such as rock cairns; landscape characteristics important to traditional Native American subsistence, spiritual, and religious practices; structures related to recent historic agricultural and industrial developments; and other features that are potentially significant to the ethnic identity of a social group.

Pre-contact archaeological resources could range in age from 11,000 BP (years before present) to AD 1800. Archaeological materials already documented in the region include Paleo-Indian artifact caches, lithic (stone) procurement sites, cairns, trails, camps and villages, food and medicine procurement sites (including hunting blinds, fish weirs, camas fields, berry processing areas), and burials. Historic resources may include structures, sites, or land alterations related to agriculture, transportation, homesteading, mining, logging, irrigation, orcharding, as well as historic cemeteries or graves of both Euro-American and Native American groups. Traditional cultural properties are presumed to be present in the project area and might include places that are important to sustaining community traditions or culturally important activities.

Because of the vastness of the project area and the potential for a new reservoir, it is important to understand the cultural resources previously identified within other reservoirs on the Columbia River. Table 3-26 summarizes the number of recorded cultural resources within 13 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. The number of recorded cultural resources identified is affected by the year of dam construction, the year of archaeological investigation, and the surface area of the pool. It is probable that a new project would result in identification of a higher proportion of cultural resources due to more refined archaeological methods.

Table 3-26. 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)
Ice Harbor (1959)	Walla Walla District USACE	62	8,375 (low flow, flat pool)
Lower Monumental (1961)	Walla Walla District USACE	197	6,590 (low flow, flat 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

3.10.2.1 Distribution of Native Groups

In 1850, at least 25 Native groups lived in the Columbia Plateau region, with boundaries of some groups extending into Canada, Idaho, and Oregon (Ray 1936). Generally, one Native group is identified within the Northwest Coast portion of the study area (Suttles 1998). Today the reservation lands of the Confederated Tribes of the Colville Reservation, Spokane Tribe of Indians, Kalispell Tribe of Indians, and Confederated Tribes and Bands of the Yakama Nation are located within the study area. The Cowlitz Tribe does not have a reservation, but their traditional territory is also within the study area. The Chinook Nation, a non-federally recognized tribe, also has its traditional territory within the project area, as does the Wanapum Band. In addition, federally recognized non-Washington state tribes have ceded territories in Washington, including the Confederated Tribes of the Umatilla Indian Reservation and Confederated Tribes of Warm Springs in Oregon, and the Nez Perce Tribe and Coeur d'Alene Tribe in Idaho.

Linguistically, native peoples of the Columbia River Basin were either Salish speakers or Sahaptin speakers, with Salish generally spoken by groups to the north and Sahaptin spoken in the south (Ray 1936). The Chinookan language was spoken in the Northwest Coast portion of the project area.

3.10.2.2 Traditional Land Use

Traditional land use in the project area may have included hunting for birds and both small and large game; seasonal gathering of roots, berries, and other plant resources; and fishing. Fish of all types were caught in rivers, lakes, and streams through a variety of methods such as weirs, traps, platforms, or nets. Villages, seasonal camps, resource procurement sites, and ritual sites have been documented both archaeologically and ethnographically, revealing over 11,000 years of human land use in the project area.

The access to the spring and fall salmon runs was shared or traded with most other groups, both in and outside the region. 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, summer foraging required a semi-nomadic existence as families moved from place to place collecting camas, roots, berries, and nuts. Hunting various localized game was supplemented throughout the year. Columbia River islands were often the locations of burials, as were areas adjacent to streams.

Today, different Native American groups continue to have access to their "usual and accustomed places" for a variety of traditional uses, including in areas outside of present-day reservations. In the Columbia River Basin this includes access to traditional fishing areas along the river and its tributaries, and hunting and gathering in shrub-steppe habitat.

3.10.2.3 Euro-American History of Region

The early nineteenth century saw the arrival of Euro-American explorers and fur traders in the Columbia River Basin. By mid-century, military forts had been established and missionaries had arrived.

Indian reservations were established in the Washington Territory by treaty with the federal government. The majority of the treaties were negotiated in 1855, with reservations developed to "[reduce] Indian land tenure, [concentrate] bands and tribes under the tutelage of the Bureau of Indian Affairs, [confine] through the presence of military posts near the reservations, and [transform] the native peoples into the surrounding majority community" (Beckham 1998:155). However, formal agreements were not reached with many of the groups in the northern Columbia Plateau. The immigration of Euro-American settlers, who often brought smallpox and measles epidemics; a gold rush near Fort Colville; and the expansion of the railroads into the traditional territories of Native groups fueled a series of military conflicts often called the Treaty Wars of 1855-1858 (Beckham 1998; Wilma 2003). Although conflicts occurred throughout the Washington Territory, many of the skirmishes were fought in what is today the project area. By 1858, most Indian people had been removed to reservations. Native groups retained rights to fish "in usual and accustomed places" under the terms of the treaties. Other treaty rights preserved included hunting, gathering, grazing, and water rights.

Industries such as mining, agriculture, and ranching grew in boom and bust cycles. Census data for Douglas County provide a glimpse of the growth throughout the region: 372 people were counted in 1885, then 838 in 1887, over 1,500 in 1892, and over 5,000 by 1910 (Secretary of State 2006). Agricultural interests promoted ways to increase reliable irrigation of crops and

irrigation districts, and other groups began forming at the turn of the twentieth century. For example, the Wenatchee Bridge Company was formed in 1904 to promote the construction of a bridge between Wenatchee and East Wenatchee. "[In] addition to offering a better and more dependable way of crossing the river, [the bridge also carried] irrigation water to a considerable acreage of fertile land in Douglas County. Available water [immediately resulted] in development of this land and [ultimately resulted] in greater business for Wenatchee merchants…and increased values to the land…" (Mitchell 1968:28). Dams were also proposed to provide irrigation and control flooding throughout the Columbia River Basin.

The importance of transportation on the Columbia River is longstanding. "The scene of considerable exploration and fur trade activity, the Columbia River was the most important transportation corridor in the Pacific Northwest during the early historic period" (Harvey 1989:4). The Columbia River 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. Steamboat travel supported the development of secondary transportation routes on land (Harvey 1989). It was not until 1888 that steamboats reached the upper Columbia River, advancing the settlements around Wenatchee and Lake Chelan. "By 1909, four transcontinental railroads traversed the state of Washington, with a network of feeder lines mainly serving agricultural, timber, and mining communities" (Harvey 1989:9). Automobile and air travel also shaped the region in the mid-twentieth century.

3.10.2.4 Archaeological Resources

Several overviews of cultural resources have been conducted for subregions of Washington. A total of 14 prehistoric study areas and 18 historic resource study units (comprising a variety of themes, including military, agriculture, and industry) were identified within Washington in the late 1980s.

The Mid-Columbia Study Unit, one of 14 prehistoric resource study areas, encompasses Benton, Franklin, Klickitat, and Walla Walla Counties (Galm et al. 1987). As of 1985, there were 620 prehistoric sites recorded in the Mid-Columbia Study Unit, with 89 percent of these associated with water; 75 percent were located within 1,000 feet of a river (Galm et al. 1987: 14, 16). The remaining 11 percent of recorded sites are mainly resource procurement or processing sites. There is likely a bias to this information due to the early focus on archaeological investigations in areas to be affected by hydroelectric projects. Even so, it is noteworthy that less than 17 percent of the sites were considered intact in 1987, with more than half either inundated or disturbed (Galm et al. 1987).

Within the Lower Columbia Study Unit (including Skamania, Clark, Cowlitz, and Wahkiakum Counties and part of Pacific County), there were 443 recorded sites by 1986 (Minor 1986). (Sites on the Oregon side of the Columbia River are not included in this evaluation.) Much of the focus of archaeological work was again biased toward riverine environments, although interior upland sites had become increasingly understood, especially within the Gifford Pinchot National Forest. As a result, approximately 53 percent of the sites consisted of "camps" (long-term and seasonal) and nearly 25 percent of the recorded sites were peeled trees.

The Eastern Washington Protohistoric Study Area covers archaeological sites dating from 1700 to 1850 within 20 counties east of the Cascade Range (Campbell 1987). As of 1986, 199

protohistoric sites had been recorded. Of these, at least 108 were located on a floodplain or terrace of a major river, at least 23 were located on islands, and at least 12 were located along streams. Accurate percentages cannot be derived because locations were not researched for 40 sites (Campbell 1987).

The Transportation Historic Resource Study Unit covers the entire state. Sites related to water, land, and air transportation have been identified throughout the state. By 1986, 208 transportation sites had been inventoried in Chelan, Kittitas, Yakima, Douglas, Grant, Benton, Franklin, and Walla Walla Counties (Harvey 1989). Transportation sites in the project area may include bridges, remnants of roads, trails, railroad structures, or trading posts.

Historic military forts are also common along the Columbia River. Fort Okanogan, Fort Colville, and Fort Walla Walla were all located close to the river; archaeological investigations have been conducted at all three forts (Chance 1972; Grabert 1968). Fort Colville was inundated by the backwaters of the Grand Coulee Dam, Fort Okanogan was inundated by the backwaters of the Wells Dam, and Fort Walla Walla was inundated by the backwaters of the McNary Dam.

Because the Management Program includes potential water storage facilities, it is helpful to examine the cultural resources identified at other reservoir locations on the Columbia and Snake Rivers. Table 3-26 summarizes the number of cultural resources that were identified at 13 of these projects.

The data in Table 3-26 provide only a cursory look at the cultural resources in the project area. Present-day survey techniques are more refined than those employed when many of these dams were constructed. Relicensing activities conducted by the Grant County and Chelan County PUDs have recently spurred extensive cultural resources surveys, thereby resulting in numerous new sites being recorded (including historic sites).

3.10.3 Cultural Significance of Rivers

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. "Pictographs are often located in out-of-the-way mountainous areas near rivers, lakes, springs, or streams…Petroglyphs are frequently found at place near rivers or lakes where people congregated, often where fishing was exceptionally good" (Boreson 1998). Numerous petroglyphs and pictographs have been recorded along the Columbia River. Just below Priest Rapids there were over 150 rock art sites on an island considered sacred to the Wanapum Band (the River People); this island was flooded in the backwaters of the Priest Rapids Dam.

The Columbia River also plays a role in the oral traditions and ceremonies of the Native American groups who lived and live along it. The Middle Columbia River Salishans (including the Sinkiuse, Wenatchee, Entiat, Chelan, Methow, Nespelem, Sanpoil, and Okanogan peoples, now concentrated on the Colville Reservation) believe that "the earth was a sky dome over an earth disk, with the Columbia River through the middle and the Cascade Mountains and Plains along the edge surrounded by ocean" (Miller 1998). Most Columbia Plateau groups, including the Middle Columbia River Salishan, conducted a First Salmon ceremony to commemorate "when the first Chinook was caught at a community weir" (Miller 1998). These ceremonies

continue today, highlighting the enduring importance of both salmon and the Columbia River to Native culture.

Native people do not view fish resources, water resources, and cultural resources separately, as the "cycle of salmon and other anadromous fish appearing and disappearing from the rivers ruled the rhythm of Indian life, [as] without a fish supply they were in danger of starving" (Netboy 1980).

3.10.4 Early Action Study Areas

3.10.4.1 Lake Roosevelt Drawdowns

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 above mean sea level (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 land is over 100 feet below normal pool and the sites there are permanently inundated.

3.10.4.2 Supplemental Feed Route

The recorded cultural resources in the vicinity of the feed route alternatives are briefly reviewed below. Reclamation is conducting a detailed project-level evaluation of the three alternatives. As the APE has not been identified for these three alternatives, a five-mile buffer was evaluated for this report.

Crab Creek Route Alternative

There are 33 recorded cultural resources located within five miles of the proposed Crab Creek drainage area. Sites include archaeological and historic resources ranging from lithic material to historical agriculture. One of these sites, the Stratford School, is listed on the National Register of Historic Places (NRHP). None of the other sites have been formally evaluated and should be presumed eligible in lieu of a formal determination of eligibility. In addition, there is one probable burial site located within five miles of Crab Creek. Minimal surveys have been conducted in this area since 1995, and they have primarily focused on the Rocky Ford Creek area.

W20 Route Alternative

There are 79 recorded cultural resources located within five miles of the West Canal or W20 lateral canal drainage, including both pre-contact and historic resources. One of these sites, the

Stratford School, is listed on the NRHP. None of the other sites have been formally evaluated for inclusion on the NRHP and should be presumed eligible in lieu of a formal determination of eligibility. Three recorded burial sites and two possible burial sites are within five miles of the drainage. In addition, there are pre-contact caves, historic homesteads, pre-contact cairns, pre-contact talus pits, and a historic trail and railroad. Minimal testing has been conducted in this area and has primarily focused only on the nearby Rocky Ford Creek area. No surveys appear to have been conducted directly adjacent to the drainage since 1995. As construction of the West Canal itself was completed in 1955, the structure can be considered a historic resource, although as of January 2007, it has not been formally recorded at DAHP.

Frenchman Hills Route Alternative

There are 43 recorded cultural resources located within five miles of the West Canal and Frenchman Hills route drainage area. Archaeological resources include pre-contact cairns, camps, lithic materials, petroglyphs, rock alignments, rock shelters, and talus pits. Historic homesteads and structures are also in this area. None of the sites have been formally evaluated for inclusion on the NRHP and they should be presumed eligible in lieu of a formal determination of eligibility. Since 1995, an estimated 5 percent of the project area has been surveyed, in most cases in proximity to the Frenchman Hills Wasteway drainage area. The largest of these surveys was conducted on the southeastern portion of the drainage; however, no cultural resources were identified (Carmack 2004).

3.10.4.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

No specific projects or locations are identified in the CSRIA VRA, so the potential affected cultural resources cannot be described. Some storage or conservation projects that may be proposed under the CSRIA may require additional cultural resource analysis in the future.

3.11 Transportation

The Management Program could affect surface transportation but is not likely to affect air transportation. Surface transportation modes serving the region include highways, railroads, and waterborne transportation.

3.11.1 Highways

Approximately 80,209 miles of federal, state, and local roads compose the public highway and road network in Washington. Included in that number are 764 miles of interstate highways (USDOT 2006). The largest interstate highways are Interstate 5, which traverses western Washington north-south from the Canadian border to the Oregon border on the Columbia River, and Interstate 90, which traverses much of the state west-east from Seattle to the Idaho border. The interstate and state highway system is managed by the Washington State Department of Transportation. Interstate and state highways in Washington are shown on Figure 3-18. Other public road systems are managed by county and municipal governments.

3.11.2 Railroads

Washington is served by a number of private railroads, including two large Class I railroads: the BNSF Railway and the Union Pacific Railroad. There are about 2,330 total miles of Class I railroad track in the state (USDOT 2000). Class 1 railroads in the project area are shown on Figure 3-18.

3.11.3 Water Transportation

The Columbia and Snake Rivers have 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. On the Columbia River, barge shipping is through the Ports of Pasco, Benton, Klickitat, Umatilla (Oregon), Vancouver, Portland (Oregon), and Kalama. Barge shipping on the Snake River extends from Pasco to Lewiston, Idaho. On the Snake River, barge shipping is through the Ports of Walla Walla and Clarkston. Tourist cruise ships also operate in the same segments of the Columbia and Snake Rivers.

3.11.4 Early Action Study Areas

3.11.4.1 Lake Roosevelt Drawdowns

Transportation adjacent to Lake Roosevelt and the areas that would receive additional water supplies is primarily land-based by road and rail. New water supplies could be provided as far down the Columbia River as the Tri-Cities, where waterborne transportation is also available.

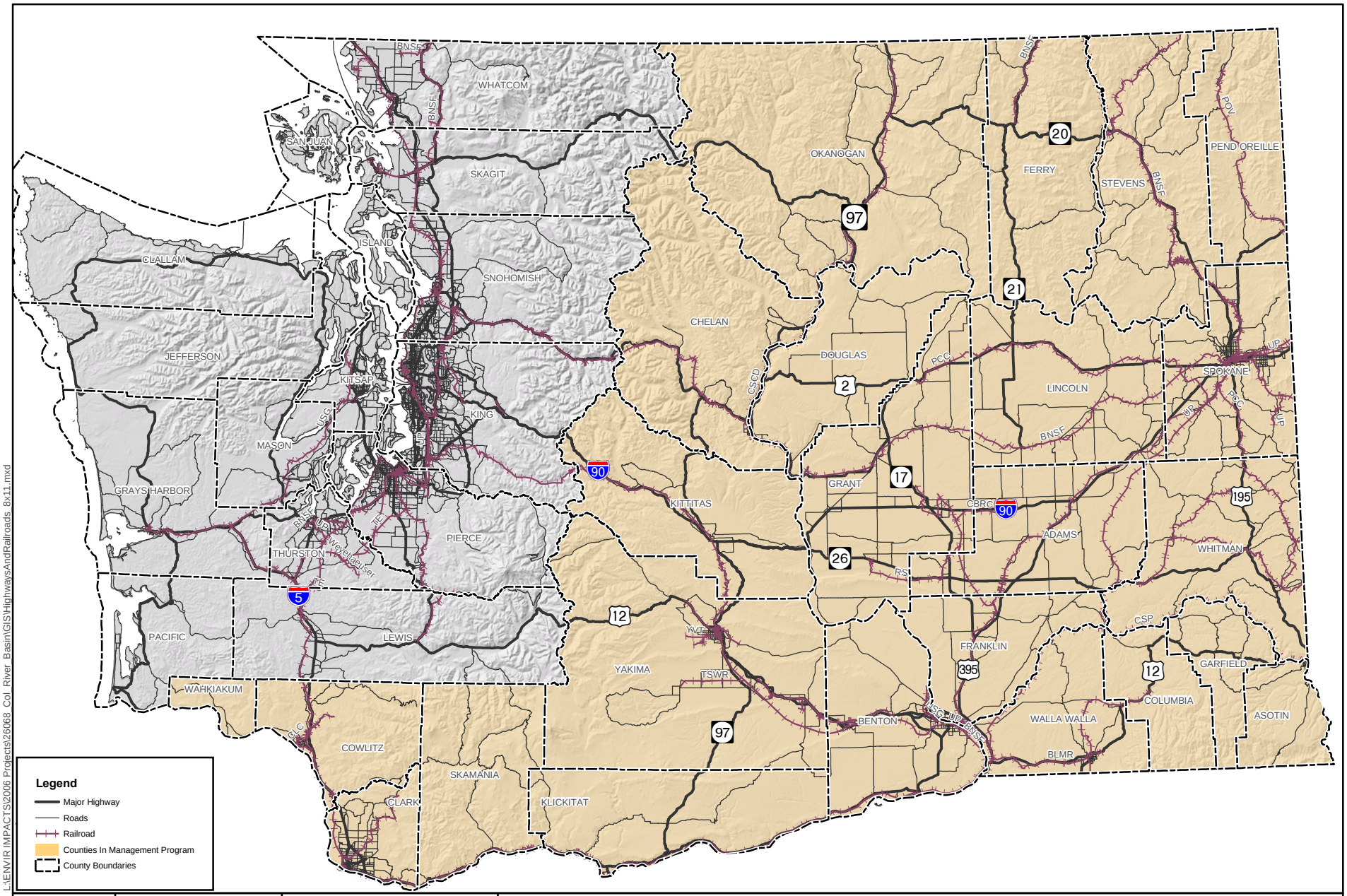
Instream flow augmentation would occur within the Columbia River, which is used for barge transportation.

3.11.4.2 Supplemental Feed Route

Transportation in all of the areas being considered for the supplement feed route is land-based via road or rail. Interstate 90 passes south of Moses Lake and north of Potholes Reservoir. The BNSF Railway has a rail line that passes to the north of Moses Lake and south of Pinto Dam.

Crab Creek flows under State Route 28 and county roads between Stratford and Moses Lake. There are also several crossings of the BNSF Railroad. The W20 Canal flows under State Route 28 and the BNSF Railroad in a Naylor Siphon. Several county roads are located along the proposed route.

The Frenchman Hills Wasteway is crossed by two major county roads that will require expanded culverts – Dodson Road and Road C SE.



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FIGURE 3-18

MAJOR TRANSPORTATION ROUTES

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

3.11.4.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The area for this proposed VRA is not defined in the application materials, but the organization includes membership throughout the project area. Therefore, any transportation systems in the project area could be affected.

3.12 Recreation and Scenic Resources and Aesthetics

The Management Program project area includes a variety of recreation and scenic resources. Recreation areas include parks, monuments and historic areas, wildlife refuges, wilderness areas, and multi-use forest and range areas. Many parts of the project area have high scenic value, and it contains one designated national scenic area. Figure 3-19 shows the designated recreation and scenic areas located in the Management Program project area.

3.12.1 Recreation Resources in the Management Program Project Area

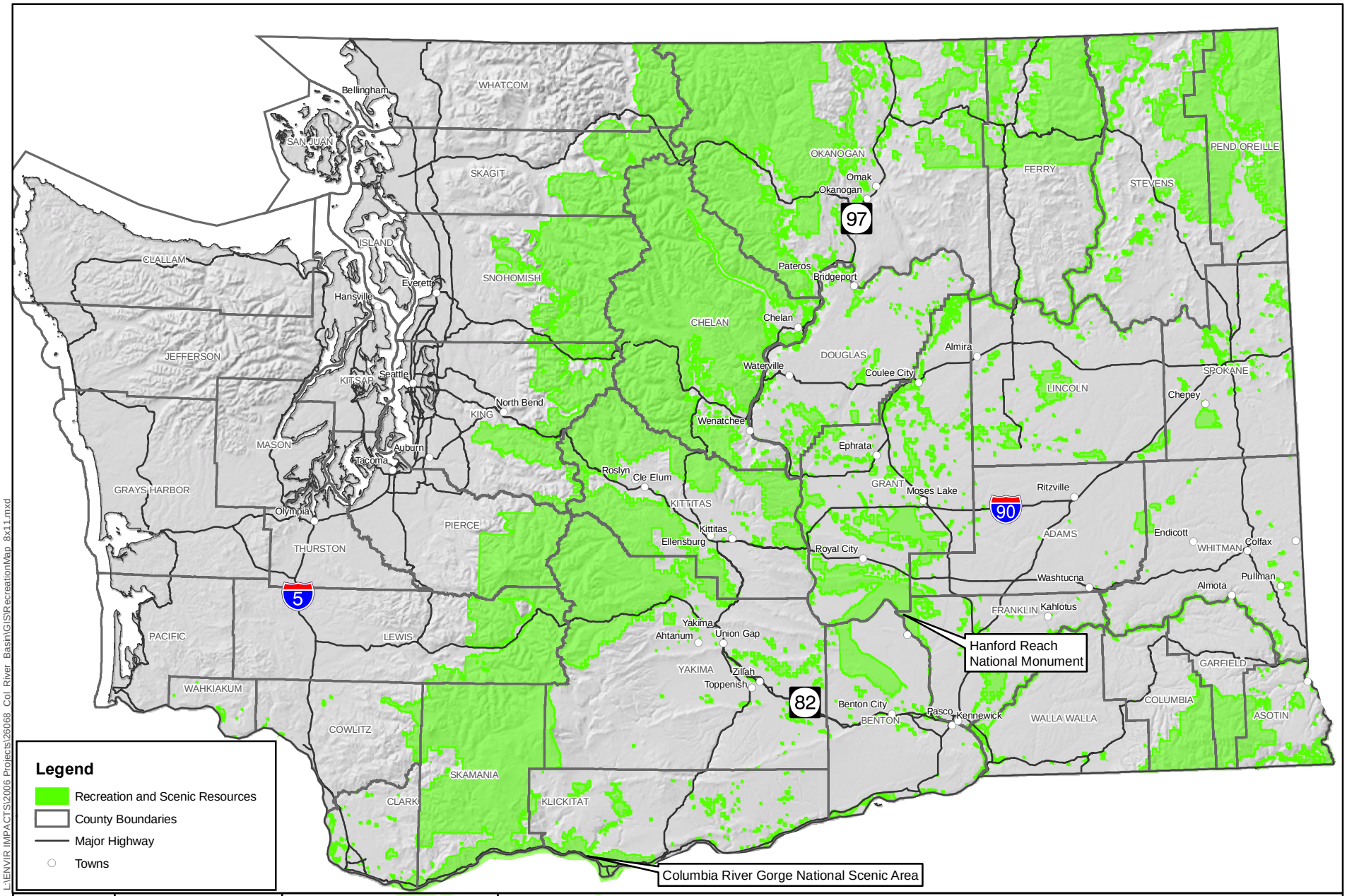
Waters and the adjacent land areas in the Management Program project area are used extensively for recreation. State residents and visitors enjoy a multitude of activities such as sightseeing, bird watching, hunting, fishing, boating, beachcombing and other water-oriented activities.

The types of water-oriented recreational opportunities are determined by the nature of the water body. For example, whitewater rafting requires free-flowing rivers with adequate flows to create whitewater conditions. Conversely, lakes and reservoirs are generally more conducive to power-boating and windsurfing than free-flowing streams. If the character of a water body is changed through flow alterations, such as construction of a dam, associated recreational opportunities may change as well. Similarly, if the quality of water in a lake or stream changes, it may alter the use of the water body for recreation. For example, bacterial or chemical contamination in a water body may make it unsuitable for swimming or fishing. An increase in water temperature in a lake may alter fish populations, thereby potentially reducing the numbers or eliminating cold water fish species (e.g., some types of trout) and creating conditions more conducive for warm water fish species (e.g., bass).

Fishing and hunting are important recreational activities in the Management Program area. Figures 3-20 and 3-21 show fish and wildlife regions, Washington Department of Fish and Wildlife (WDFW) water access sites, and WDFW Wildlife Areas in the Management Program project area. Hunting opportunities are also available on other public lands and private lands in the project area.

WDFW compiles annual statistics for hunter effort in Washington State. In 2005, hunting effort for deer was highest in Region 1. As defined by WDFW, Deer Areas exist in Klickitat, Grant, Adams, Columbia, Walla Walla, and Whitman Counties.

Elk hunting effort was highest in Region 5. As defined by WDFW, Elk Areas exist in Lewis, Wahkiakum, Cowlitz, Skamania, Klickitat, Yakima, Kittitas, Chelan, Douglas, Benton, Columbia, Garfield, and Asotin Counties.



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FIGURE 3-19

DESIGNATED RECREATION AND SCENIC RESOURCES IN THE PROJECT AREA

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON



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SOURCE: Washington Department of Fish and Wildlife.

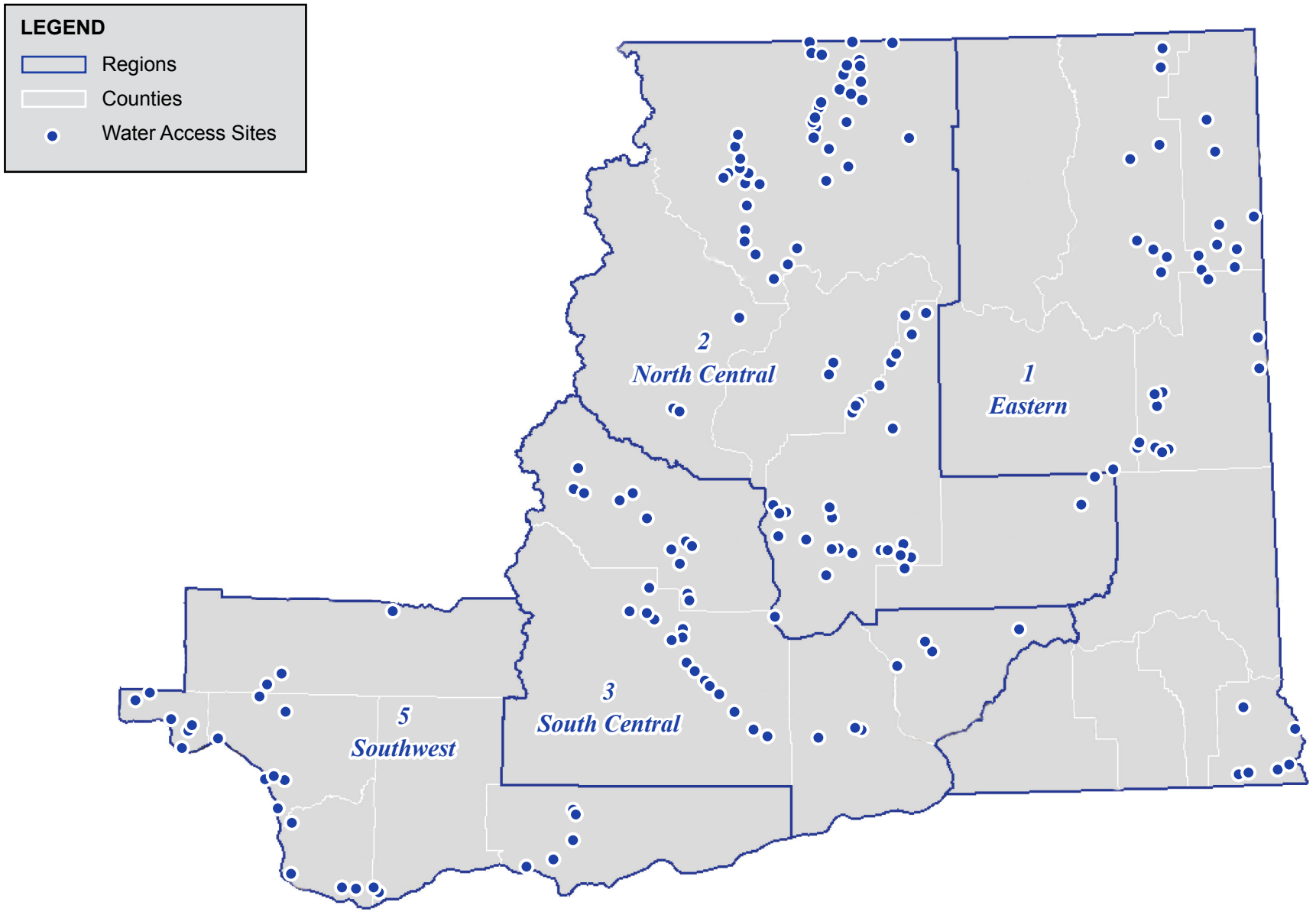
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FIGURE 3-20

WDFW WILDLIFE MANAGEMENT REGIONS

COLUMBIA RIVER BASIN PROGRAMMATIC EIS

WASHINGTON



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SOURCE: Washington Department of Fish and Wildlife.

FIGURE 3-21

WDFW WATER ACCESS SITES

COLUMBIA RIVER BASIN PROGRAMMATIC EIS

WASHINGTON

Hunting effort for duck was highest in Region 2. Duck hunters in Grant County made up 75 percent of all duck hunters in Region 2, and duck hunters in Clark County made up 40 percent of all duck hunters in Region 5.

Pheasant hunting effort was highest in Region 1 in 2005. Similar to duck hunters, a majority of hunters (nearly 70 percent) in Region 2 pursued pheasant in Grant County. Pheasant release sites exist in Ferry, Okanogan, Douglas, Grant, Lincoln, Whitman, Adams, Kittitas, Yakima, Franklin, Walla Walla, Columbia, Garfield, Asotin, Klickitat, Clark, and Lewis Counties.

Goose hunting effort in 2005 also occurred in Regions 1, 2, 3 and 5, with the majority of hunters in Region 2 (75 percent) pursuing geese in Grant County. Based on the most recent data, Grant County sees a substantial amount of bird hunting effort compared to other parts of Region 2.

Table 3-27 provides additional hunting data for selected species in the Management Program project area from 2005. The total number of hunters and days spent hunting are summarized.

Ecotourism activities relating to wildlife are also important recreational activities that are growing in popularity. Wildlife-related festivals in the Management Program project area include the Othello Sandhill Crane Festival, held annually at the end of March; the Leavenworth Spring Bird Festival, held annually at the end of May; the Fall Festival of Foliage & Feathers, last held in Walla Walla in October 2003; the Ephrata Sage and Sun Festival, held annually the second weekend in June; the "Balde" Eagle Festival, held annually in the Grand Coulee Dam area during mid-February; and the Wenatchee River Salmon Festival, held annually in Leavenworth during late September.

Table 3-27. Hunting Effort by Region, 2005

	Deer Hunters	Days Hunted	Elk Hunters	Days Hunted	Duck Hunters	Days Hunted	Pheasant Hunters	Days Hunted
Eastern Region (1)	**45,449**	**219,993**	8,770	39,275	3,303	19,681	**10,881**	**56,021**
North Central Region (2)	23,913	111,666	1,335	5,137	**7,675**	**48,636**	7,624	39,136
South Central Region (3)	16,877	78,461	24,708	135,382	5,147	33,598	6,709	32,838
Southwest Region (5)	27,337	165,102	**25,798**	**148,150**	2,154	28,986	1,259	7,432

Bold entries represent regions for which the most hunting effort was expended for the selected species in 2005.

3.12.2 Scenic Resources and Aesthetics

Washington's wide variety of natural settings and climate provides abundant scenic resources. Among the scenic resources in the Management Program project area are coastal and estuarine waters and associated beaches, rivers, mountain ranges, lakes, wetlands, and the wide-open vistas of the Columbia River Basin farmland and high desert. The Interagency Committee for Outdoor Recreation estimates that 50 percent of the approximately 587,000 people who partake in sightseeing activities each year in Washington do so at scenic areas (Interagency Committee for Outdoor Recreation 2002).

The Management Program project area contains numerous rural and natural areas that are largely undeveloped, or developed primarily for outdoor recreation and wildlife habitat conservation.

The many wildlife refuges also contribute to the scenic quality of the region by preserving areas of special vegetation, often associated with surface or ground water, that contrast with the cultivated or more sparsely vegetated surrounding landscapes. Some local governments have land use plans and/or zoning code or ordinances that require aesthetics to be considered when permitting for development occurs. The Management Program project area includes the Columbia River Gorge National Scenic Area, which provides federal protection of scenic resources adjacent to a portion of the Columbia River, and the Hanford Reach National Monument, which protects the last free-flowing stretch of the Columbia River (Figure 3-19).

3.12.3 Early Action Study Areas

3.12.3.1 Lake Roosevelt Drawdowns

Lake Roosevelt is approximately 150 miles long and is nearly surrounded by the Lake Roosevelt National Recreation Area (NRA). This recreation area is a largely natural area with recreational facilities for boating and tourism, including 22 public boat launches, 27 campgrounds, and three marinas managed by the National Park Service. Motorboats, canoes, sailboats, houseboats, and other types of watercraft are served at these facilities, and houseboats, boats, and moorage slips are available to rent at most marinas. Visitation to the Lake Roosevelt NRA has been approximately 1.3 million to 1.5 million in recent years.

Lake Roosevelt is used for boating, swimming, fishing, wildlife viewing, hiking, and other recreational activities. The recreation area is also considered to have high scenic value. The lake is characterized by a wide daily fluctuation in the lake level due to power demand, water releases for flood control, and water releases for instream flow maintenance. This affects boating and other waterfront facilities because they must be designed to accommodate this fluctuation. The water level fluctuations also expose large areas of shoreline and mud flats.

Municipal and industrial uses that could receive water in non-drought years would be located in the Columbia Basin Project area**.** Many of the municipalities that could receive water own and operate local parks used for a variety of recreational purposes. The Odessa Subarea is primarily agricultural but also contains wildlife areas that are dependent on ground water and surface water supplies (see Figure 3-19).

Water users on the Columbia River who have interruptible water rights include agricultural, municipal, residential, and industrial users, which are located within one mile of the mainstem of the river, primarily in the central Columbia River Basin. Depending on the definition adopted for the mainstem, this could also include a one-mile distance from the backwater areas on tributaries of the Columbia River as well. As shown on Figure 3-19, there are many recreational resources located adjacent to the river, and some of these may currently be served by interruptible water rights.

Instream flow augmentation would occur within the Columbia River downstream of Lake Roosevelt. The Columbia River is used for fishing, boating, and swimming and contributes water to several wildlife areas.

3.12.3.2 Supplemental Feed Route

Upper Crab Creek includes publicly owned lands managed for wildlife and used for wildlife-related recreation, some of which are adjacent to the stream.

The area where the W20 Canal would be extended does not include any wildlife refuge or other recreation or scenic resources.

Land along the Frenchman Hills Wasteway is primarily irrigated farmland. At its lower end, the Wasteway enters the Potholes Wildlife Area, which abuts the southeast side of the reservoir. At the north end of the Potholes Reservoir, the Potholes Wildlife Area is also managed for habitat and wildlife-related recreation. Potholes State Park is also located near the outlet of the wasteway and features camping, swimming, and boating facilities. Potholes Reservoir annually hosts two fishing tournaments: the Potholes Bass Tournament and the Rod Meseberg Spring Walleye Classic.

The East Low Canal area includes a number of small publicly owned areas managed for wildlife habitat.

The Potholes Reservoir area includes lands primarily managed for wildlife habitat—Potholes Wildlife Area and Desert Wildlife Area. Potholes State Park is located on the reservoir and has camping, swimming, and boating facilities. The Moses Lake area includes recreational uses along the lake, including residences and facilities for boating. Moses Lake has three public boat launches and annually hosts Moses Lake Regatta (boat races) during late April. Several bass fishing tournaments and the Moses Lake Walleye Derby are also held on an annual basis.

3.12.3.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The area for the proposed CSRIA Voluntary Regional Agreement (VRA) is not defined in the application materials, but the organization includes membership over a broad portion of the Columbia River Basin in Washington. Therefore, any recreation and scenic resources in the Management Program project area could be affected by projects proposed under the VRA.

3.13 Public Services and Utilities

The Management Program project area encompasses a large region that consists of expansive rural areas, a few small towns and cities, and urban development concentrated around Spokane, Wenatchee, the Tri-Cities, and Vancouver. The region also features major regional water supply systems for irrigation and municipal uses. Substantial electrical generation facilities in the region (primarily hydropower facilities on the Columbia and Snake Rivers) provide power for much of the western United States.

This section discusses public services and utilities under three categories: water supply and regional water use, public services, and public utilities.

3.13.1 Water Supply and Regional Water Use

Water supplies for municipal and industrial uses are generally provided by local government agencies such as cities and public utility districts (PUDs), while irrigation water supplies are generally distributed by irrigation districts, which are quasi-municipal agencies.

Several municipalities in the Columbia River Basin (White Salmon, Greater Wenatchee, the Tri-Cities area, Brewster, and Bridgeport) have very limited water supplies that currently constrain their growth and economic development or are expected to do so in the foreseeable future. The municipal supply of water for the City of Wenatchee, East Wenatchee Water District, and Chelan County PUD is provided by a regional water system operated by the City of Wenatchee. These cities are located along the Columbia River, and the primary issue with their limited water supply is the availability of new water rights to serve future growth.

Current and future out-of-stream needs for water from the Columbia River were estimated for the Columbia River Initiative in 2004 and are shown in Table 3-28. Approximately 485,000 acre-feet of water is required for out-of-stream uses on the Columbia River (Ecology 2004).

Water from the Columbia River could be withdrawn anywhere between the Canadian border and Bonneville Dam. The Management Program also includes the Snake River mainstem, but a corresponding water needs assessment has not been developed for the Snake River.

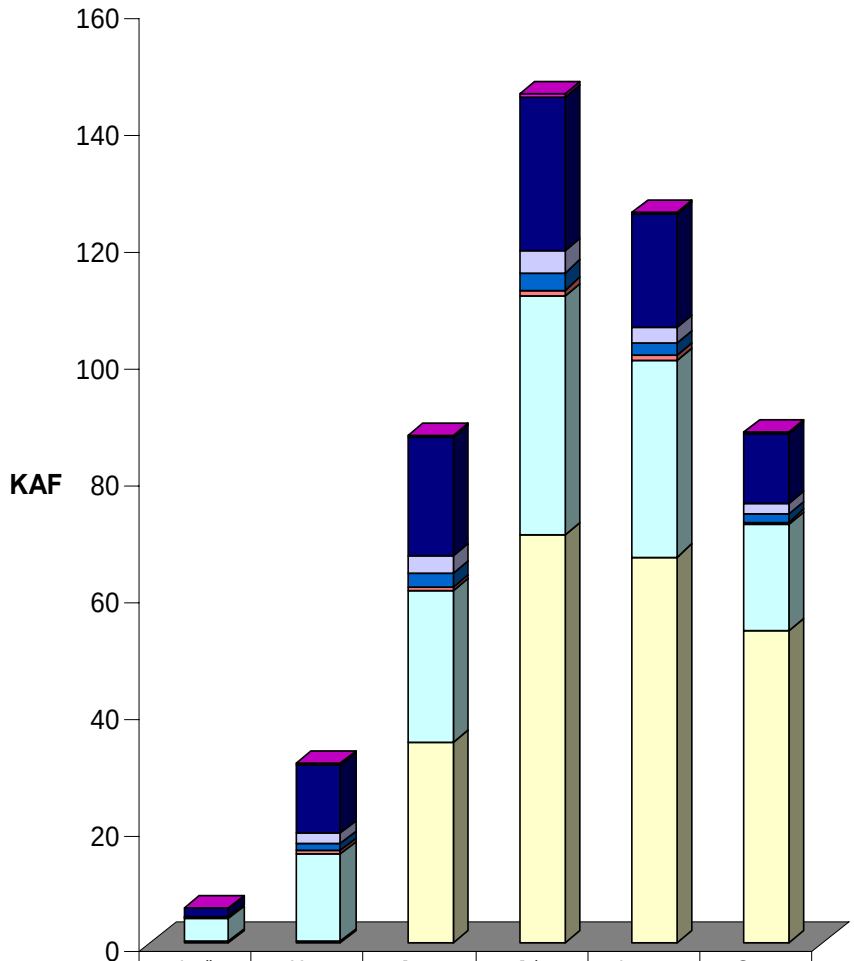
Table 3-28. Estimated Water Needs

	Estimated amount of water required to meet out-of-stream needs (KAF)*		
	Irrigation	**Municipal and Industrial**	**Total of Irrigation, Municipal and Industrial**
Drought permits to complement interruptible water rights	29	4	33
Permits issued in 2003	39	89	128
Pending applications	237	33	270
Future growth	47	7	54
Total	352	133	485

Source: Ecology 2004
*KAF= thousand acre-feet (an acre-foot is the amount of water it would take to cover an acre one foot deep.)

Demand for water from the Columbia River is greatest during July and August. During these months, water needs for irrigation as well as municipal and industrial needs are higher. Figure 3-20 shows the predicted water withdrawals, by month, that were estimated for the Columbia River Initiative. The amount of water used per month is based on existing patterns of water use by municipal, industrial, and agricultural users. The amount of water from each pool is based on Huppert et al. (2004). The Management Program would not be limited to the amounts of water shown in Figure 3-22, nor is it a certainty that these water supplies can be provided. This figure

is provided primarily as an illustration of the expected fluctuation in demand for water along the mainstem of the Columbia River. For a more complete discussion of water needs for irrigation and other uses, see Section 3.4.



	April	May	June	July	August	Sept
Chief Joseph	0.0203	0.1618	0.2817	0.3633	0.2654	0.1663
Wells	1.4753	11.7563	20.4616	26.3886	19.2827	12.0841
Rocky Reach	0.2112	1.6830	2.9293	3.7778	2.7605	1.7299
Rock Island	0.1684	1.3422	2.3361	3.0128	2.2015	1.3797
Wanapum	0.0506	0.4032	0.7017	0.9050	0.6613	0.4144
Priest Rapids	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
McNary	3.8236	15.0277	25.8882	41.0735	33.7732	18.2622
John Day	0.2914	0.3552	34.4988	69.9963	66.2374	53.5393
Dalles	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Bonneville	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Month

Figure 3-22. Predicted Water Withdrawals Estimated for the Columbia River Initiative

3.13.2 Public Services

Public services in the region are provided by tribal, federal, state, county, and local governments, as well as by volunteer fire departments and other volunteer groups in many areas, especially rural areas. Services include emergency fire and police services, education, health services, recreation programs, and other services.

Demand for public services is largely dependent on population growth, which is described in Section 3.9. Other factors that affect demand for services and the cost of delivering services are the density of development and the economic climate of the region. In low-density rural areas, it is too expensive for governments to provide some services, which is why volunteer fire departments and similar services have formed in some areas. During periods of slow or negative economic growth, the demand for public services such as health care or housing tends to increase.

3.13.3 Public Utilities

Public utility districts (PUDs) or cooperatives provide electricity service to most of the Management Program project area. Of these, the Douglas County, Chelan County, and Grant County PUDs operate dams on the Columbia River. The region is served by two major natural gas pipelines and three suppliers (OTED 2001).

Major hydropower generation facilities in the Management Program project area include Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, Priest Rapids, McNary, John Day, The Dalles, and Bonneville Dams on the Columbia River, and the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams on the Snake River. There are also nuclear, small hydropower, wind-powered, and natural gas-fired electrical generation facilities in the Management Program project area.

Wastewater and solid waste utilities are provided by counties and cities. Outside of urban areas, in some cases wastewater treatment is provided by private treatment facilities serving individual developments. In most rural areas, wastewater treatment is provided through individual private septic systems. Major regional landfills include the Roosevelt Regional Landfill in Klickitat County and Asotin County Regional Landfill. The Spokane Regional Solid Waste System operates a waste-to-energy incinerator.

3.13.4 Early Action Study Areas

3.13.4.1 Lake Roosevelt Drawdowns

Public services and utilities near Lake Roosevelt are provided by Lincoln, Stevens, Ferry, and Okanogan Counties, and the Cities of Grand Coulee and Coulee Dam and Kettle Falls. Lake Roosevelt provides water for the Grand Coulee hydropower facility and irrigation water for the Columbia Basin Project. Grand Coulee Dam is managed by Reclamation. Power produced by the dam is coordinated as part of the Federal Columbia River Power System.

Municipal and industrial uses that could receive water in non-drought years are located in the Columbia Basin Project area, which includes Douglas, Lincoln, Grant, Franklin, and Adams Counties.

In the Odessa Subarea, public services and utilities are provided by Lincoln, Grant, Franklin, and Adams Counties. Irrigation water is provided by pumping from private wells.

Water users in the Columbia River Basin who have interruptible water rights are primarily located in the central Columbia River Basin, in Benton, Kittitas, Chelan, Douglas, Lincoln, Grant, and Franklin Counties.

Instream flow augmentation would occur within the Columbia River downstream of Lake Roosevelt and thus could affect any water suppliers or downstream hydroelectric facilities on the Columbia River mainstem.

3.13.4.2 Supplemental Feed Route

The proposed routes for the Supplemental Feed Route are all within the service area of the East Columbia Basin Irrigation District or the Quincy Columbia Basin Irrigation District. A variety of public services and utilities are located along the proposed routes. Several large powerlines cross the area.

3.13.4.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The area for this proposed VRA is not defined in the application materials, but the organization includes membership throughout the region extending from Bonneville Dam to the Washington borders with Idaho, Oregon, and Canada. Therefore, any public services and utilities in that region could be affected.

CHAPTER 4.0 IMPACTS AND MITIGATION MEASURES FOR MANAGEMENT PROGRAM COMPONENTS

This chapter analyzes potential impacts that could be associated with implementation of the Columbia River Water Management Program (Management Program). Because this is a programmatic EIS, and at this time the details of projects that would be proposed under the Management Program are unknown, impacts are discussed in general terms. Specific projects proposed in the future under the Management Program may be required to undergo additional environmental review to identify specific impacts.

The nature and magnitude of impacts from implementation of the Management Program would vary depending on the specific project proposed. Water conservation measures such as the installation of on-farm conservation improvements would have limited impacts for short periods of time. Impacts would largely be confined to the property where the project is located. Large storage projects and regional conservation projects would generate more impacts over a larger area.

Section 4.1 presents the impacts associated with implementation of the Management Program. The potential impacts of storage projects are described in Section 4.1.1. Conservation program impacts are presented in Section 4.1.2, and the potential impacts of Voluntary Regional Agreements (VRAs) are described in Section 4.1.3. The impacts of not implementing the Management Program are described in Section 4.2, the No Action Alternative. Anticipated cumulative impacts of the Management Program components are described in Section 4.3.

The level of analysis of impacts varies by element of the environment. The most detailed analysis is presented for those issues that generated the most comments during the scoping period, and/or have the greatest potential for impact (see Section 1.5). Water quantity and quality issues, water rights, socioeconomics, and fish and wildlife impacts were the issues most frequently commented on during scoping and are the ones presented in the greatest detail in this programmatic EIS.

Implementation of the components of the Management Program will require additional studies. Some of those studies are currently being conducted by the Bureau of Reclamation, U.S. Environmental Protection Agency, U.S. Geological Survey, and Confederated Tribes of the Colville Reservation. Construction of storage and conservation projects will be coordinated with federal agencies that have a permitting and regulatory role. In addition, the program will be coordinated with those agencies and utilities already involved with storage and conservation projects such as the Bonneville Power Administration (BPA), Natural Resources Conservation Service (NRCS), and extension offices. Continuing coordination among the key stakeholders, including Reclamation, the Washington Department of Fish and Wildlife, the Department of Archaeology and Historic Preservation, federally recognized tribes in the project area, and other state and federal agencies, will be essential to implementation of the project.

4.1 Columbia River Water Management Program

4.1.1 Storage Component

This section describes the short-term and long-term impacts that could be associated with storage projects proposed under the Management Program. Potential mitigation measures for minimizing impacts are also described. This programmatic EIS does not evaluate the impacts of any specific storage project because none has currently been proposed under the Management Program. Instead, this EIS describes the range of impacts associated with the general types of storage projects likely to be proposed under the Management Program. The general types of projects considered are new large storage projects, new small storage projects, modification of existing storage facilities, aquifer storage and recharge (ASR), and pump exchanges. These types of storage projects are described in Section 2.1.2.1.

Many of the storage projects that could be proposed under the Management Program would require additional environmental review. Depending on the extent of federal funding or permitting required for the project, the environmental review could be under the National Environmental Policy Act (NEPA) as well as the State Environmental Policy Act (SEPA). Large-scale storage projects would undergo extensive studies to determine their technical and economic feasibility. This detailed level of analysis would occur when specific projects are proposed under the Management Program.

While construction of a single large facility would likely be very expensive, the costs and environmental impacts may be less than building several smaller facilities to achieve the same benefit. Pursuing several smaller sites would require that feasibility study, environmental review, design, permitting, land acquisition, and construction be conducted multiple times, rather than once for a single large facility. Construction of a single facility would limit environmental and cultural impacts to one geographic area, while the construction of several smaller sites would create such impacts in several geographic areas.

4.1.1.1 Earth

Short-term impacts

The most extensive short-term earth impacts of potential storage projects would be associated with construction. Construction may include land clearing, the development of new roads, excavation, and filling. These activities would disturb the ground and expose soils and could increase soil erosion by removing protective vegetation, disrupting soil profiles, and modifying slopes and drainage patterns. The magnitude of these potential impacts would depend on the type and scale of construction activities, the inherent erodibility of the local soils, the local climate, and the season during which the construction would occur (Ecology 2003b; Ecology 2005b).

Construction may require the import of large quantities of fill material and concrete for access roads, a dam, a dam spillway, or conveyance facilities. Imported fill materials would need to be from an approved source that would meet the requirements of the state Model Toxics Control Act (RCW 70.105D). In addition, design and construction would be subject to design plan

reviews and construction inspections by the Dam Safety Office (Ecology 2003b; Ecology 2005b). Construction of (or modification to) storage facilities would involve the consumption of earth resources, such as gravel, sand, and concrete.

Short-term impacts associated with the construction of an underground storage reservoir for ASR could include ground disturbances from drilling recharge, recovery, and monitoring wells, and construction of conveyance facilities and well buildings.

Long-term impacts

New storage reservoirs, including both on-channel and off-channel reservoirs, may increase ground water levels (see Section 4.1.1.4). It is possible that changes in ground water levels and the hydrostatic force of the water in storage facilities could lead to geologic instabilities. These could include local subsidence, increased slope failures, and erosion due to development of new seeps and springs (Ecology 2003b). Changes to the capacity of existing impoundments may result in similar impacts.

Increases in ground water elevations in underground storage reservoirs could lead to deformation at the ground surface as a result of increased hydrostatic pressures in the storage aquifer. Seepage of recharge water from the storage aquifer could result in instability or slope failure. Specific potential impacts associated with proposed projects would be analyzed in detail during feasibility and design evaluations. These types of impacts would be described in subsequent site-specific investigations.

Mitigation

Requirements for erosion control would be defined for each project through review by state and local regulatory agencies (Ecology 2005b). Requirements could include construction best management practices (BMPs) such as the use of straw bales or silt fencing to trap sediments. Any proposed storage projects would undergo further design and geotechnical review, and additional project-level environmental review, prior to construction to assess the site's suitability (Ecology 2005b). Erosion control requirements would reduce sediment production and delivery from new roads. Roadways would have to be properly designed, and projects would have to comply with stream buffer requirements in applicable local critical areas ordinances and stormwater requirements. Mitigation measures to reduce erosion could also include watershed restoration activities such as planting vegetation on exposed stream banks and improving drainage culverts (Ecology 2005b).

Mitigating the risks associated with potential or actual geologic instabilities may require structural changes to the facility itself, and construction of control or mitigation structures both upstream and downstream of the facility. The risks associated with geological instability caused by increased ground water levels and weight of the impounded water may be reduced through geotechnical design and long-term monitoring of the facility (Ecology 2003b).

Mitigation measures to reduce the potential for ground deformation include performing a geotechnical evaluation of the materials overlying the storage aquifer prior to design, so that geotechnical considerations are adequately incorporated into project design, and managing hydrostatic pressures in the storage aquifer so that the lithostatic pressure of the materials

surrounding the storage aquifer is not exceeded (including a factor of safety). Geotechnical evaluations of potential unstable slopes prior to design will minimize the potential for facilities to be located in unstable areas. Managing recharge volumes and pressures in the storage aquifer to limit seepage from the aquifer, inventorying slopes in the project area, and monitoring pressures in slope areas during recharge and storage are measures to minimize slope instability.

4.1.1.2 Air

Short-term impacts

Construction of new storage facilities would require the use of heavy equipment and vehicles for excavation, grading, filling, and material hauling activities. Excavation can result in temporary fugitive dust and equipment combustion emissions. However, Ecology regulations and/or those of the local governing air agency would minimize fugitive dust by requiring best available control technologies (BACT). In addition, most of the construction equipment emission sources would be mobile and intermittent in nature. Air quality impacts would not be expected to exceed any ambient air quality standard. Consequently, construction activities associated with municipal conservation programs could produce adverse, but likely insignificant, air quality impacts within a localized project region.

Currently, there are three non-attainment areas in eastern Washington: Spokane (carbon monoxide), Wallula (particulate matter), and Yakima (carbon monoxide) (EPA 2003). Construction projects in these areas, especially large projects, could exacerbate local air quality issues. However, because construction activities are temporary and intermittent in nature, and all projects would be required to comply with regional and local regulations regarding emissions, cumulative construction impacts on air quality would not be significant.

Long-term impacts

Some amount of fugitive dust and combustion emissions could be generated by vehicles during maintenance activities associated with storage projects. However, these emissions would be negligible and intermittent in nature. Fugitive dust could also be generated during periods of reservoir drawdown when lake beds are exposed.

Although new storage projects are not expected to directly affect climate in the region, climate change could affect the need for water in the region over the long term. If the warming trend continues to reduce glaciers and snowpack in the mountains that feed the Columbia and Snake Rivers, water supplies could be reduced. Increased demand for irrigation water could reduce hydropower production. To make up for reduced electric power production due to reduced water availability, power would be purchased from other generation facilities. These facilities are typically hydrocarbon-based (gas or coal) turbine generators that produce significant air emissions.

Mitigation

Air pollution control regulations implemented by Ecology and/or local air agencies would limit emissions of fugitive dust during construction and facility operations. Some of the control measures include:

- Use of wetting agents in active areas that generate visible dust;
- Use of covers, wetting agents, or sealed load containers to prevent materials from escaping out of truck loads while on public roads;
- Cleaning techniques to prevent vehicles from tracking soil/particulate matter onto public roads;
- Stabilization of storage piles;
- Use of water sprays during material handling and transfer operations, such as those performed by a loader;
- Surfacing dirt roads with gravel or pavement; and
- Dust management considerations in reservoir operations.

For construction activities occurring in or near carbon monoxide non-attainment or maintenance areas, consideration should be given to reducing construction emissions. The following equipment control measures could be implemented:

- Use of heavy-duty diesel-powered construction equipment manufactured after 1996 (with federally mandated "clean" diesel engines) whenever feasible;
- Use of construction equipment with the minimum practical engine size;
- Use of efficient management practices to minimize the construction equipment operating simultaneously; and
- Maintenance of construction equipment in tune per the manufacturer's specifications.

4.1.1.3 Surface Water

Short-term impacts

Water Quantity. Temporary impacts may be associated with the construction of new storage facilities. For new on-channel facilities, impacts may occur primarily during the dam and overflow spillway construction phase. Interruption of flow may occur during this phase (Ecology 2003b). The construction phase of a large or small on-channel storage facility can also pose unique threats from dam breach during the short periods where structural elements and failsafe design features are incomplete or awaiting final inspection (Ecology 2003b).

Disturbance of contaminated sediment could release toxic contaminants into the water column and in aquatic species. The level of impact will vary depending on the level of contamination and disturbance. However, this could contribute to existing concentrations of contaminants, such as DDE, Aroclors, zinc, and aluminum, that have already bioaccumulated in fish tissue (EPA 2002a).

For new off-channel storage facilities, short-term impacts would be similar to those described for on-channel facilities. Facilities may require constructing a diversion structure or pump station on a stream and bypassing a short reach of the stream during construction. Construction of a dam and reservoir to store water would require filling, thereby reducing flows in the stream from which the water was diverted.

Short-term impacts for modifications to existing storage facilities may be similar to those described above if the resulting use of water from the existing storage facility requires construction of an additional diversion structure or pump station. Short-term impacts to surface water for development of an underground reservoir are limited to decreases in streamflow in the stream from which the water is diverted.

Water Quality. Construction of on-channel storage facilities requires substantial disturbance of earth as discussed in Section 4.1.1.1. There is a potential for post-construction sediment loading to the downstream channel from sloughing and superficial erosion of earthen berms until the berm surface reaches structural stability. Similarly, there could be increased sediment loading to the reservoir from bank sloughing until the banks reach structural equilibrium. The level of impact on the quality of surface water would vary, depending on the volume of earthwork, proximity to a water body, condition of surrounding vegetation, and mitigation measures implemented (Ecology 2005b). These sediment inputs to water bodies, even if short-term, may be significant. Inputs of sediment to any water body may increase turbidity until the site is revegetated. Inputs of fine sediment may also affect the substrate condition in streams. The level of impact will vary with the amount of sediment input into the water body. Additionally, the import of non-native soils may affect the chemistry of nearby surface waters.

For new off-channel storage facilities, short-term impacts would be similar to those described for on-channel facilities. The facilities may require construction of a diversion structure or pump station on a stream and construction of a dam and reservoir to store water.

Short-term impacts for modifications to existing storage facilities may be similar to those described above if the resulting use of water from the existing storage facility requires construction of an additional diversion structure or pump station. Other modifications to existing structures could have limited construction and limited short-term impacts. Short-term impacts to surface water for development of an underground reservoir are limited to temporary construction impacts for construction or modification of conveyance infrastructure.

Long-term impacts

Water Quantity. New on-channel storage facilities would change the stream reach from free flowing to a regulated river, thereby affecting the flow regime and stream morphology processes downstream. The storage structure would, by design, change the flow regime by storing more water during periods when the impacts to Columbia River fisheries are relatively low and releasing it to augment instream flows when it is critical to fisheries. One-third of the water yield of the reservoirs would be dedicated to this purpose. Creating an impoundment would also interrupt natural surface and subsurface flow routing. The flux of shallow ground water typically moving laterally toward the stream would be altered. Similarly, the surface water elevation of tributary streams in the inundation area would be altered as the water backs up behind the impoundment rather than flowing freely downstream. A new equilibrium between upland flow and the new surface water elevation of the reservoir would be established. In addition, evaporative losses would be expected from the surface of any reservoir (Ecology 2003b).

The ability to augment instream flows during low flow periods using water from new storage will result in an increased ability to meet minimum mainstem Columbia River flow targets established by NOAA Fisheries, and reserved tribal rights to water to hunt and fish in usual and accustomed places.

The specific nature and degree of the impacts to surface water quantity would depend on operation of the storage facility. Other long-term impacts may include:

- Long-term rapid fluctuations in reservoir and downstream channel water surface levels dependent on gate operation, which will have large impacts on near-bank and overbank biota.
- Potential for the dam to breach, resulting in catastrophic flooding downstream. Dam safety regulations require extensive studies such as a downstream hazard assessment and mapping of potentially inundated areas. In addition, an emergency action plan would be required to alert and evacuate downstream residents in the event of a dam breach.
- Evaporative losses would occur from any reservoir (Ecology 2003b).

Construction of new off-channel storage facilities could change the stream morphology and flow regime downstream of the intake. The hydrologic effects would be similar to on-channel storage projects. The specific nature of the impacts to surface water resources would depend on how the storage facility was operated. Secondary effects may include enhancement of recharge of the aquifer under the reservoir. Evaporative losses would also occur from off-channel reservoirs (Ecology 2003b).

With regard to dam safety issues, creating storage in off-channel impoundments could have the same long-term impacts as on-channel storage facilities (Ecology 2003b).

The long-term impacts of modifying the operations or raising existing on-channel storage facilities on surface water may range from negligible to significant depending on the type of project. Impacts may include those discussed above. Fluvial processes already disturbed from the initial construction of the facility may be slightly altered due to the expansion or change in flow regulation. Peak flows may be further reduced and low flows may be increased. For a project that increases the storage area, evaporative losses would be predicted to increase in proportion to the increase in surface area. In cases where large existing facilities are raised by a small percentage, the effects may be small. In cases where small facilities are increased significantly in size, the effects may be pronounced (Ecology 2003b).

Modifications to existing dam structures must be authorized by the Dam Safety Office and must conform to the provisions of the guidelines for structural modification outlined in WAC 173-175. As the elevation of an existing structure is raised, the volume stored behind the reservoir will increase exponentially. The increased volume of water increases the risks of dam failure (Ecology 2003b).

The addition of beneficial uses of water from a reservoir or other storage facility may reduce return flows if new consumptive uses are allowed from a facility that was previously allocated for recreation, power, instream flow, or other non-consumptive uses. This impact may be significant. Also, unanticipated dam safety issues may arise. Evaluation on a case-by-case basis would be required (Ecology 2003b).

Development of underground storage could result in increased ground water discharge to seeps, springs, wetlands, and surface water if recharge water discharges from the storage aquifer as a result of increased ground water elevations or pressures. This would increase baseflows in surface water bodies where discharge occurs. Streamflow impacts from development of underground storage are similar to those for above-ground reservoirs. Streamflows used for underground storage are generally diverted during periods of high streamflows, such as during snowmelt. Thus, impacts on stream temperatures and low flows are minimized (Ecology 2003b).

Water Quality. The extent of the impacts of on-channel storage facilities on water quality will be dependent on the size and location of the facility. Small impoundments (for example, impoundments the size of stock ponds or run-of-river diversions) may not have substantial effects on water quality. Large dams may have very significant effects. The local nutrient loading and the mitigation measures incorporated into the project will also influence the changes in water quality associated with on-channel facilities.

The specific nature and degree of the impacts to surface water quality would depend on operation of the storage facility. Long-term impacts may include:

- Seasonal increases in downstream sediment loading and gas entrainment resulting from rapid drawdown in anticipation of flood events. Rapid drawdown may entrain and discharge sediment. It may also result in spillway flow that entrains dissolved gas.
- Blockage of natural debris carried downstream by the stream, reducing the organic loads in the stream below the dam.
- Potential changes in downstream overbank soil characteristics and riparian zone vegetation due to flood control measures that change the flood inundation profile.
- Eventual silting of the reservoir that will require dredging or reduce storage capacity with associated environmental impacts.
- Decreased turbidity and bedload sediment downstream of the impoundment.
- Increased stream temperature downstream of the impoundment.
- Decreased dissolved oxygen downstream of the impoundment.
- Increased stream temperature within the impoundment.
- Potential for eutrophication of water where nutrient levels are high.
- Potential for the accumulation of pollutants in the sediments at the headwaters of the impoundment.
- Decreased organic loads in stream below the reservoir due to blockage of natural debris behind the dam (Ecology 2003b).

These potential impacts would be considered in the project-level review of the proposed storage facilities.

Construction of off-channel storage facilities may also have significant effects on streamflow. Reductions in flows may result in long-term increases in water temperature if the reduction in flow is substantial. In addition, water quality could be affected if the off-channel facility were built on a location where local soils and/or geology contained contaminants. The magnitude of the effect would depend on local conditions. There are potential impacts of increased baseflows

and, therefore, surface flows on water quality. If the quality of the recharge water is lower than the quality of local ground water, degradation of water quality may occur. Secondarily, degradation of surface water quality could occur under these circumstances; however, surface water quality degradation would likely be less than that of ground water due to the effect of dilution by surface flow (Ecology 2003b).

The long-term impacts of modifying the operations or raising existing on-channel storage facilities on water quality may include those discussed above. Long-term effects on surface water quality from allocating water from existing storage facilities to additional beneficial uses could be variable and depend on the current allowable uses and the newly added beneficial uses.

The addition of recreational use or stock watering adjacent to a reservoir currently permitted only for drinking water may decrease water quality. The degree of effect would depend on the type of use allowed and the extent of use. Protecting water quality would be more challenging in reservoirs that are popular recreational areas. If new recreational uses include the use of motorboats, oil and gas may pollute the water body (Ecology 2003b).

Residential development, grazing, and other land uses can also affect water quality. Residential development may introduce chemicals from lawns and potentially some septic leakage. Grazing can increase nutrient loads. The extent of potential impact to water quality would be directly related to the extent and type of use (Ecology 2003b).

The preceding paragraphs focus on the addition of beneficial uses to systems used for drinking water. Other situations have a lower potential for affecting water quality. For instance, adding stock watering as a beneficial use for a facility currently permitted for irrigation is unlikely to have a significant effect on water quality. Likewise, the addition of a hydropower facility to an impoundment that provides water for irrigation is unlikely to have significant effects on water quality. In situations where drinking water is added as a beneficial use, improvements in water quality may be achieved through the introduction of source protection measures. Therefore, water quality may be either improved or degraded depending on the change that is implemented. The significance of changes in permitted beneficial uses would depend on the quantity of pollutants that are introduced to or removed from a water body as a result of the change in beneficial use (Ecology 2003b). Site-specific investigations for future projects will identify potentially adverse or beneficial impacts to water quality and will identify specific mitigation measures as needed.

Mitigation

Water Quantity. Short-term impacts on water quantity can be mitigated by minimizing the area and time of disturbance or flow interruption. To minimize the possibility of inadvertent dam failure during construction, the construction plans should be evaluated to identify vulnerabilities in dam safety, and best construction management practices should be implemented.

Long-term impacts may be mitigated by:

- Developing an augmentation plan to reduce the impacts on other water right holders;
- Developing operating rule curves to compensate for flow alterations;
- Scheduling high flow releases to mimic natural event magnitudes;
- Releasing sediment from facilities along with flushing flows to maintain natural scour patterns; and
- Performing extensive studies as required by dam safety regulations, such as a downstream hazard assessment and mapping of potentially inundated areas. In addition, an emergency action plan would be required to alert and evacuate downstream residents in the highly unlikely event of a dam breach.

Water Quality. Short-term impacts of construction on water quality can be mitigated to some extent by implementing soil erosion BMPs, constructing the facility "in-the-dry," and revegetating disturbed areas quickly. Impacts to water quality would be reduced by a site selection process that includes an analysis for those geologic characteristics that will minimize ongoing turbidity and control erosion in the surrounding areas. However, some sediment input to streams is unavoidable. The effects of local soils and geology on water quality can be minimized through careful review of site conditions during project planning and the avoidance of sites containing potential pollutants (Ecology 2003b).

Long-term effects of on-channel facilities on water quality can be substantial. Mitigation of some of these effects may include:

- Controlling the depth of the intake to minimize downstream effects on temperature and dissolved oxygen;
- Reducing elevated temperatures in water discharged from the reservoir by infiltrating the water to allow cooling before recharging surface waters;
- Providing sediment bypass facilities (only effective on small impoundments); and
- Implementing measures to control nutrient inputs.

The appropriate mitigation measures for surface water quality effects of adding beneficial uses to an existing storage facility will depend on the change in use. Proposed changes in use should be reviewed and any potential effects on water quality identified during site-specific investigations. Effects may be mitigated by limiting use (for example, limiting or excluding motorized recreation on lakes), implementing source control measures to protect municipal supplies, and/or by controlling methods of use (for example, requiring off-site watering of animals). Appropriate mitigation would be identified on a project-specific basis (Ecology 2003b).

Implementation of water quality plans may protect, restore, or enhance water quality. The rate and magnitude of improvement will depend on the requirements of individual plans (Ecology 2003b).

Monitoring of water quality may influence the effectiveness of water quality management programs. This can have a net effect of reducing the impacts of land management practices on water quality (Ecology 2003b).

Numerous other mitigation measures may also be appropriate and will tend to be project-specific. Proposed on-channel facilities would be subject to extensive review to ensure that the potential effects are well understood and that appropriate mitigation measures are applied.

4.1.1.4 Ground Water

Short-term impacts

Water Quantity. Short-term impacts to ground water resources could involve changes in ground water levels and gradients during construction. If construction includes substantial ground water control activities, required construction dewatering could temporarily reduce ground water levels and availability in the alluvial aquifer and/or sedimentary aquifer system (Ecology 2003b; Ecology 2005b).

Short-term impacts to ground water from development of underground storage include changes in ground water levels and gradients during pilot testing of recharge, storage, and recovery. There may be short-term increases in ground water elevations or pressures during recharge and storage, and short-term decreases in ground water elevations or pressures during recovery pumping.

Water Quality. Potential water quality impacts from construction include contamination from surface water sources if soil removal has created a means for contaminants to reach the ground water system. Pilot testing of recharge and storage to develop ASR will result in the mixing of recharge water and native ground water. Depending on the quality of each water source, there may be physio-chemical reactions between the recharge water, the native ground water, and the aquifer matrix that could adversely affect ground water quality.

Long-term impacts

Water Quantity. Operating an on-channel storage facility or raising the level of an existing on-channel or off-channel storage facility could permanently increase ground water recharge rates and ground water levels near the storage facility. The magnitude of these potential impacts would depend on the size and depth of the storage facility, the hydraulic head created by the storage impoundment, and local hydrogeologic characteristics (the properties of the underlying aquifers and water table elevation) (Ecology 2003b; Ecology 2005b).

Reducing or eliminating stream diversions within the reservoir service area would potentially raise alluvial aquifer ground water levels along reaches downstream of diversions. The additional water flowing in the streams would either recharge ground water along these reaches, or reduce the amount of ground water discharging to these reaches. Decreased ground water irrigation demands due to readily available or supplemental surface water may also lead to increased ground water levels (Ecology 2005b).

Long-term impacts to ground water could occur with the development of underground storage. The quantity of water injected for ASR and the properties of the aquifer(s) used for ASR would affect the magnitude of the impact on ground water levels or pressures, changes in vertical and horizontal ground water flow directions, and ground water flow velocities during ASR operations.

Ground water levels or pressures could increase significantly with the recharge of an underground reservoir. The magnitude of the increase depends on several characteristics of the storage aquifer: the size, transmissivity (the rate at which ground water can be transmitted horizontally in an aquifer), and storativity (the volume of water that an aquifer releases from storage with a decline in hydraulic head).

The rise in ground water pressures could occur over a large area in a transmissive, confined aquifer with low storativity. If ground water pressures rise above ground surface in a confined aquifer, flowing artesian conditions could develop at existing wells, resulting in loss of stored water, and possibly damage to the well and surrounding area and localized flooding and erosion. Increased ground water elevations or pressures could also result in increased discharge to surface water, seeps, springs, and wetlands, and could cause slope instability or ground deformation.

During ASR recharge, ground water will flow radially away from the recharge well(s). When recharge stops, ground water elevations in the vicinity of the well will decrease as water levels equilibrate. The horizontal hydraulic gradient in the aquifer could increase near the well, resulting in increased ground water flow velocities.

Where primary aquifers overlie the storage aquifer, increased ground water elevations in the underlying storage aquifer near the area of the recharge well can result in a change in hydraulic gradient, and a subsequent reversal in vertical flow direction between the storage aquifer and overlying aquifer(s) (i.e., the flow direction between two aquifers changes from downward to upward). Seepage of stored water to overlying aquifers may result in a ground water level rise in these aquifers and possibly an increase in ground water discharge to seeps, springs, and surface water.

Water Quality. Ground water quality could be affected if the reservoir is built at a location where local soils and/or geology contain contaminants that could leach to ground water. Contaminants from past land use practices (e.g., agricultural chemical applications or septic tanks) may include natural or elevated concentrations of salts, agricultural chemicals (pesticides, lime, fertilizers, petroleum products), and domestic or agricultural wastes (onsite sewage systems, disposal pits, manure). The ground water impact would depend on the contaminant concentration, the ability of underlying soil and aquifer materials to absorb contaminants, and the hydraulic connection with underlying aquifers. Changes in ground water quality could potentially impact domestic water use near the reservoir or facility and surface water quality at the point of ground water discharge to streams (Ecology 2005b).

Ground water quality could change as a result of recharge and aquifer storage of water. If the quality of the recharge water and native ground water are significantly different, physio-chemical reactions could occur that could result in precipitation of minerals, along with taste and odor problems with the recovered water (if used for drinking water supply). Similarly, the recharge water could react with the aquifer matrix, resulting in dissolution of the aquifer matrix, increasing the dissolved solids content of the ground water. Precipitation of other minerals could occur, which could clog aquifer pore space or recharge well screens.

The recharge water may also contain other chemical constituents that are not present in native ground water including pesticides, herbicides, endocrine disruptors, or other chemicals. Water intended as a future drinking water supply may need to be disinfected or treated before it is

injected. Treated and disinfected water contains chemicals such as chlorine and byproducts (trihalomethanes and haloacetic acids) that are not present in the native ground water.

Site-specific investigation would be conducted for each proposed storage project to characterize the full extent of potential impacts, avoid them where possible, and if impacts cannot be avoided, develop appropriate mitigation.

Mitigation

Water Quantity. For all storage projects, impacts to ground water could be avoided and/or mitigated by conducting appropriate hydrogeological studies prior to design and construction or implementation and during operation. The degree of study required would depend on the type and magnitude of the storage project. If any adverse ground water effects were predicted as a result of the studies, then design or construction would be adjusted to reduce the effects (Ecology 2005b). Hydrogeologic studies could include seasonal monitoring of current ground water levels near current and anticipated points of water diversion and use. The monitoring results would be used to estimate the impacts of changes in use or diversion on ground water levels. For areas where ground water levels would be reduced, the timing or magnitude of the changes in water use could be avoided, or other measures, such as artificial recharge or withdrawal, could be considered (Ecology 2005b).

In compliance with dam safety regulations, an inspection program would be required to monitor for potential seepage in the immediate vicinity of the dam, near the toe of the dam, and at its abutments. This monitoring program, which would occur over the life of the structure, would involve the installation and maintenance of permanent and temporary piezometers, observation wells, seepage galleries, geotechnical soil and rock borings, and excavated test pits. The dam operator may also need to monitor ground water levels and flow near the impoundment. This may require the installation, maintenance, and abandonment of piezometers, test wells, and observation wells (Ecology 2003b).

Site-specific hydrogeologic studies for underground storage would include evaluations of the physical ground water system, including hydrostratigraphic units, aquifer hydraulic properties, aquifer boundaries, ground water recharge, discharge, and ground water flow, recharge water and ground water quality and compatibility, along with evaluation of other ground water users, water rights, and natural and environmental hazards. The assessment of hydrogeologic conditions can then be used as a foundation for the development of a project pilot testing and operation strategy and a monitoring plan for ground water levels, recharge and recovery volumes, recharge and recovered water quality, and natural and environmental hazards.

Water Quality. Potential impacts to ground water quality beneath a reservoir, caused by leaching and migration of natural or artificial contaminants, could be reduced by assessing and removing manmade sources of contamination (if present) before filling the reservoir. Assessing the chemistry of reservoir site soils (and determining the likely ground water flow from the reservoir) would indicate the potential for contamination sources. Natural mixing and dilution of ground water may sufficiently mitigate changes to ground water quality. Potential impacts to ground water quality from the introduction of contaminated water could be reduced through

sampling of source water and engineered system design so that water from a potentially contaminated source is not used to recharge ground water (Ecology 2003b; Ecology 2005b).

Periodic monitoring of source water and ground water quality would help ensure that contaminated water is not being introduced to ground water. Long-term cumulative implementation of water quality plans may result in improved ground water quality. Implementation of water quality monitoring plans may improve the effectiveness of ground water quality management programs and efforts by providing data with which to make management decisions. This could lead to an improvement in ground water quality by reducing contaminant levels in recharge (Ecology 2003b).

Water quality plans and public education could also help to restore, protect, or enhance ground water quality by reducing contamination of ground water, soil, and/or surface water bodies that recharge ground water. The effect on ground water quality would depend on the current ground water quality, the degree to which existing water quality plans are implemented, and the effectiveness of water quality plans to reduce contamination in the water source (Ecology 2003b).

4.1.1.5 Water Rights

New storage, whether it is a new reservoir, increased storage capacity in an existing reservoir, or storage in an underground aquifer, would require a water right permit from Ecology. Ecology makes decisions for reservoir permits under the same standards as for any other water right as provided in RCW 90.03.250 through RCW 90.03.320. Ecology may not issue a water right permit, including a reservoir permit, if there would be any adverse impact to existing water rights. State law allows Ecology to consider mitigation proposed by a water right applicant to offset any potential adverse effects of their proposed water use (Ecology 2003). Mitigation "strategies are as varied as the conditions they are designed to protect and improve" (Ecology 2003).

Short-term impacts

Potential impacts to water rights from storage projects are primarily long-term operational impacts. However, water rights, including instream flows, could be affected during the filling of a reservoir.

Long-term impacts

Operation of a storage project has the potential to reduce availability of water to existing water users. These considerations would be included in Ecology's analysis in deciding whether to issue a storage permit. Long-term beneficial impacts would include increased availability of water for instream and out-of-stream uses during low flow periods.

Mitigation

Potential impacts on other water rights during reservoir filling for off-channel storage could be mitigated through management of the rate and timing of pumping from the stream to the

reservoir. Mitigation measures for any long-term impacts would be determined on a project-specific basis.

4.1.1.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. Discussions of fish in the text below are intended to be broad, including anadromous fish species (salmonids, lamprey, sturgeon, among others), resident fish species (salmonids, coldwater and warmwater game fish and non-game fish species) as well as native freshwater shellfish species (mussels, clams, snails, limpets, etc.) as described in Section 3.7.1. Two basic storage project designs are proposed – in-channel storage and off-channel storage. Some aspects of both types of project have similar impacts to aquatic resources, while many of the project features are vastly different with respect to aquatic impacts.

In-channel projects that impound water in the existing channel can influence fish by:

- Restricting or adversely influencing upstream and downstream passage;
- Entraining or impinging juvenile species at points of diversion and gated orifices;
- Inundating channel habitat features important for spawning or rearing habitat;
- Altering the quantity (streamflow levels), flow rate, and quality (temperature; dissolved oxygen, nutrients, pesticides, herbicides, suspended and bedload sediment levels) of water in the channel downstream of the reservoir that could have an influence on modifying trophic relationships, shellfish beds, behavioral cues, and migratory timing of fish; and
- Partitioning habitats on a longitudinal basis, thereby influencing habitat connectivity.

Off-channel storage reservoirs can influence the quantity of water downstream of the point of water intake and the quality of water downstream of the return point. They also have the potential to adversely influence channel habitat features if the site includes an existing drainage used by aquatic species. Surface water sources for off-channel facilities either occur through gravity feed or via pump-storage options. In either process, supplying water to the storage facilities can create instream flow issues downstream of the point of diversion.

Construction-related impacts for any type of storage project are primarily a function of soil disturbances and short-term increases in suspended sediment (turbidity) and bedload sediment in local water bodies. Compliance with Washington Department of Fish and Wildlife Hydraulic Project Approval (HPA) provisions for in-channel work within the Ordinary High Water Mark (OHWM) and use of WDFW mitigation policy[1] should minimize construction-related effects.

[1] The stated goal of the mitigation policy is to achieve no loss of habitat function and value. The hierarchy or continuum of preferred actions is (1) avoiding damage, (2) minimizing damage, (3) repairing damage, (4) reducing damage through long-term maintenance, (5) compensating damage by replacing resources and (6) taking corrective measures over the long-term. It lists the guiding principles for making decisions on appropriate mitigation activities, required elements of mitigation plans and appropriate legal documentation. A complete copy of the policy is in Appendix J.

One natural response of reservoir fill is a short-term increase in nutrient levels with the decomposition of the vegetative matter under the reservoir. An early spike in reservoir productivity for aquatic species is typical. Although beneficial, this effect is short-lived within the first few years following reservoir creation. Reservoir productivity typically declines thereafter, depending on operational characteristics.

Wildlife and Plants. Short-term impacts to wildlife and plants would result from the disturbance and removal of vegetation during construction of new storage facilities. The magnitude of the impact will range from significant to less significant depending on the several variables, including:

- The quality of existing habitat in the proposed facility area;
- The size of the proposed facility and amount of habitat that will be disturbed and/or lost;
- The level of use by wildlife, particularly listed and priority species;
- The location of nearby similar and suitable wildlife habitats; and
- The timing of construction activities (i.e., during critical periods for wildlife).

If conveyance lines are needed for a new storage project, vegetation along the conveyance corridor would be removed. If those plant communities provide habitat for wildlife, that habitat will be lost. Similarly, wildlife in those habitats, such as birds, small mammals, amphibians or reptiles, including priority wildlife species, could be lost or displaced by construction activities. Wildlife in the vicinity of the new storage area would also be displaced by noise and construction activities.

Impacts would be greater if they occurred in riparian areas, intact shrub-steppe habitats, and those habitats suitable for listed wildlife species such as pygmy rabbit, Washington ground squirrel, sage grouse, or spotted frog. Impacts to disturbed habitats such as active agricultural lands would be less significant. As previously mentioned, construction impacts would be minimized through compliance with wetland regulations set by the U.S. Army Corps of Engineers and Ecology, and the use of the WDFW mitigation policy.

Long-term impacts

Fish. The long-term and operational impacts of storage facilities on aquatic species include:

- Modification of existing habitat under the reservoir;
- Altered hydrological and thermal regimes downstream;
- Fish passage hindrances;
- Shifts in species composition; and
- Interruption of downstream gravel recruitment.

The region has made a substantial commitment to artificial production facilities to support and supplement fish populations and fisheries in the Columbia River Basin. Storage projects under the Management Program could potentially influence hatchery operations by modifying the

quality or quantity of source water, influencing habitat conditions or species compositions near the traditional hatchery release points, or by influencing stock assessments or harvest management considerations by means of altered species compositions. Site-specific environmental review conducted when storage projects are identified will assess potential effects on hatchery programs.

Operational factors of the storage facility that could affect fish include fill timing and rate; reservoir turnover rate (length of storage); reservoir elevation fluctuations; access to tributary habitats; and downstream flow regimes including up-ramping and/or down-ramping rates. A shift in aquatic species compositions with a change from lotic (free-flowing) to lentic (ponded) hydrological systems is typical of reservoir creation. In the Columbia River Basin, warmwater species would likely dominate the reservoirs. An increase in non-native species and species that might prey on salmonid fishes is also likely with reservoir creation.

Wildlife and Plants. Long-term impacts to wildlife and plants associated with operation of new storage facilities include loss of habitat, permanent displacement of wildlife, and change in vegetation communities.

The permanent loss of plant communities would result due to inundation by the new facility. To comply with dam safety regulations, all large and deep-rooted plants would be permanently prohibited on the face of earthen impoundment structures, and grasses or other shallow-rooted plants would be maintained to allow inspection of the impoundment surface. If new facilities are proposed in or near native grasslands, shrub-steppe communities, and Garry oak communities, those habitats would be permanently removed from future regeneration. New storage projects may also result in the permanent loss of microbiotic crust if it is present in the area of new facilities.

The addition of water to arid areas may increase plant species diversity through alteration of vegetation communities. However, vegetation typically associated with reservoirs and altered hydrology is composed of primarily non-native or invasive species, such as Eurasian watermilfoil (*Myriophyllum spicatum*), saltcedar (*Tamarix ramosissima*), purple loosestrife (*Lythrum salicaria*), Russian olive (*Elaeagnus angustifolia*), common reed (*Phragmites australis*), and reed canarygrass (*Phalaris arundinacea*). Invasive species and non-native plants can spread rapidly and outcompete native species, forming single-species stands that reduce habitat for native fish, waterfowl, and other aquatic wildlife. An increase in non-native species is likely with reservoir creation.

Increasing the storage of existing facilities may result in changes in vegetation communities and fluctuating water levels that expose variable amounts of rock, vegetation, mudflat, etc. depending on the amount of water released. Long-term rapid fluctuations in water surface levels at facilities and downstream channels could have impacts on near-bank and overbank plants and wildlife during all times of the year. Impacts could include loss of vegetation or the nests of waterfowl and shorebird species. The changing levels of inundation could alter the suitability for wildlife that use these habitats for wintering, breeding, or during migration.

New storage facilities would permanently displace wildlife in and around the facility through inundation of their habitat. The level of effect will be dependent on the quality of current habitat

and the species assemblages using that habitat as well as the size of the facility. Additional open water or mudflat areas may create new habitat for waterfowl species, especially during spring and fall migration. However; insects including mosquitoes could breed in the additional mudflat areas and wetlands. The increase in mosquitoes may require an increase in the insecticides used for mosquito control, which would have an impact on fish and wildlife using these areas. In addition, mosquitoes could carry diseases, including the West Nile virus. During summer drawdowns, exposed mudflats could be colonized by a mix of native and non-native plant species, including smartweed (*Polygonum*) and cocklebur (*Xanthuim*).

New storage facilities may also result in new water supply to areas where it was previously unavailable. New water supply could increase demand for agricultural land use and increase the pressure to convert native habitats, such as intact shrub-steppe, to agricultural uses. This would result in an increased habitat loss for species dependent on shrub-steppe habitats or other native habitats and may further decrease populations of those species. Listed plant species in these habitats may include Spalding's catchfly, northern wormwood, and whitebluffs bladderpod. Wildlife may include listed species such as pygmy rabbit, Washington ground squirrel, and sage grouse. As required by federal and state regulations, a site-specific evaluation of threatened and endangered species in the proposed project area would be conducted for each storage project, and would include an analysis of the associated increase in agriculture.

Mitigation

Fish. Mitigation measures associated with storage projects will be discussed on a site-specific basis with the project proponent, Reclamation, Ecology, and WDFW. The federal Services, including NOAA Fisheries and USFWS, would also be consulted if federal funding or permitting is involved. The following items are generally considered ways to minimize the influence of dams and reservoirs on local aquatic environments:

- Seasonal restrictions on surface water withdrawals from supply reservoirs to the period with the least influence on key species;
- Adult and juvenile fish passage provisions at all in-channel storage sites;
- Reservoirs designed with low width/depth ratios to minimize thermal heating;
- Reservoirs designed with bottom withdrawals for downstream water temperature control, where appropriate;
- Construction techniques that minimize work activity and the seasonal timing within the OHWM and in compliance with HPA provisions;
- Intake screens and seasonal restrictions on surface water withdrawals to supply the storage reservoir for off-channel projects;
- Diversion screens for reservoir withdrawal;
- Fish barriers in discharge canals;
- Ramping rates for diversions and for initiating or terminating downstream releases to minimize water level fluctuations and adverse effects on aquatic species; and
- Monitoring, periodic review, and adaptive management.

In addition, coordination between Ecology, Reclamation, WDFW, tribes, the federal Services, and various hatchery operators will be important to minimize impacts to artificial production (hatchery) programs.

Wildlife and Plants. Site-specific feasibility investigations would include an evaluation of the presence of threatened, endangered, or sensitive plant or wildlife species. If these species are found, the area should be avoided. If the project cannot be relocated to a less sensitive area, mitigation measures for the specific project will need to be developed to reduce or prevent adverse impacts to the affected plants, wildlife, and wildlife habitat. Mitigation measures and BMPs may include:

- Minimize the area of disturbance;
- Revegetate and restore disturbed areas around the reservoir with native plant species to provide improved habitat for wildlife species and encourage recolonization by native plants;
- Monitor and maintain replanted areas until species are well-established;
- Implement a noxious weed control program to control invasive species that may establish in the new storage area;
- Coordinate with NRCS to minimize impacts to areas set aside in federal Farm Bill programs such as the Conservation Reserve Program;
- Acquire habitat or other unmanaged land near new storage site for restoration and maintenance as mitigation for lost habitat;
- Select construction windows to minimize disturbance to sensitive or listed wildlife species during critical periods such as breeding or raising young; and
- Set reservoir operation schedules to minimize the impact of rapid fluctuations in facility and downstream channel water surface levels on near-bank and overbank plants and wildlife.

4.1.1.7 Socioeconomics

Short-term impacts

The design and scope of individual storage projects would determine the levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty. Construction activities would likely generate job opportunities and income in the local area. These opportunities would accrue to local residents unless workers come from outside the area. If the local economy is functioning at full employment, the construction projects would engage local workers by inducing them to leave jobs elsewhere, increasing labor costs for local businesses in other sectors, and tightening the local labor market. If workers come from outside, they would tighten local markets for housing, public services, and consumer products.

The level and distribution of costs among Washingtonians would be influenced by the amount of funding available from outside sources. Federal guidelines restrict funding for projects that

generate local benefits, such as increased farm earnings, at the expense of competitors in other regions (U.S. Water Resources Council 1983). To the extent a construction project attracts funding that otherwise would be invested elsewhere in the state, then its economic consequences would be offset by the forgone consequences of the displaced investment in other projects and programs. Momentum generated by the Management Program may lower the costs of making decisions about, and accelerate the implementation of, structural projects that would happen anyway.

Long-term impacts

Predicting the long-term economic impacts of the proposed Management Program with precision is difficult because the Management Program would interact with many factors, such as shifting markets for water-related goods and services, overlapping trends in the overall economy, individual industries, community economies, and society's preferences regarding water and related resources. By increasing the supply of resources for some while decreasing the supply for others, the Management Program would have both positive and negative impacts on the relationship among competing demands for scarce resources. Both types of impacts would materialize, for example, as the program alters competitive markets by enabling some producers of irrigated crops to increase their output, and by altering the demand for the products produced by others.

Recent studies of water-related economic issues in the Columbia River Basin have reached different conclusions, reflecting different assumptions about how households, farms, communities, businesses, and the state as a whole would respond to a change in the management of the area's water supplies. The following discussion reflects, rather than resolves, these differences in assumptions and conclusions, and outlines the factors that will affect those impacts while providing a framework for considering the potential outcomes.

The design and scope of individual storage projects would determine the levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty. An increased supply of water during periods when water would normally be more scarce would have value, as it reduces shortage-related risk and uncertainty for water users. Table 4-1 shows the distribution, by crop, of new water for irrigation if it were used in the same manner as existing irrigation in the project area. About one-half would irrigate field crops (hay and wheat), 17 percent orchards, 20 percent row crops, and 13 percent other crops. If new water for irrigation were as productive as existing irrigation, it would yield the direct, net economic returns (value of the crop minus the cost of producing it) to the local economy shown in Table 4-1. These range from negative $91 to positive $147 per acre-foot of irrigation water for the project area as a whole, and from negative $82 to positive $129 per acre-foot in the Columbia Basin Project (Huppert et al. 2004). Irrigation of potatoes, vegetables, and orchards would yield positive net economic returns. For hay, wheat, and other crops, the costs of production would exceed the crop value, although individual farmers, by not fully accounting for some costs, might see positive cash-flow. According to Huppert et al. (2004), if new water for irrigation were used in the same manner as existing irrigation, the net economic return per acre-foot of the new irrigation water would be about $22.

Table 4-1. Use of New Irrigation Water and Net Economic Return, by Crop, if New Irrigation Resembles Existing Irrigation (Huppert et al. 2004)

	Hay	Orchards	Vegetables	Other	Potatoes	Wheat
Percent of new water that would be used for each crop	34%	17%	9%	13%	11%	15%
Local, Direct Net Economic Return per Acre-Foot Diverted						
Project area average	-$5	$82	$89	-$91	$147	-$34
Columbia Basin Project	-$5	$67	$96	-$82	$129	-$29

Source: Huppert et al. 2004

Huppert et al. (2004) recognized that the figures in Table 4-1 give an incomplete representation of the statewide economic consequences of new supplies of water for irrigation in the project area, because farmers are unlikely to use new water in exactly the same way as they use existing water, or to earn the same net returns. Moreover, if farmers using the new water significantly expand the supply of irrigated crops produced in the state, they would likely depress the market prices all farmers receive for the crops, diminishing the net economic returns of existing farmers.

Two studies took these factors into account and extended the analysis of Huppert et al. (2004). They concluded that increasing irrigation in the project area by 1 million acre-feet would reduce the overall value of the state's agricultural output, and the statewide net economic return of increasing irrigation in the project area would be between negative $60 and negative $70 per acre-foot (Griffin 2005; Williams and Capps, Jr. 2005). Federal guidelines (U.S. Water Resources Council 1983) indicate that these findings, along with the likelihood that increased production from new irrigation in the project area would lower the earnings of farmers producing the same crops in other states, diminish the likelihood that new storage projects in the project area would qualify for federal funding. Olsen (2006), however, challenged the notion that increases in the production of irrigated specialty crops, such as orchard, vegetables, potatoes, and other high-value crops, would depress prices, especially in the long run. He also identified "problems/issues" with the findings of Williams and Capps Jr. (2005), but did not provide theoretical or empirical substantiation for these concerns or offer a substitute analysis.

Expansion of irrigated agriculture in the project area would likely generate some new jobs and income. Huppert et al. (2004) estimated that increasing irrigation by 1,000 acre-feet would generate about 20 new jobs in agriculture and directly related industries, assuming new irrigation were similar to existing irrigation in terms of crop mix and productivity. They also predicted that the increased spending by farms, workers, and others would generate additional jobs and income elsewhere in the economy through the so-called multiplier effect. Using a common economic model, Huppert et al. predicted that for each new job directly related to new irrigation, the multiplier effect would generate an additional 1.4 jobs. Olsen (2006) also predicted that new irrigation would have a multiplier effect on jobs and income.

Other economists, however, have determined that the multiplier effect from new irrigation is likely to be much smaller than this model predicts, and may be zero. They reach this conclusion in part because the negative effect on crop prices, described above, would diminish earnings of other farmers. In addition, the expansion of irrigation would draw labor, capital, and other

resources from other uses so that the generation of irrigation-related jobs would be accompanied by the loss of jobs elsewhere. Agricultural economists at Washington State University and the University of Idaho (Hamilton et al. 1991) summarized the literature on this point 15 years ago. Zhang (Ecology 2004a) found the current literature indicates that new irrigation in the project area would have no secondary effects, and Griffin (2005) endorsed this view. Bhattacharjee and Holland (2005) took an intermediate view and recognized that, if declining water supplies in the Odessa Subarea cause farmers there to stop growing potatoes, a range of outcomes is possible, from a collapse of potato-related sectors of the economy to a transfer of production from the Odessa Subarea to nearby areas so that the overall economy experiences little change.

The proposed Management Program's impacts on the value of irrigation-related goods and services constitute only part of the overall impact. The Independent Economic Analysis Board of the Northwest Power Planning Council (1999) has concluded that the non-market values of resources affected by water-management decisions "can rival in magnitude" the values of the market-oriented goods and services, such as those associated with irrigated agriculture and hydropower. The impacts on these and other values will be addressed in the future examination of specific projects, if any, implemented under the program.

Increases in the supply of water for producing goods and services, such as municipal-industrial uses, recreation, waste assimilation, and fish conservation, probably would have positive economic value. Direct increases in jobs and income probably would accompany resulting increases in industrial uses of water, water conservation, recreation, and other commercial activities.

Improvements in streamflow and riparian habitat may increase the supply of amenities, such as scenic vistas and opportunities for fishing, viewing wildlife, and other recreational activities. These improvements probably would have direct economic value and they may directly generate jobs and incomes in tourism, recreation, and related sectors of the economy. Impacts on the supply and location of water-related amenities also may affect household location decisions and, therefore, derivative jobs and income. For example, a water storage project that increases downstream streamflows during critical periods, boosts salmon populations, and creates fishing opportunities closer to urban centers than those that currently exist, might attract households to the area. The increased population would then generate jobs and income in industries with no direct connection to the water-storage project. Such changes in the supply of resource-related amenities would reinforce efforts—such as the Othello Sandhill Crane Festival, Coulee City Bald Eagle Festival, and Audubon birding loop—to improve access to resource amenities and develop the resource-related tourism sector.

To the extent that new storage increases streamflow at critical periods and boosts fish populations, it would generate economic benefits currently estimated at $715 per salmon or steelhead (Huppert et al. 2004). These benefits would be distributed among tribal members, commercial fishers, anglers, and others who place a value on conserving these species. It is reasonable to assume that benefits to tribal members would be greater than $715 per fish, as salmon and steelhead have cultural and spiritual values not represented in the research underlying this estimate. Increased fish populations could generate increases in jobs and income in commercial fisheries (tribal and non-tribal, both in-river and ocean) and recreational fisheries.

Such increases may provide additional benefits to tribal members and others, for whom fishing is an integral part of maintaining a traditional lifestyle.

Expansion of agricultural, municipal, and industrial use of water in the project area would likely increase the economic costs associated with emissions of pollutants to streams and aquifers, and with other spillover effects (negative externalities). Potential emissions include heat energy, sediment, nutrients, pesticides, and pharmaceuticals (NRC 2005 and Ribaudo and Johansson 2006). Diverting water from the Columbia River for storage and use elsewhere might reduce the amount of water available to generate hydropower and support navigation activities (Huppert et al. 2004). Any potential impacts to hydropower or navigation would be closely reviewed with the potentially affected utilities and coordinated under the Federal Columbia River Power System. Diverting water from one location to another may reduce the number or quality of recreational opportunities and the water's waste assimilation capacity at the point of diversion, but may increase them as the water passes through other waterways or is stored elsewhere.

Changes in water available for release and water surface elevations in the reservoirs behind Grand Coulee Dam and downstream dams, including Chief Joseph, McNary, John Day, The Dalles and Bonneville, among others, can impact hydropower production available for marketing and revenues received by the Bonneville Power Administration. The Confederated Tribes of the Colville Reservation have an agreement with BPA that provides an annual payment to the Confederated Tribes for lands needed by the United States for Grand Coulee Dam and Lake Roosevelt and taken from the Colville Reservation. The annual payment to the Confederated Tribes would be affected by changes in power production at Grand Coulee Dam and the downstream dams, as well as revenues received by BPA throughout the hydropower system in the state of Washington and upstream states. Studies by the Confederated Tribes demonstrate that the annual payment can be favorably increased or adversely decreased by as much as $500,000 annually depending upon marginal changes in future diversion and use of water and the magnitude and timing of consequent changes to release patterns at relevant dams (Watson, personal communication, 2007).

Mitigation

The design and scope of individual storage projects would determine the nature, location, and timing of long-term adverse impacts, their distribution among different groups, and the nature of opportunities for mitigating them. Reductions in recreational opportunities resulting from the diversion of water at one point, for example, might be mitigated by creating compensatory recreational opportunities nearby. Coordination with tribal and non-tribal resource managers, and consultation with communities of interest, would promote the identification and balancing of their respective economic concerns. Evaluations of specific storage projects would consider economic impacts, both direct and indirect. Projects involving the expenditure of federal funds would be subject to evaluation under federal evaluative principles and guidelines (U.S. Water Resources Council 1983).

4.1.1.8 Land and Shoreline Use

Short-term impacts

Short-term impacts to land and shoreline use from the construction of new storage facilities could include relocation of some uses in areas to be inundated, and temporary disruption of access to businesses or recreational uses during construction. In addition, right-of-way may be required for conveyance lines. The scale of these impacts is dependent on the characteristics and size of the new or modified facility and its proximity to other land uses. Siting and feasibility studies for each facility will identify and evaluate potentially sensitive land uses within the proposed area of inundation, and will attempt to avoid impacts to existing beneficial land uses as much as possible.

Long-term impacts

Development of new storage facilities may result in significant long-term impacts to land use, based on the amount of land and type of land use affected. Constructing a new storage facility or raising the level of an existing storage facility would inundate additional shoreline areas and could eliminate or curtail current land uses. At the same time, it could encourage some new uses, such as recreation, that may not have been present before. Extensive property acquisition may be required in order to construct a new storage facility. Property acquisition can be highly controversial in some areas, and will be an important consideration in site-specific evaluations. Land use considerations, including the amount and type of land uses to be inundated, will be incorporated into site-specific feasibility evaluations. Impacts to land use associated with development of storage facilities are linked to water availability and the economic impacts that can result from changes to current water management practices. Refer to Section 4.1.1.7 for a more detailed discussion of this linkage. Following is a discussion of general land use impacts that can result from changes in water availability and distribution.

Potential beneficial long-term impacts of new storage facilities include additional, reliable water resources for out-of-stream uses, such as irrigated agriculture and urban development. New storage facilities would result in additional water for irrigation. The increased reliability could result in several possible effects on agricultural land use, including:

- Conversion of low value crops, such as hay, to high value crops such as orchards, vineyards, and potatoes;
- Shift to smaller farm units with conversions to orchard and vineyards;
- Expansion of the non-farm uses associated with the wine tourist industry;
- Shift to larger scale agriculture;
- Conversion of non-irrigated lands to agriculture; and
- Reduced pressure to convert agricultural land near urban areas to residential uses.

Changes in types of agriculture are not generally regulated by local zoning or comprehensive plans and would not be considered adverse impacts on land use. The changes in types of agriculture could cause several minor changes in land use patterns, which could conflict with

existing land use policies. These changes in land use could result in a trend toward reduction of existing wildlife habitats, as discussed in Section 4.1.1.6.

Because orchard and vineyard production could take place on a smaller scale than some irrigated annual crops, changes of these types could result in smaller farms with more workers, and thus higher density of residences. However, the increase in density would be developed in compliance with local zoning regulations and would continue to support the goals of preserving and enhancing the productivity of agricultural lands. Therefore this would not be an adverse impact on land use.

The vineyard industry has produced a related tourist industry that requires non-agricultural development such as lodging, eating, and drinking establishments. These types of commercial uses may or may not be consistent with local comprehensive plans or zoning regulations. Increased vineyard production could contribute to the success of wine tourism and create pressure to convert more agricultural land to these types of non-farm uses.

Crops such as potatoes also produce high yields if sufficient water is available. More water being available could result in more land being converted to large-scale potato production, which could occur with little increase in population density.

New irrigation and crop conversions could take place on lands that are zoned for agriculture; these conversions would be expected to be in accordance with adopted land use plans. Expansion of an individual crop such as potatoes could have adverse effects on existing farms due to impacts on market conditions, which in turn can affect uses that are dependent on potato production such as processors and equipment producers. Refer to Section 4.1.1.7 for a discussion of potential economic impacts associated with increased water availability.

The improved reliability of irrigation could be expected to reduce pressures to convert agricultural land to residential land in some areas, because of the potential for improved economic viability of the agricultural use. This would be consistent with comprehensive plan goals and policies that emphasize the importance of maintaining and enhancing agricultural lands.

Mitigation

Specific projects proposed under the Management Program will be required to comply with applicable shoreline master programs, zoning codes, local comprehensive plans, and critical area ordinances. All storage projects will undergo an extensive site-specific evaluation, which will include an analysis of consistency with adopted land use plans and policies, as well as an extensive public outreach program. Local permits may not be required for smaller facilities such as on-farm storage facilities or ASR projects.

Any proposed development that receives the benefits of new water storage facilities may also be subject to project-level review and approval by a local permitting agency before the project could be constructed. This would provide an opportunity to determine whether the proposed development is consistent with local policies and regulations.

Any property acquisition would be done on a case-by-case basis and in accordance with applicable state and/or federal requirements. Property owners would be compensated at fair market value for any property that would need to be acquired for construction of the storage facilities.

4.1.1.9 Cultural Resources

Short-term impacts

Construction of a storage facility could adversely impact cultural resources in the short term. Any ground disturbing activity, including removal of vegetation prior to inundation, earthmoving, and use of heavy equipment, could adversely affect cultural resources in the area of the construction activity as well as in staging areas. Other impacts could include removal of historic structures prior to inundation.

Long-term impacts

Construction of a storage facility could adversely impact cultural resources over the long term. The impacts to cultural resources within reservoirs could include destruction or damage of archaeological sites, historic structures, or Traditional Cultural Properties (TCPs). There are generally three zones of impact to cultural resources in storage reservoir settings: the inundation zone, the direct impact (fluctuation) zone, and the indirect impact (backshore) zone.

Archaeological sites can be damaged or destroyed through erosion, inundation, chemical weathering, vandalism/artifact collecting, and land development. These impacts often occur in combination. Of these, erosion by wind and water is the most predominant impact (Lenihan et al. 1981). Erosion impacts vary based on the site type, land form, severity of wind and water action, soil structure, and type of cultural resource. Depending on the fluctuation zone of the reservoir (the area between normal high and low water levels) and the angle of the landform slope, sites can slump, be washed out, or suffer bank calving. Inundation impacts sites by making them inaccessible for research. The sites may become covered with sediment, although there is some speculation that the sedimentation provides protection to the site. Artifacts and features may be damaged by long-term inundation due to changes in the chemical composition of the surrounding geologic matrix. No detailed studies have been conducted to evaluate the impacts of sedimentation on fragile archaeological deposits.

Chemical weathering impacts to archaeological sites could include damage to organic remains through repeated wetting and drying of archaeological deposits, leading to a loss of scientific potential of sites along reservoir boundaries. This impact is often linked to irrigation-related reservoirs (Galm and Masten 1988).

Vandalism and artifact collecting could be expected, especially if a new reservoir provides recreational areas. Vandalism includes a range of activities from intentional looting of sites, to off-road vehicle use in culturally sensitive areas, to extended recreational use, which destabilizes soils. With increased boat use, more sites could be accessible and become vulnerable to vandalism. Increased boat use is also likely to increase erosion due to wake action. Rock art is often the target of graffiti. Site erosion often makes sites more susceptible to vandalism by increasing site exposure.

Land development in the areas surrounding a reservoir can include construction of roads and recreational facilities, grazing, agricultural or orchard uses, and increased residential, commercial, or industrial use. Grazing cattle can adversely affect cultural deposits up to a meter below ground surface as cattle come to water's edge to drink and wallow. The impacts to trampled sites are compounded by fluctuations in the shoreline and changes to soil chemistry related to manure incorporation.

Historic structures in the inundation and fluctuation zones will likely be removed prior to inundation. Historic structures in the backshore zone could have increased access, which often leads to increased vandalism. The increased proximity of water may adversely impact the significance of the historic structure by altering the integrity of its setting.

Traditional Cultural Properties (TCPs) in the inundation zone would become permanently inaccessible. TCPs in the fluctuation zone would likely be so altered that even when exposed, they would lose their characteristics (such as isolation or resource availability), which provide their integrity of setting, feeling, or association. TCPs in the backshore zone may suffer adverse effects due to alteration of the integrity of setting, feeling, or association as well.

Mitigation

The construction of storage facilities would require additional environmental review, after which the exact mitigation measures would be developed in coordination with the Department of Archaeology and Historic Preservation (DAHP), the affected tribes, and other interested parties. Ecology will develop a Cultural Resources Management Plan (CRMP) in consultation with interested parties. The CRMP will support the goals of the Management Program while ensuring appropriate cultural resources management. The CRMP will outline efforts to identify cultural resources in the project area, develop a review process for planned actions, outline potential mitigation measures, and include processes to identify and resolve conflicts.

Because of the anticipated multi-agency and multi-government involvement with projects proposed as part of the Management Program, it may be appropriate to develop a Programmatic Agreement. Federal involvement is likely at the project level which will require compliance with Section 106 of the National Historic Preservation Act. A Programmatic Agreement outlines an alternative to meeting the requirements of Section 106 in cases where the project is complex and the full range of impacts is not well-defined. The CRMP can provide the basis for the Programmatic Agreement. Signatories to the Programmatic Agreement would likely include Ecology, Reclamation, and the appropriate historic preservation officer. Invited signatories could also include the affected tribes, including Tribal Historic Preservation Officers, and the Advisory Council on Historic Preservation. The Programmatic Agreement should be negotiated to clearly outline the responsibilities of each party and the approach to identifying cultural resources and mitigating impacts to them.

Mitigation measures would differ by impact zone (inundation, fluctuation, or backshore). Mitigation measures could include archaeological remote sensing during reservoir planning to allow avoidance; excavation of archaeological sites that would be adversely affected by the reservoir; documentation of historic structures; site protection/stabilization, including site burial, use of filter fabrics, revegetation, site armoring, creation of no-wake zones, and other measures;

efforts to reduce vandalism through public education, fencing, or site surveillance; and archaeological monitoring during construction and for the length of the project (Draper 1992; Lenihan et al. 1981). Construction contracts would require that if any archaeological material is encountered during construction, construction activities in the immediate vicinity would halt, and DAHP, a professional archaeologist, and, if appropriate, tribal cultural resources staff would be contacted for further assessment prior to resuming construction activity in that area.

Mitigation measures for TCPs would need to be determined in consultation with the appropriate cultural group. Mitigation measures might incorporate the purchase and protection of properties to mitigate indirect effects, encompass mitigation of ongoing effects of the project, and provide for off-site mitigation as appropriate. Because TCPs contribute to the maintenance of a culture, mitigation efforts also might include documentation of the significance of the place through oral histories or recording traditional storytellers. It is important to note that it is not always possible to mitigate adverse effects to TCPs.

Existing reservoirs within the region have ongoing programs for the life of the project to assure that operational changes, continuing erosion, and new project elements address cultural resources issues.

4.1.1.10 Transportation

Short-term impacts

Construction activities would result in additional traffic on roads near the construction areas, including trucks, heavy equipment, and worker vehicles. Numerous truck trips would be necessary to haul materials to the site or to dispose of waste materials. The number of construction-related trips as well as the frequency and duration of impacts is dependent on the location, nature, and scale of the project.

If construction takes place adjacent to roads, disruption of traffic on these roads would likely occur. Delays or detours may be necessary, depending on the nature and location of the project, and may involve construction of temporary access roads. The degree of impact depends, in part, on the current level of service on potentially affected roads. Roads at or above capacity would be more heavily affected than roads that are substantially below capacity.

In-water construction activities could have a minor impact on barge transportation routes, for example if an existing on-line storage facility on the Snake River were modified.

Long-term impacts

Depending on a project's location, new storage facilities could require relocation of roads, highways, or railroads in the project area. This would potentially result in minor to moderate impacts on transportation systems, depending on the number of people affected by the relocation, the number of road/highway/railroad miles that are relocated, and the distances involved. Increased municipal development could require additional roads.

If a storage project were constructed on the Columbia River below the Tri-Cities or on the Snake River, navigation by barges could be affected. Construction of a project that could adversely

affect barge navigation would require coordination with the Corps of Engineers and other federal agencies to minimize navigational impacts.

Mitigation

Potentially relevant mitigation measures include:

- Preparing a construction traffic management plan that includes signage, detour routes, pedestrian safety measures, limited access, designated parking and staging areas, hours of construction, and public information measures; and
- If a roadway needs to be relocated for a new storage facility, the relocated roadway could be constructed to ensure equal or better access and circulation to that which existed prior to construction. Replacement roads or road segments could be constructed prior to the completion of the new storage facility.

4.1.1.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

Recreation use and access may be temporarily disrupted during construction of new storage facilities. If a recreation area is near a new storage site, access to part or all of the recreation area may be limited during construction. Construction activities may also introduce noise and dust that would degrade the recreational experience at the site. Construction in or near existing water bodies may temporarily increase water turbidity. In a water-oriented recreational area, turbidity may make the area less attractive for swimming, fishing, or passive enjoyment. Once the project is completed, however, recreation use would generally continue as before.

Because storage facility construction would affect the visual quality of the surrounding area, recreational opportunities could be reduced or changed. This would be of greatest potential impact in areas where the scenic resources play a significant role in the recreational use. For example, impacts could result from loss of vegetation, inundation of areas previously available for hiking, fishing, or other activities, and/or the introduction of construction equipment. The magnitude of the impact will vary depending on the character of the area, the level of existing use, and the scope of the proposed project, but some level of impact is unavoidable. Site-specific investigations would be conducted for any potential storage project to characterize existing recreational usage and to assess specific recreational impacts.

New storage projects would similarly affect local scenic and aesthetic resources during construction, through the alteration of the landscape, introduction of construction equipment, and short-term generation of dust. The potential duration and magnitude of the impact will depend on the nature of the existing scenic resources and the extent of potential modification, but in some cases, the existing visual environment would be significantly altered.

Long-term impacts

Construction of a storage facility could impact recreation resources over the long term. Construction of new on-channel storage facilities would change the stream reach from free flowing to a river with regulated flow, affecting the water flows downstream. The flow regime

would be altered by the storage facilities, which would store water during high flow periods and release it during lower flow periods to augment instream flows and other beneficial uses. This could alter recreational opportunities downstream, reducing or eliminating the potential for canoeing, rafting, or other boating opportunities in some areas. However, the increase of flow during the dry season may provide improved recreational opportunities for some aspects of water-related recreation. Changes in riparian vegetation may change hunting opportunities. Hunting areas for upland species would be reduced where a reservoir inundates dry land. Changes in streamflow may affect recreational fishing opportunities.

Constructing storage facilities will permanently alter the visual character of the surrounding area. The magnitude of the impact will depend on the proposed location of the facility, the existing character of the surrounding landscape, and the anticipated scale of the specific project. Areas inundated will be permanently removed from the visual landscape; downstream reaches of receiving waters would be altered where the flow regime is altered. Project-level evaluations will incorporate visual and scenic resource considerations to avoid impacting significant, unique scenic resources. It will not be possible to avoid visual impacts associated with storage facilities, and some individuals will likely consider these impacts significant.

In some cases, new storage facilities could create recreational opportunities associated with the creation of a large body of water, including fishing, boating, or swimming. To the extent that storage projects increase instream flows, downstream fish populations may benefit, which in turn could benefit recreational fishing.

Mitigation

Project-specific environmental analysis will assess current recreational and scenic resources within potentially affected areas. Specific measures to offset or minimize affected recreational resources will be developed for specific projects. Some potential measures include:

- Restore vegetation in disturbed areas after construction to diminish the impact to recreation, scenic resources, and aesthetics;
- Incorporate recreational usage into discharge flow regimes from the facility; and
- Employ construction best management practices to minimize potential for construction-related turbidity in downstream water bodies.

4.1.1.12 Public Services and Utilities

Short-term impacts

Providing additional water for some utilities or irrigation districts may reduce supplies for others. All potential modifications to water supply utilities would be evaluated as part of site-specific investigations, and would be coordinated closely with potentially affected utilities.

Construction of new storage facilities could cause temporary disruption or relocation of existing utilities. Any potential disruption would be evaluated and coordinated with the affected utility prior to construction. Construction of new water storage facilities would likely require significant financial resources for project design and construction. Large-scale projects may not be feasible without Congressional and/or state legislative appropriations. To offset part or all of

project costs, increases in existing water rates (irrigation, municipal, etc.) may be necessary.

Substantial federal, state, and local agency involvement in permitting, including environmental review under SEPA and/or NEPA, would likely be necessary for any new storage facility. This could require additional agency staff resources.

Long-term impacts

The operating entity for new water storage facilities, such as an irrigation district or Reclamation, may require significant resources for operation and maintenance. There may also be significant opportunity costs associated with public funding of storage facilities, particularly larger and more costly facilities. That is, public funds spent on construction of a storage facility would not be available for other public purposes.

Water stored and used for out-of-stream consumptive uses could reduce potential power generation at downstream hydroelectric facilities, depending on when and where it is diverted. The reduction in power generation potential would affect the Federal Columbia River Power System. Potential impacts to hydropower generation would depend on the specifics of any proposed project. For any project that could reduce power generation potential, Ecology would work in conjunction with Reclamation to coordinate and negotiate with the Bonneville Power Administration, Columbia River PUDs, and the Corps of Engineers to determine potential impacts and appropriate mitigation.

Mitigation

Analyses of funding needs conducted by proponents for storage projects should consider all short-term and long-term public services costs and impacts, including resources required for permitting and public processes. Compensation could be provided for agency costs incurred in permitting and conducting public processes where appropriate.

Storage facilities could be operated to minimize any reduction in water availability for electrical generation. If the river or stream gradient is sufficient, it may be feasible to construct hydropower facilities at new storage projects or on conveyance systems to partially offset the power generating potential lost at downstream mainstem dams.

4.1.1.13 Comparison of Impacts for General Types of Storage Projects

Table 4-2 presents a comparison of the impacts that would be associated with the general types of storage projects that are likely to be proposed under the Management Program. This comparison is not exhaustive, but instead highlights the major differences in impacts of the types of projects.

Table 4-2. Comparison of Impacts for Types of Storage Projects

Element of the Environment	New Large Storage (> 1 Million AF)	New Small Storage (< 1 Million AF)	Modifications to Existing Storage	Aquifer Storage and Recharge
Earth *Short-Term* *Long Term* *Mitigation*	Primary impacts include erosion, sedimentation, non-native fills and the general consumption of earth materials. Soil saturation may decrease slope and soil stability. Mitigation measures to minimize impacts would include construction BMPs and appropriate hydrogeological studies.	Construction impacts will be of lesser magnitude than large storage projects, but of similar nature.	Construction impacts will be of lesser magnitude than large storage projects, but of similar nature.	Construction impacts will be of lesser magnitude than large surface storage projects, but of similar nature. There is an increased potential for ground deformation or slope instability during recharge and storage because of elevated ground water pressures. Mitigation measures may include geotechnical evaluations and management of ground water pressures during recharge and storage.
Air *Short-Term* *Long Term* *Mitigation*	Large storage facilities would require the most construction and therefore would have the greatest potential for air impacts. Mitigation includes compliance with Ecology and local air quality regulations	Small storage facilities would have comparatively less construction and therefore less potential impacts.	Modifications to existing storage facilities could involve less construction than new large facilities and thus would have less potential for air quality impacts.	ASR projects would have less construction associated with them; therefore, construction impacts would be less than for other storage projects.
Surface Water *Short-Term* *Long Term* *Mitigation*	Water quantity impacts may include interruption of flow, change in streamflow regime, rapid changes in reservoir and downstream channel levels and increases in evaporative losses. Water quality impacts may include sedimentation, increased temperature, seasonal increases in sediment loading and dissolved gas, eutrophication, accumulation of pollutants in the headwaters of the impoundment and decreased organic loads in streams. Mitigation may include scheduling flow releases to mimic natural event magnitudes, releasing sediment along with flushing flows and developing operating rule curves to compensate for flow alterations.	Construction and/or operational surface water impacts will be of lesser magnitude than large storage projects, but of similar nature. Mitigation will be similar but to a lesser extent.	Construction and/or operational surface water impacts will be of lesser magnitude than large storage projects, but of similar nature. Mitigation will be similar but to a lesser extent.	Temporary construction impacts would occur for construction or modification of diversion and conveyance infrastructure. Changes in flow and temperature would occur when flow is diverted for recharge. Increased discharge to seeps, springs, and surface water would occur.
Ground Water *Short-Term* *Long Term* *Mitigation*	Ground water impacts may include changes in ground water levels, gradients, and introduction of contaminants. Mitigation includes extensive hydrogeological investigations during feasibility to avoid high risk areas, conducting design and construction in accordance with dam safety requirements, and developing a comprehensive monitoring program	Construction and/or operational ground water impacts will be of lesser magnitude than large storage projects, but of similar nature.	Operational ground water impacts will be of lesser magnitude than large storage projects, but of similar nature.	Changes in ground water elevations, ground water flow directions, and water quality during pilot testing could occur. Changes in ground water elevations, ground water flow directions, and vertical hydraulic gradients could occur during recharge and storage. Changes in ground water quality could result from mixing and reactions between recharge water and native ground water and aquifer matrix. Precipitation of secondary minerals may also occur. Evaluation of hydrogeologic system and development of monitoring and mitigation plans would help to mitigate impacts, along with long term monitoring of ground water levels and water quality.

Element of the Environment	New Large Storage (> 1 Million AF)	New Small Storage (< 1 Million AF)	Modifications to Existing Storage	Aquifer Storage and Recharge
Water Rights *Short-Term* *Long-Term* *Mitigation*	Subject to review and mitigation under Chapter 90.030 RCW.	Subject to review and mitigation under Chapter 90.030 RCW.	Same water right review under RCW 90.03.290 for additional stored water as for new storage. Modifications to add or change purposes of use of stored water subject to review under RCW 90.30.380.	Project must meet standards for review and mitigation regarding specific issues listed in RCW 90.03.370(2)(a) and defined further in Chapter 173-157 WAC**.**
Fish *Short-Term* *Long Term* *Mitigation*	Large storage project reservoirs have the potential to stratify the water column. Warm surface water layers can adversely influence downstream water temperatures and aquatic species dependent upon cool water. Deep water withdrawals would be beneficial.	Small storage project reservoirs may heat the entire water column, with little potential for cool water withdrawals. Reservoir designs with small width to depth ratios would be beneficial with respect to thermal warming.	The effects of modifications to existing facilities might include either increasing storage capacity or operating in a different mode. Impacts of either type of change would be a small adjustment to the current level of ongoing effects.	Surface water diversion to supply ASR projects can influence seasonal instream flow levels for fish and aquatic oriented species. Restricting withdrawals to seasonal periods where abundant water is available will be important to support instream uses.
Wildlife and Plants *Short-Term* *Long Term* *Mitigation*	Construction-related impacts would be greatest of all options considered; potential for localized disruption of wildlife could be significant during construction. Operation of large storage facilities has greatest potential to affect plants and wildlife and alter vegetation communities associated with extensive inundation area and potential for alterations of downstream flow regimes. This option has the greatest potential to convert native habitats to agricultural uses. Mitigation for large storage projects includes 1) Minimization; 2) Revegetate disturbed areas; 3) Implementation of noxious weed control program; 4) Acquisition of disturbed habitats or other unmanaged land to be restored and maintained as mitigation area; 5) Implementation of timing windows.	Construction and operation impacts would be of lesser magnitude than large storage projects, but of similar nature. Mitigation measures for small sites would be the same.	Plants and wildlife using the edge of existing reservoirs could be impacted by the change in flood control and water levels at all times of the year. Impacts could occur to wintering wildlife (primarily waterfowl), breeding individuals, or species using habitats during migration. Reservoir operation schedules could be set to minimize this impact during critical periods.	ASR would raise ground water levels, which may affect vegetation communities and wildlife habitat over the long-term in some areas. This could be positive or negative for plants and animals, depending on the areas that are inundated. ASR is not likely to otherwise adversely affect wildlife and plants during construction or operation.
Land and Shoreline Use *Short-Term* *Long Term* *Mitigation*	Large storage facilities may spur the development of new recreational and residential uses utilizing the reservoir as an amenity, which may or may not be consistent with local planning goals. Large storage facilities would require the acquisition of more property. Availability of a more reliable source of water would allow continuation of agricultural land use practices in some areas. Mitigation includes compliance with adopted land use plans and policies.	Similar impacts to large storage, but smaller magnitude.	Existing storage facilities may have residential or recreational development adjacent to them that could be affected or displaced by raising the inundation level.	ASR projects would not likely result in changes in land use patterns. Acquisition and/or special management of lands in the vicinity of the aquifer recharge area may be required, similar to wellhead protection areas (Economic and Engineering Services, Inc. 2001).
Socioeconomics *Short-Term* *Long Term* *Mitigation*	Construction costs and forgone goods and services from inundated areas would be greatest of all options considered. Costs may be offset by federal contributions if a project satisfies economic guidelines. Of all	Potential costs, benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty probably would be similar	Location and design of modifications would determine levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk	If ASR affected vegetation and inundation in some areas, it would alter the production of goods and services by wetlands, floodplains, riparian vegetation, etc. Higher water levels in aquifers would reduce costs

Element of the Environment	New Large Storage (> 1 Million AF)	New Small Storage (< 1 Million AF)	Modifications to Existing Storage	Aquifer Storage and Recharge
	options considered, this has the greatest potential benefits for local irrigators and impacts on jobs and income associated with increased irrigation, but the greatest negative effects on crop prices and earnings associated with other irrigation, and the greatest negative potential for negative externalities, such as irrigation-related emissions of pollutants to streams and aquifers. Coordination with key stakeholders would ensure that economic considerations are incorporated into facility siting and design.	in nature but smaller than those of large storage projects.	and uncertainty.	irrigators, municipalities, Ecology, and others incur to pump water.
Cultural Resources *Short-Term* *Long Term* *Mitigation*	Construction-related impacts will be greatest of all options considered; potential for disturbing cultural resources during any ground disturbing activities, with heavy equipment, during site preparation, and in staging areas. Operational impacts include erosion, inundation, chemical weathering, vandalism, and land development. Mitigation measures should be outlined in a Cultural Resources Management Plan and possibly a Programmatic Agreement developed in consultation with Ecology, DAHP, Tribes, ACHP, federal agencies, and other stakeholders.	Construction impacts will be of lesser magnitude than large storage projects, but of similar nature. Site avoidance may be more feasible for smaller storage projects. Operational impacts will be of a similar nature to large storage projects.	Cultural resources could be adversely affected by changing water levels at existing reservoirs. Impacts would be similar to operational impacts.	ASR would raise ground water levels, which may affect the preservation of buried organic materials or the soil chemistry of buried cultural resources. ASR is not likely to otherwise adversely affect cultural resources during construction or operation.
Transportation *Short-Term* *Long Term* *Mitigation*	Large storage projects have the greatest potential for affecting transportation due to the volume of materials, and the likelihood of disrupting roads. Coordination with regional transportation managers will help to avoid and/or minimize impacts.	Impacts similar to large storage projects, but of lesser potential magnitude.	Modifications to existing storage are not likely to disrupt transportation.	ASR projects would have substantially less impact on transportation during construction due to the smaller amount of construction needed. Operation of ASR projects would not likely affect land-based transportation, except for occasional maintenance vehicles.
Recreation and Scenic Resources & Aesthetics *Short-Term* *Long Term* *Mitigation*	Construction-related impacts will be greatest of all options considered; potential for localized disruption of recreation could be extensive during construction. Operation of large storage facilities has the greatest potential to affect recreation associated with extensive inundation area and potential for alterations of downstream flow regimes. This option has the greatest potential for impacts to scenic/visual resources.	Construction impacts will be of lesser magnitude than large storage projects, but of a similar nature.	Recreational facilities such as docks and swimming facilities might have to be adapted to higher or lower water levels at existing reservoirs.	ASR would raise ground water levels, which may affect vegetation and inundation in some recreational areas. This could be positive or negative for recreation and scenic resources, depending on the areas that are inundated. ASR is not likely to otherwise adversely affect recreation or scenic resources during construction or operation.

Element of the Environment	New Large Storage (> 1 Million AF)	New Small Storage (< 1 Million AF)	Modifications to Existing Storage	Aquifer Storage and Recharge
Public Services & Utilities *Short-Term* *Long Term* *Mitigation*	Large storage facilities generally have the greatest costs, including agency costs, associated with them. Large facilities also have the greatest potential to affect existing utilities and hydropower production, but also may have more potential to generate electricity.	Smaller storage facilities would have similar impacts to large facilities but on a smaller scale.	Modifications may require only limited agency resources for permitting and environmental review, depending on the nature of the modification. Modifications to existing storage facilities could include the addition of hydroelectric plants, or improvements to existing hydropower facilities to increase the capacity for electrical generation. Mitigation would be similar to that required for new storage facilities.	ASR would have limited impacts on public services. Additional power may be required for pumping.

4.1.2 Conservation Component

This section describes the potential impacts that would occur from the range of conservation projects that could be proposed under the Management Program. No specific conservation project is analyzed because none has been proposed under the Management Program. The general types of conservation projects considered are municipal, regional agricultural efficiency improvements, on-farm, and industrial. These types of conservation projects are described in Chapter 2. Table 4-3 at the end of this section presents a comparison of the impacts that could occur from the different types of projects.

Some of the conservation projects that could be proposed under the Management Program, including regional agricultural efficiency improvements, would be likely to require additional environmental review. Smaller projects such as on-farm conservation would not likely require additional review.

4.1.2.1 Earth

Short-term impacts

Implementation of conservation projects may require canal installation, new roads to access canals for lining or piping, construction of water reclamation or reuse plants and new conveyance or distribution systems, installation of closed piping upgrades, pond construction, leak repair, and distribution system upgrades. These activities have the potential to disturb the ground and expose soils, resulting in the potential for erosion and delivery of sediments to nearby surface waters. Earth impacts from construction-related activities would be similar to those described in Section 4.1.1.1.

Long-term impacts

Long-term impacts to earth resources could involve the permanent removal of earth, the use of resources such as sand and gravel for construction fill or grading, and soil erosion from land clearing, excavation, and filling activities (Ecology 2003b).

Mitigation

Mitigation measures to minimize construction-related impacts would be similar to those discussed in Section 4.1.1.1. For any site in which reclaimed water is used to recharge ground water, thorough hydrogeologic studies should be conducted to properly select the injection or recharge site and prevent problems such as slumping or bank instability.

4.1.2.2 Air

Short-term impacts

Short-term impacts would be the same as described for construction activities in Section 4.1.1.2, except that conservation projects generally would require less construction.

Long-term impacts

Long-term impacts would be the same as for storage projects described in Section 4.1.1.2.

Mitigation

Mitigation for impacts to air would the same as described under Section 4.1.1.2.

4.1.2.3 Surface Water

Short-term impacts

Water Quantity. Short-term impacts to water quantity as a result of implementing the conservation component are expected to be the same as long-term impacts.

Water Quality. Construction associated with conservation projects may result in temporary impacts to surface water quality. The replacement of leaky irrigation ditches with pipelines, and municipal conservation activities such as leak detection and replacement programs, may have short-term construction impacts. Construction projects involving lining or modifying canals have the potential to directly transport sediment that has accumulated in the canal during construction to streams. The potential will be a function of the proximity of the project to a water body, the volume of sediment generated, the condition of vegetative buffers between the site and the water body, and the best management practices (BMPs) applied to control erosion. Inputs of sediment to any water body may increase turbidity until the site is revegetated. Inputs of fine sediment may also affect the substrate condition in streams. The level of impact will vary with the amount of sediment input into the water body. Construction-related surface water quality impacts would be similar to those discussed in Section 4.1.1.3.

Other conservation efforts, such as increasing incentives to install low volume showerheads and toilets, will have no short-term impacts to surface water.

Long-term impacts

Water Quantity. For cases in which both the point of diversion and place of water use occur in the same basin, saved water from conservation measures would reduce demand from streams and rivers and provide more water for instream flows in the reach immediately downstream from the diversion. If conservation projects result in a reduction in consumptive use, then the water budget for the entire river basin would benefit from an increase in water supply. Reduced demand resulting from conservation projects could result in an increased ability to meet minimum mainstem Columbia River flow targets established by NOAA Fisheries, and reserved tribal rights to water to hunt and fish in usual and accustomed places.

If water savings are implemented in a system that conveys water from one basin to another, the source stream or aquifer would benefit from the reduction in demand, and the basin where water is used would realize a decline in water supply due a reduction in return flows, leaks, or other losses.

In most cases, water conservation and irrigation efficiency efforts will increase surface water and ground water in the immediate area of the diversion or withdrawal by reducing demand on that source. Consumptive use reduction (i.e., reduction in evaporation or evapotranspiration) would benefit water supplies in the basin generally, not just downstream of the point of diversion from a stream or in the immediate area surrounding a well. Conservation efforts may make more water available for instream flow and other beneficial uses.

Secondary effects may include evaporative losses and ground water recharge associated with new or resized reservoirs used for regulating irrigation canal flow, changes in the timing and location of ground water recharge through irrigation district expansion, and the potential for reduced recharge along any discontinued, lined, or piped irrigation facilities.

Changes in return flow patterns may have an adverse impact on the availability of water for down-gradient water users who are relying on the return flows as a source of supply. Implementation of regional agricultural efficiency improvements could decrease artificial recharge to ground water, which could have the effect of locally lowering water tables or decreasing ground water discharge to down-gradient streams. The existence and magnitude of these impacts would depend on many factors, including the number and size of irrigation canals and ditches, the degree to which these structures are currently leaking, the amount and efficiency of new lining that may be installed, the depth to the water table, the underlying soil permeability, the amount of recharge from other sources, and the rates of ground water withdrawal (Ecology 2003).

For municipal conservation, demand management strategies such as increasing rate structures and public education should promote conservation and therefore require less water to be diverted from the source. Replacing leaky pipelines and retrofitting plumbing fixtures will also save on the amount of water required to serve customers. Secondary effects include locally reduced recharge from these previously leaking conveyance facilities, potentially altering the timing of baseflows.

Water Quality. Increases in flow may subsequently reduce stream temperature and increase dissolved oxygen, particularly in situations where summer water depths are currently low and flows are substantially increased. Increased flows may also result in reductions in the concentrations (not total load) of other pollutants. Additionally, reductions in return flow may reduce the inputs of sediment, pesticides, and fertilizers associated with agricultural practices.

In situations where water is diverted and transported to a different subbasin, reductions in return flow could reduce streamflow in the subbasin where the water is used. Reductions in streamflow have the potential to increase stream temperature. This potential may be significant in situations where a substantial portion of the flow is reduced.

Reductions in streamflow also have the potential to increase the concentration of other pollutants in a stream. This effect would tend to be offset by the reduction of inputs of non-point source pollutants unless other pollutants of another source and type are present. The latter situation is likely rare but may occur in some locations. In this situation, reductions in flow would tend to increase the concentration, but not the load, of the pollutants input through other sources. The

magnitude of effect would depend on the current pollutant load, the expected post-project pollutant load, and the amount of reduction in streamflow caused by the reduction in return flow.

Mitigation

Water Quantity. In order to maximize the benefits from conservation measures, detailed, coordinated conservation planning should be conducted to address the continued problem of surface water supply shortages during periods of low streamflow. Conservation planning should lead to a coordinated approach to maintaining instream flows to ensure that some of the water savings resulting from conservation efforts is retained to enhance instream flows (Ecology 2005b).

Situations where projects would effectively reduce flow in a stream by reducing return flow should be carefully reviewed prior to implementation to ensure that the net effect of the project will be beneficial and meets the objectives of the implementing or funding agency. The geographic extent of changes in place of diversion and use should also be minimized.

Water Quality. Direct inputs of sediment from construction in canals can be minimized by completing work "in the dry," attempting to clear canals of sediment prior to releasing water into them, and/or providing for sediment filtration of the initial water release. Other BMPs may also help reduce sediment inputs.

4.1.2.4 Ground Water

Short-term impacts

Water Quantity. Construction involved with implementing conservation projects may include installation or upgrades of canals, on-farm ponds, and reclamation or reuse facilities. These activities could result in changes in ground water levels and gradients during construction. Should construction include substantial ground water control activities, construction dewatering may temporarily reduce ground water levels and water availability in the alluvial aquifer and/or sedimentary aquifer system (Ecology 2003b; Ecology 2005b).

Water Quality. Potential water quality impacts from construction include contamination from surface water sources if soil removal has created an easy route for contaminants to reach the ground water system.

Long-term impacts

Water Quantity. The magnitude of potential ground water impacts from conservation projects would depend on the project. Municipal and industrial conservation programs that include demand management and operational efficiency measures could reduce withdrawals of ground water and increase water table elevations in the vicinity where ground water is withdrawn. Lining or piping of conveyance systems and more efficient on-farm irrigation systems would reduce the loss of surface water to seepage, decreasing recharge to ground water. The loss of recharge to ground water could change local ground water recharge patterns and would lower ground water levels, resulting in both positive and negative impacts (Ecology 2003b; Ecology 2005b).

Implementation of water reclamation and reuse could result in additional ground water resources being available for withdrawal should the project involve artificially recharging ground water with reclaimed, reused, or graywater. The artificial recharge of ground water may support stream baseflows in areas where the receiving aquifer is in hydraulic continuity with surface waters.

Single on-farm conservation measures may cause long-term impacts to surface water quantity associated with new or resized storage ponds, changes in the timing and location of ground water recharge locally through implementation of a more efficient irrigation method, and the potential for reduced recharge along any discontinued or lined irrigation facilities (Ecology 2003b).

Implementation of conservation projects could change the quantity and distribution of ground water recharge and withdrawals within and between basins (should interties involve more than one basin). For example, recharge could be reduced if water use changes from irrigation to municipal uses. The nature and magnitude of these potential impacts would depend on a number of factors, including the nature and location of the changes in water uses and the volume of water subject to the change (Ecology 2003b).

Water Quality. Artificially recharging ground water with reclaimed, reused, or graywater, available through conservation, could potentially introduce contaminants into the ground water. The magnitude of these impacts would depend on factors such as the volume and quality of water reintroduced to the ground water, natural recharge, and ground water withdrawal patterns. Reductions in deep percolation from less efficient irrigation systems may reduce the inputs of pesticides and fertilizers associated with agricultural practices. Changes in water quality could potentially impact domestic water use near the project and surface water quality at the point of ground water discharge to streams (Ecology 2003b; Ecology 2005b).

Mitigation

For all conservation projects, impacts to ground water could be mitigated by conducting appropriate hydrogeological studies prior to project implementation. The degree of study required would depend on the type of project being undertaken. If adverse ground water effects were predicted as a result of the studies, then construction, design, or operation of the project could be adjusted to reduce the effects (Ecology 2005b).

Water Quantity. Conservation projects such as canal lining would require study to determine the effects on ground water recharge. Available water level data are not sufficiently detailed and precise to assess the current amount of leakage from irrigation canals and ditches, the artificially elevated ground water levels due to leakage, and the artificially elevated ground water discharge to streams resulting from increased alluvial aquifer storage. These studies would include measuring surface water and ground water levels in and next to the open irrigation structures before lining to determine the current leakage rate, then estimating the potential change in ground water level decline with the loss of leakage (Ecology 2005b).

Increased water efficiency would locally reduce ground water recharge to the alluvial aquifer, reduce ground water levels, and reduce stream baseflow downstream of leaky irrigation canals or inefficiently irrigated areas. For areas where declining ground water levels would reduce baseflow or impair habitat (wetlands), the timing or magnitude of the decrease in ground water

levels could be avoided, lining activities could be avoided or limited, or other measures such as artificial recharge could be considered (Ecology 2003b; Ecology 2005b).

Water Quality. Proper design and operation of a reuse or reclamation facility would ensure adequate treatment that prevents contaminants from being introduced into the ground water, and ensure compliance with Department of Health and Ecology standards. Compliance with standards would require regular monitoring of reclaimed water and ground water quality to ensure that contaminated water is not being introduced to ground water (Ecology 2003b) and that beneficial uses are being preserved.

4.1.2.5 Water Rights

Short-term impacts

Any potential impacts of conservation and efficiency efforts on water rights would be long-term impacts.

Long-term impacts

An analysis of the potential impact to existing water rights may arise in two instances. Ecology will investigate potential impairment to existing water rights when a request is made to change the place or purpose of use, or the point of diversion of water saved through a conservation project. Additionally, water right holders may bring private actions in court claiming impairment of their rights due to reduced availability of water. Water saved through irrigation conservation projects is primarily water that previously became return flow under less efficient systems. Water users may use return flow that is available and "may obtain a right to return flow provided that flow naturally originated from and returned to a water course within the same watershed. Such rights are …subject to the availability of the water based on the first appropriator's right to make further uses of the water on the lands to which the right is appurtenant" (*Ecology v. Aquavella,* Memorandum Opinion Re: Subbasin Exceptions 1995).

A reduction in return flow is not, however, an impairment of downstream water rights because the water user is not obligated to provide return flow to downstream users (*Burke v. Department of Ecology,* PCHB No. 03-155, July 24, 2004)[2]. As a result, although changes in return flow patterns may have an adverse impact on the physical availability of water, they would not have an adverse impact on the legal availability of water, i.e., existing water rights.

Impacts from municipal and industrial conservation projects would be expected to be neutral or positive to the extent the projects reduce the demand for water. Negative impacts could arise from changing the place or purpose of use, or the point of diversion, of the saved water and would be addressed through Ecology's review of a water right change application for impairment.

[2] This Board's decision was upheld on appeal by the *Acquavella* court. The court's decision was appealed to Division 3 of the Court of Appeals.

Implementation of regional agricultural efficiency improvements could decrease artificial recharge to ground water. Artificial ground water recharge caused by leakage from unlined irrigation canals or ditches may be reduced or eliminated should conservation projects include lining of these structures. As noted above, this could have the effect of locally lowering water tables. The existence and magnitude of these impacts would depend on many factors, including the number and size of irrigation canals and ditches, the degree to which these structures are currently leaking, the amount and efficiency of new lining that may be installed, the depth to the water table, the underlying soil permeability, the amount of recharge from other sources, and the rates of ground water withdrawal (Ecology 2003).

Impacts from municipal and industrial conservation projects would be expected to be positive to the extent the projects free up more water for instream and/or out-of-stream uses. Any negative impacts could arise from changing the place or purpose of use, or the point of diversion, of the saved water and would be addressed through Ecology's analysis of the change application.

Mitigation

As explained above, although changes in return flow patterns may have an adverse impact on the physical availability of water, they would not have an adverse impact on the legal availability of water (i.e., existing water rights) and no mitigation would be required.

4.1.2.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. Conservation projects are not expected to result in short-term impacts to fish, native freshwater shellfish, or aquatic resources if water savings result in withdrawals that are less than the existing full water right.

Wildlife and Plants. Short-term impacts to plants and wildlife associated with conservation projects would primarily occur during construction of improvements by irrigation districts. Impacts would be similar to those described for storage projects in Section 4.1.1.6. Some conservation projects would have no impacts. Lining canals to prevent water loss or complete replacement of canals or ditches with piped systems would result in construction activities that may displace wildlife. Installation of pump-back stations and re-regulating reservoirs will also result in noise and construction impacts to wildlife that may extend through critical periods (e.g., breeding) for some listed species. Soil disturbance from dozing and excavation may alter conditions for plant re-growth or remove areas of microbiotic crust.

Those projects implemented by individual landowners would likely have a reduced impact on wildlife due to the smaller scale of the project. Impacts would occur in localized areas and would be the same as those discussed in Section 4.1.1.6 but on a smaller scale. Projects such as replacement of canals with piped systems would disturb small amounts of localized habitat for birds and small mammals, such as Washington ground squirrel.

Long-term impacts

Fish. Conservation projects are expected to result in a net benefit to fish and shellfish species by reducing existing water withdrawals and future water right needs. For aquatic benefits to be gained, conservation projects must achieve water savings that result in less withdrawal than the full allocation of existing water rights.

Wildlife and Plants. Long-term impacts to wildlife associated with conservation and irrigation efficiency projects include both positive and negative impacts. Operation of conservation projects may locally remove wildlife habitat or modify conditions that alter species composition and wildlife use at or near the site. Certain projects will result in additional water delivery to areas that are currently dry, and others will reduce water in areas that are currently wet. For example, on-farm ponds for tail water reuse could provide additional wintering habitat for waterfowl, or habitat that waterfowl could use during spring and fall migration. On a larger scale, many conservation and irrigation efficiency projects are meant to free up water. In some cases this water is used to fill junior downstream rights and/or to increase the number of irrigated acres, which may result in habitat loss. In such cases, no major change in streamflow would be expected. In other cases; however, water conservation and irrigation efficiency projects would result in increased instream flow. Increases in streamflow would have the positive effects on fish habitat and fish production described in Section 4.1.1.6. In areas where streams are currently dry or nearly dry, increases in flow would also provide additional water for terrestrial organisms and convert arid habitats into wetter areas. However, those species currently associated with arid areas such as grassland or shrub-steppe area could be negatively impacted.

Alternatively, if implementation of agriculture conservation measures results in controlling leakage of irrigation systems, some existing wetlands that may have formed along the irrigation canals and ditches could experience reduced flows or may become dry. Similarly, riparian or other vegetation associated with leaky canals or ditches can also be dewatered by implementation of this alternative, resulting in reduction or loss of this plant life. Such changes may result in a shift in species composition toward non-wetland or more arid plant community types.

Mitigation

Fish. Since conservation efforts are assumed to result in a net benefit to aquatic species production, no mitigation action is recommended. The following administrative recommendations should be considered to assure the conservation measures provide a benefit:

- Codify conservation gains with water right transfers, trust agreements, or conservation agreements to benefit instream water uses.
- Provide incentives to the agricultural community to implement conservation measures.

Wildlife and Plants. Where construction is involved, the mitigation measures described in Section 4.1.1.6 should be implemented to minimize adverse impacts to fish, plant communities, and wildlife.

Another possible means to mitigate for potential impacts to plants and wildlife could come from incentive-based programs for conservation projects that create additional terrestrial or aquatic habitat. Landowners could be rewarded for implementing projects that create new habitat or improve existing habitats. For example, rather than line an open ditch or canal with an impermeable surface, the ditch could be enclosed or buried in a pipe and the land reclaimed where the ditch previously existed. Piping the ditch may also result in improvements to migration or movement of terrestrial species where a ditch previously acted as a barrier.

4.1.2.7 Socioeconomics

Short-term impacts

Implementation of conservation programs may entail limited construction activity, such as eliminating leakage from canals or levelling fields; adoption of conservation technologies, such as drip irrigation; and/or changes in behaviour, such as relying on scientific measurements of soil moisture before irrigating a field. Construction-related effects probably would be less intensive than those associated with construction of storage facilities described in Section 4.1.1.7.

In order to implement substantial conservation activity, irrigators would have to overcome hesitancy that has impeded the adoption of conservation measures in the past. Conservation efforts may reduce uncertainty and risk regarding the impact of conservation on water right holders and/or alter the structure of the socioeconomic relationship between water and local communities. Conservation that reduces or eliminates farmers' use of a particular type of farming technology, for example, may reduce sales of that technology.

Long-term impacts

Long-term costs, benefits, impacts on jobs and income, distributional effects, interactions with socioeconomic structure, and effects on risk and uncertainty would be determined by the scope and design of individual conservation projects and programs. Conservation programs could reduce economic value, jobs, and income associated with water uses and practices, but could increase value, jobs, and income associated with conservation activities and with the goods and services produced by the conserved water. The direct benefits, costs, and impacts on jobs and income associated with the use of conserved water would likely be similar, on a per unit basis, to those associated with the use of water from storage projects. The distribution of costs and benefits would depend on the details of individual conservation programs and projects. The availability of state and federal funding, for example, may reduce costs to individual farmers, irrigation districts, municipalities, and industries that undertake conservation.

The overall scope of conservation opportunities remains unknown. Schaible (2000) found there are opportunities for irrigators in the Pacific Northwest (Idaho, Washington, and Oregon) to implement conservation technologies and practices that would reduce water diversions by 1.7 million acre-feet per year and realize substantial net economic benefits or minimal net costs. In-depth research (Gleick et al. 2003) that was acknowledged by the National Research Council (2004) indicates that municipal-industrial conservation can satisfy all of California's foreseeable urban demands for water. Similar efforts may yield similar results in the project area. The Management Program may accelerate the lowering of barriers that otherwise would slow the pace of conservation. It may reduce uncertainty by clarifying what would happen with conserved

water, and how conservation would affect all parties with an interest in the conserved water. It may also reduce financial risk to water right holders by increasing the funding available for conservation efforts on individual farms and across larger landscapes (National Research Council 2004; Schaible 2000).

Mitigation

Mitigation for impacts from construction and operation of conservation projects would be similar to those described for construction of storage facilities in Section 4.1.1.7. The design and scope of individual conservation projects and programs would determine the nature, location, and timing of long-term adverse impacts, their distribution among different groups, and the nature of opportunities for mitigating them. Coordination with tribal and non-tribal resource managers, and consultation with communities of interest, would promote the identification and balancing of their respective economic concerns. Evaluations of proposed conservation projects and programs would consider project- or program-specific economic impacts.

4.1.2.8 Land and Shoreline Use

Short-term impacts

Conservation projects would generally not affect land use in the short term because the projects would likely involve changes to existing regional and on-farm irrigation infrastructure that would not require much, if any, additional land area. One exception would be the siting of reclamation plants and associated facilities, which could result in short-term land use impacts due to displacements. However, siting of these facilities, as well as any conservation project, would be required to be consistent with applicable local comprehensive plans, zoning codes, shoreline master programs, and critical area ordinances.

Long-term impacts

Land use impacts associated with conservation projects are similar to those described for storage projects in that they relate to changes in water availability and management practices. To the extent that these changes would be more subtle following conservation projects than with storage projects, impacts would be expected to be less significant. Demand management programs may involve modification of water rate structures to encourage conservation. This could impose a proportionately larger burden on large, low-income families or small businesses with high water needs.

The Management Program could assist with the development of water reclamation and reuse facilities to conserve municipal water. Operation of these facilities is required by state health regulations to be consistent with the long-term land and water use planning objectives of the community. In counties fully planning under the Growth Management Act, comprehensive plans must address the need for and the means to accommodate public utilities. Thus any facility developed would likely be sited to minimize land use conflicts.

When conserved water is made available for uses such as recreation, instream flow, agriculture, municipal water supplies, or other beneficial uses, it could result in indirect impacts associated with new development, conversion of cropland to higher value crops, conversion of non-irrigated

farmland to irrigated farmland, and reduced pressure to convert agricultural uses to residential development, similar to those described for new storage facilities. If development proceeds according to locally adopted plans, land use impacts would not be expected to be significant. Potential beneficial impacts include a potential increase in reliable municipal water supply or wastewater treatment capacity that would support planned community growth.

Mitigation

In addition to the mitigation measures discussed under Section 4.1.1.8, the Management Program could include efforts to inform farmers of available federal cost-sharing programs administered through the state and local conservation districts.

4.1.2.9 Cultural Resources

Short-term impacts

Impacts would be similar to but likely less than the short-term impacts associated with construction of storage facilities described in Section 4.1.1.9. Generally, conservation projects would not require construction over areas as large as would be expected for storage facilities. As such, it may be feasible to locate a project to avoid adversely affecting cultural resources.

Long-term impacts

In most cases where modifications are made to existing systems, such as lining irrigation canals, the operation of conservation projects is not expected to have significant long-term impacts on cultural resources. Existing systems may include historic properties and the effects to them would need to be mitigated. Long-term and operational impacts related to reservoirs or ponds would be similar but of lower magnitude than those associated with construction of storage facilities described in Section 4.1.1.9. Conservation projects may be able to be located to avoid impacts to cultural resources.

Mitigation

Mitigation for impacts from construction and operation of conservation projects would be similar to those described for construction of storage facilities in Section 4.1.1.9.

4.1.2.10 Transportation

Short-term impacts

Short-term impacts from conservation projects would be similar to those described for storage projects in Section 4.1.1.10, except that the scale of construction would generally be smaller and impacts would be proportionately less. Conservation projects are less likely to disrupt roads during construction, unless conservation projects are immediately adjacent to roadways.

Long-term impacts

Operation of conservation projects would entail only infrequent trips by maintenance vehicles and would have minor impacts on transportation systems.

Mitigation

Although implementation of conservation projects would likely require less construction than new storage facilities, mitigation measures similar to those listed in Section 4.1.1.10 could be required for construction of conservation projects. No mitigation is necessary for operation of conservation projects.

4.1.2.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

Impacts would be similar to but likely less than short-term impacts associated with construction of storage facilities described in Section 4.1.1.11. Generally, conservation projects would not require construction over areas as large as would be expected for storage facilities.

Long-term impacts

The operation of conservation projects is not expected to have significant long-term impacts on recreation. Availability of additional irrigation water may be beneficial for uses that depend on irrigation such as golf courses and active sports fields; however, this effect is not expected to be significant.

Mitigation

Mitigation for impacts from construction and operation of conservation projects would be similar to those described for construction of storage facilities in Section 4.1.1.11.

4.1.2.12 Public Services and Utilities

Short-term impacts

Conservation projects could temporarily disrupt utilities during construction, including both those that would benefit from the project and those adjacent to the construction site, such as power lines or pipelines. Coordination with affected utilities would occur for each specific project.

Conservation and efficiency measures, such as lining irrigation ditches, could result in cost impacts to irrigation districts and irrigators. Over the short-term, these costs will need to be absorbed by the irrigation districts unless funded by grants or through the sale or lease of conserved water. For municipal and industrial conservation measures, similar impacts could occur.

If industrial water use efficiency activities involve water reclamation and reuse, a sewer utility or municipality would need to commit significant resources to design and construct reclamation and reuse facilities.

Long-term impacts

Conservation measures could reduce energy consumption over time by reducing the volume of water that needs to be pumped to irrigate a given area. Changes in irrigation practices such as from rill to center pivot irrigation may increase electricity demand.

Implementation of this alternative could involve substantial commitments of financial resources by irrigation districts and irrigators unless funding is provided by federal, state, and tribal resource agencies and entities. Some conservation program elements for municipal water systems could require long-term commitments of financial resources by public water systems. These commitments would need to be factored into utility rate systems.

Water reclamation plants may be more expensive to operate than more conventional forms of wastewater treatment and could potentially require increased utility rates. However, reclaimed water can be used to offset potable water consumption, which would help to reduce costs and hold rates down in the long term.

Mitigation

Costs to irrigation districts, irrigators, municipalities, or sewer districts associated with implementation of this alternative could be offset to some degree by the availability of saved water to be put to another beneficial use, or to be used to meet planned future growth.

4.1.2.13 Comparison of Impacts for General Types of Conservation Projects

Table 4-3 compares the potential impacts that could occur for each general type of conservation project. The table highlights the differences between the types of projects and does not present every potential impact.

Table 4-3. Comparison of Impacts for Types of Conservation Projects

Element of the Environment	Municipal	Regional Agricultural Efficiency Improvements	On-Farm Conservation	Industrial
Earth *Short-Term* *Long Term* *Mitigation*	Municipal conservation projects involving construction may have similar earth impacts and mitigation as discussed for Earth in Table 4-2.	Construction of pipelines, canal lines, new canals or wasteways will impact earth resources. Impacts and mitigation measures are discussed in Section 4.1.1.1.	Increased soil erosion due to construction activities, including the construction of storage ponds.	Industrial conservation projects involving construction may have similar impacts as discussed for Earth in Table 4-1.
Air *Short-Term* *Long Term* *Mitigation*	Water reclamation facilities may, at times, produce odors that would be a nuisance to persons living or working in the vicinity. The most effective mitigation strategy for preventing odor impacts would be to properly design and operate the facility to minimize odor emissions and to provide a sufficient distance between a proposed reclamation facility and potential human receptors.	No impacts to air quality or climate are expected.	No impacts to air quality or climate are expected.	Impacts associated with industrial water reclamation could produce odors similar to those described for municipal projects. Proper design and operation will minimize the potential for odor generation.
Surface Water *Short-Term* *Long Term* *Mitigation*	Impacts and mitigation would be similar to Regional Agricultural Improvement projects, but of a lesser magnitude.	Short-term construction impacts could occur from sediment washed into water bodies. Long-term impacts may include an increase in streamflow in the stream being diverted from along with a reduction in stream temperature, increase in dissolved oxygen and a reduction in return flow from reduced seepage in other streams, possibly causing an increase in pollutant concentrations. Mitigation of short-term impacts can be achieved through construction related BMPs. Long-term impacts can be mitigated by ensuring the net effect of the project is beneficial.	Impacts and mitigation would be similar to Regional Agricultural Improvement projects, but of a lesser magnitude.	Although surface water quality impacts from industrial conservation projects are likely to be similar to those of the municipal projects, industrial sources of reclaimed or conserved water may be more likely to introduce contaminants into the surface water. Mitigation of industrial impacts could include storm water controls and appropriate discharge permits.
Ground Water *Short-Term* *Long Term* *Mitigation*	Construction-related ground water impacts will be similar to those discussed in Section 4.1.1.1. Ground water impacts may include changes in level, gradient, recharge and discharge rates and contaminant introduction. Impacts may be mitigated by conducting appropriate hydrogeological studies prior to project implementation.	Regional agricultural efficiencies may decrease artificial recharge of ground water.	Increased irrigation efficiencies may decrease artificial recharge of ground water.	Ground water impacts from industrial conservation projects are likely to be similar to those of municipal conservation projects.
Water Rights *Short-Term* *Long-Term* *Mitigation*	Municipal conservation projects are not expected to adversely affect water rights.	Potential impacts on physical availability of water are of wider geographic scope than with single farm projects.	Potential for local reductions in ground water recharge from more efficient irrigation methods.	Industrial conservation projects are not expected to adversely affect water rights.

Element of the Environment	Municipal	Regional Agricultural Efficiency Improvements	On-Farm Conservation	Industrial
Fish *Short-Term* *Long Term* *Mitigation*	Municipal conservation that results in a water saving and a reduction of instream withdrawals, would have an immediate benefit on fish populations, influencing habitat capacity and abundance compared to existing conditions. Efficiency improvements that result in water quality enhancements would have an immediate benefit on fish productivity metrics. Benefits would accrue over the long-term should conservation measures remain in place.	Water quantity savings and quality improvements through agricultural improvements and conservation measures will directly benefit fish species. Natural resource benefits compared to the other types of conservation measures will vary directly with the relative level of water savings and improvements.	Water quantity savings and quality improvements through on-farm conservation measures will directly benefit fish species. Natural resource benefits compared to the other types of conservation measures will vary directly with the relative level of water savings and improvements.	Water quantity savings and quality improvements through industrial conservation measures will directly benefit fish species. Natural resource benefits compared to the other types of conservation measures will vary directly with the relative level of savings and improvements.
Wildlife and Plants *Short-Term* *Long Term* *Mitigation*	Construction and operation of municipal projects would have less impact than regional agricultural projects and some municipal projects would have no impacts.	Construction of regional agriculture efficiency projects would have similar noise and disturbance impacts to large storage projects. Operation could benefit plant and wildlife species diversity by providing additional water to dry habitats. Increases in streamflow could provide additional water and convert arid habitats into wetter areas. Conversely, controlling leaky systems may locally dewater wetlands and riparian areas.	On-farm conservation projects would have similar construction and operation impacts to municipal projects, but on a smaller scale. Some on-farm projects would have no impacts.	Industrial conservation projects would have similar impacts to municipal projects.
Land and Shoreline Use *Short-Term* *Long Term* *Mitigation*	Municipal conservation facilities could include water reclamation and reuse facilities that must be designed and sited carefully to minimize odor and noise impacts on neighboring properties.	Regional agricultural conservation efforts are not expected to have a significant impact on land use.	On-farm conservation efforts are not expected to significantly affect land use.	Development and implementation of industrial conservation measures, such as in-process efficiency measures, may result in cost impacts to individual industries. Land use impacts are not expected to occur.
Socioeconomics *Short-Term* *Long Term* *Mitigation*	The scope and design of demand-management programs and investments in infrastructure would determine their costs, benefits, impacts on jobs and income, distribution of costs and benefits, interaction with the socioeconomic structure, and levels of risk and uncertainty. Mitigation, if any, probably would entail spreading the costs so they are not concentrated within a particular group.	The nature and location of conservation projects and programs would be different than those for municipalities. The scope and design of demand-management programs and investments in infrastructure would determine their costs, benefits, impacts on jobs and income, distribution of costs and benefits, interaction with the socioeconomic structure, and levels of risk and uncertainty. Mitigation, if any, probably would entail spreading the costs so they are not concentrated within a particular group.	The economic effects, positive and negative, of on-farm conservation probably would be smaller than those for regional projects and programs. Mitigation, if any, probably would entail spreading the costs so they do not fall heavily on individual farmers.	Impacts and mitigation opportunities probably would resemble those for municipal conservation.

Element of the Environment	Municipal	Regional Agricultural Efficiency Improvements	On-Farm Conservation	Industrial
Cultural Resources *Short-Term* *Long Term* *Mitigation*	Municipal conservation projects are not anticipated to impact cultural resources unless there are modifications to the historic infrastructure.	Regional agriculture efficiency improvements which involve ground disturbing activities or modifying historic structures have potential to impact cultural resources. Operational impacts may occur related to pump-back stations or re-regulation reservoirs. Avoidance of cultural resources may be feasible. Mitigation measures should include development of a Cultural Resources Management Plan and possibly a Programmatic Agreement.	On-farm conservation projects which involve ground disturbing activities or modifying historic structures have the potential to impact cultural resources. Operational impacts may occur related to on-farm ponds.	Industrial conservation projects are not anticipated to impact cultural resources unless there are modifications to the historic infrastructure.
Transportation *Short-Term* *Long Term* *Mitigation*	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.	No impacts anticipated.
Recreation and Scenic Resources & Aesthetics *Short-Term* *Long Term* *Mitigation*	Conservation projects could benefit municipal recreation facilities, for example, by providing additional water for irrigating playfields.	Regional agriculture efficiency projects are not expected to affect recreation or scenic resources.	On-farm conservation is not likely to affect recreational resources because construction would not occur on public recreational lands.	Industrial conservation programs are not expected to affect recreation or scenic resources.
Public Services & Utilities *Short-Term* *Long Term* *Mitigation*	Conservation programs including the development of reclamation and reuse facilities could require additional investments by local utilities and require increased rates in the short term. However, over the long-term, conservation programs could reduce costs of providing municipal water as the cost of new water supplies increases.	Conservation and efficiency measures, such as lining irrigation ditches, will result in cost impacts to irrigation districts and conservation districts. Over the short-term, these costs will need to be absorbed by the irrigation districts.	On-farm conservation measures would have minimal impacts on public services and utilities. Conservation measures, such as more efficient irrigation application rates that result in less return flow, could reduce water reaching lakes and rivers as return flow, which could affect other irrigation districts' ability to provide adequate water.	If industrial water use efficiency activities involve water reclamation and reuse, the Departments of Health and Ecology would need to issue permits for that portion of the activities.

4.1.3 Voluntary Regional Agreement Component

The Voluntary Regional Agreement (VRA) component of the Columbia River Water Management Act is described in Chapter 2. The primary impacts that would be associated with VRAs would be to water rights and to streamflows outside of mandated no-net-loss months. The VRAs will likely include specific projects such as storage or conservation. The impacts of those specific projects would be similar to those described in Sections 4.1.1 and 4.1.2 and may require future environmental review. The following is a discussion of water rights related impacts associated with VRAs. In addition, the policy discussion in Chapter 6 includes water rights implications of different alternatives for implementing and processing VRAs. Potential impacts to fish and wildlife are also discussed in this section.

RCW 90.90.030 authorizes Ecology to enter into voluntary regional agreements for three purposes: (1) to provide new water for out-of-stream purposes; (2) to streamline the application process; and (3) to protect instream flow. Instream flows on the mainstem of the Columbia and lower Snake Rivers are to be protected from negative impact in July and August and from April through August, respectively. "Mainstem" is defined for purposes of VRAs as follows:

> (a) "Columbia river mainstem" means all water in the Columbia River within the ordinary high water mark of the main channel of the Columbia River between the border of the United States and Canada and the Bonneville dam, and all ground water within one mile of the high water mark.
>
> (b) "Lower Snake river mainstem" means all water in the lower Snake River within the ordinary high water mark of the main channel of the lower Snake River from the head of Ice Harbor pool to the confluence of the Snake and Columbia Rivers, and all ground water within one mile of the high water mark (RCW 90.90.030(12)).

The alternatives for defining "ordinary high water mark" (OHWM) and the alternatives for defining "no negative impact" are discussed in Sections 6.1.9 and 6.1.10.

The term "instream flow" is used to identify a specific streamflow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the streamflows needed to protect and preserve instream resources and values, such as fish, wildlife, and recreation. Instream flows are most often described and established in a formal legal document, typically an adopted state rule.

The Columbia River Water Management Act is unclear in its references to "instream flows." It is unclear whether the Act refers to those flows adopted in state rule that represent the minimum streamflow necessary for preservation of fisheries, or merely the flow present in the river. It is unclear whether the Legislature was referring to the adopted regulatory structure on the Columbia and the Snake Rivers, or whether it was effectively identifying a "no-net-loss" standard for referenced summer months.

WAC 173-163 defines adopted instream flows for the Columbia River. There are currently no instream flows set for the lower Snake River. The unappropriated waters of the mainstem Snake River were withdrawn from appropriation by WAC 173-564-040, but it expired on July 1, 1999, and no instream flows have subsequently been set under the instream resources protection

program in accordance with Chapter 173-500 WAC. The lack of adopted instream flows for the Snake River would suggest that the Legislature was not referring to regulatory flows when specifying the standard of no impact in RCW 90.90.030(2)(b): "[f]or water rights issued from the lower Snake River mainstem, there is no negative impact on Snake River mainstem instream flows from April through August as a result of new appropriations under the agreement." Rather, the implication is that the Legislature was referring to streamflows.

The National Research Council study was an important technical foundation for discussion of the Columbia River Partnership process and subsequent negotiation of the 2006 legislation. The standard for protection chosen by the Legislature is one of no net loss of streamflow during the referenced summer months, and that standard comes from the National Research Council study. The study stated that new appropriations during those months were not advised. The alternatives in Chapter 6 regarding acceptable mitigation incorporate the interpretation that the Legislature meant the flow of the river when it said "instream flows".

RCW 90.90.030 proposes to streamline the application process. Two streamlining features are apparent in the law. First, protection of instream flows in the mainstem Columbia and lower Snake Rivers during the designated months is deemed "adequate for purposes of mitigating instream flow impacts resulting from" new water rights issued under a VRA. Second, the law reduces and restructures the consultation requirements in Chapter 173-563 WAC (RCW 90.90.030(3)) if an applicant is part of a VRA. Applicants not participating in a VRA are still subject to the consultation requirements identified in the 1998 rule amendments.

The administrative rule for the Columbia River establishes instream flows for all months of the year, not just July and August. By providing that if a new water right does not have a negative impact on the Columbia River flows during the months of July and August, impacts to instream flows have been mitigated, the Legislature decided that water is available during the other 10 months of the year. Further, by directing Ecology to only consider impairment of instream flows during the referenced summer months, the Legislature has effectively made an overriding consideration of the public interest determination that the adopted instream flows outside of July and August will not be protected.

This appears to be inconsistent with RCW 90.90.030(8), which prohibits any interpretation or administration of the section regarding VRAs "that impairs or diminishes a valid water right or a habitat conservation plan for purposes of compliance with the federal endangered species act."

The instream flows for January through June in the Columbia River are valid water rights. This conflict could be resolved if Ecology amended WAC 173-563 to reflect the legislative intent and the different standards that apply to applications processed under VRAs and all other applications. Ecology's administrative rule for the Columbia River requires that a decision whether a water right is subject to instream flow protection or mitigation conditions is to be determined case-by-case (WAC 173-563-020). The mitigation provision in RCW 90.90.030 would streamline the application process at the expense of more focused case-by-case analysis.[3]

[3] RCW 90.90.03092)(b) also requires that VRAs ensure that "[f]or water rights issued from the lower Snake River mainstem, there is no negative impact on Snake River mainstem instream flows from April through August as a result of new appropriations under the agreement[.]"

RCW 90.90.030(3) also overrides consultation requirements in Chapter 173-563 WAC. As discussed above, the Columbia River rule provides that any water right application must be "evaluated for possible impacts on fish and existing water rights" in consultation with appropriate local, state, and federal agencies and Indian tribes (WAC 173-563-020(4)). RCW 90.90.030(4)(a) requires that before Ecology executes a VRA Ecology shall:

> Provide a sixty-day comment period for consultation with county legislative authorities and watershed planning groups with jurisdiction over the area where the water rights included in the agreement are located, the department of fish and wildlife, and affected tribal governments, and federal agencies (RCW 90.90.030(4)(a)).

The Washington Department of Fish and Wildlife is required to make written comments. Consultation on a VRA substitutes for consultation on water right applications submitted pursuant to a VRA.

> The consultation process for voluntary regional agreements developed under the provisions of this section is deemed adequate for the issuance of new water rights provided for in this section and satisfies all consultation requirements under state law related to the issuance of new water rights (RCW 90.90.030(4)(a)).

The Columbia River Water Management Act thus creates two consultation pathways: a streamlined consultation for VRAs, and the case-by-case consultation required by WAC 173-563-020(4) for applications not covered by a VRA. Historically, consultation with local, state, and federal agencies and Indian tribes under WAC 173-563 has taken much longer than the 60 days provided for in the VRAs. Again, this has the potential to streamline the application process; however, it may reduce the effectiveness of the consultation process with governmental entities under a VRA. Following consultation under a VRA, opportunities for coordination among governmental entities still exist for specific project applications under a VRA. These include public notice for the water right applications, environmental reviews (e.g., SEPA) for the projects, and stakeholder outreach groups formed by Ecology to provide input into the process (e.g., the Policy Advisory Group and the Technical Advisory Group).

4.1.3.1 Fish, Wildlife, and Plants

Short-term impacts

Short-term impacts are expected to be similar to long-term impacts.

Careful consideration of benefits to fish species attributed to VRAs will be needed since it is likely VRAs will increase overall consumptive use of water in the Columbia River Basin. Depending on the timing of withdrawal and the life history characteristics of the species, a reduction in water volumes could adversely affect fish habitat, fish migration, and fish populations both locally and regionally as discussed by the National Research Council (2004). Endangered Species Act (ESA) target instream flows along the mainstem Columbia River are frequently not met (Fish Passage Center 2006) depending upon the water year. According to NOAA Fisheries, Columbia River flows are critical in every month and any project that increases the risk to complying with the Biological Opinion flow targets is a potential concern

(Columbia River Policy Advisory Group meeting minutes October 11, 2006; http://www.ecy.wa.gov/programs/wr/cwp/images/pdf/ meeting_notes_10112006.pdf). Specific influences will be addressed in environmental documentation associated with each VRA as they are identified.

Long-term impacts

Water transfers contemplated under VRAs are an exchange of water between two or more entities in a manner that would benefit the production of fish species in a local area. The exchanges may either be in the form of water right transfers or new permits mitigated by the acquisition of an existing water right and retirement or placement into the Trust Water Right Program.

Negative impacts to fisheries may occur if acquired water rights are transferred upstream, or if mitigation credit from a downstream water right is applied to an upstream diversion. The flow of a stream or river would be reduced between the new upstream point of diversion and the old downstream point of diversion. Chapter 6 describes four policy choices that would identify the stream reach to which a mitigation credit could be applied. Limiting transfers or the use of mitigation credits to within a single pool as opposed to within one of four major stream reaches would reduce the distance that a mitigation credit could be assigned to a new permit to divert water upstream of the site of the mitigation credit. As a result, there would be fewer miles of river with the potential for reduced streamflow and that, consequently, might negatively impact fisheries or other elements of the built or natural environment. The significance of the impact to fisheries by any particular upstream transfer or mitigation credit assigned from a downstream water right would depend on the location of and distance between the two points, the time that water would be used, and the habitat available for fish within the affected reach.

A VRA may also contemplate a physical exchange of water between two sources that would benefit fisheries. Inter-basin transfer of waters might influence the homing instincts of returning adult anadromous fishes to various locations within the watershed. Water from one basin discharged into another has been shown to alter the olfactory response that could confuse, delay, or preclude successful migration to the spawning grounds.

If the inter-basin transfer is permanent and continuous, outmigrating juvenile fishes originating in the receiving basin will imprint upon the mixed-water source and return appropriately to their spawning areas in subsequent years. However, if the inter-basin water transfers are discontinuous or seasonal, or if the transfer discharge point is near the confluence of both basins, long-term impacts related to straying adults from one basin to the other can ensue.

Mitigation

Mitigation measures associated with VRAs will be discussed on a site-specific basis with the project proponent, Ecology, and WDFW. The federal Services including NOAA Fisheries and USFWS would also be consulted if federal funding or permitting is required. The following measures are generally considered beneficial ways to either avoid or minimize the influence of inter-basin transfer of water:

- Preclude not only WRIA but inter-basin transfer of water under local VRAs where distinct spawning populations occur;
- Locate the point of discharge in the receiving water a sufficient distance upstream of the confluence of both basins to facilitate mixing of the two water sources. An un-mixed water mass attached to nearshore region in the receiving basin can attract returning adult fish destined for the source basin; and
- Ensure the transfer is permanent and continuous so that the discharge of source water in the receiving basin does not fluctuate beyond natural levels.

4.2 No Action Alternative

Under the No Action Alternative, the Management Program would not be implemented. Water management in the Columbia River Basin would continue under existing regulations and policies. Ecology would not aggressively pursue new water in the area, and no state funding would be provided for storage or conservation projects. Ecology would not enter into VRAs. Storage and conservation projects could be developed independent of the Management Program, but the number and scale of programs would likely be smaller and further in the future due to staffing and funding limitations. In some cases, these projects may not be implemented.

If the Management Program is not implemented, the opportunity to improve the reliability of interruptible water rights and increase instream flow in the Columbia River may not occur. Because there would be no comprehensive management program, mitigation efforts would occur individually and may be less effective than under a coordinated basin-wide program.

For most elements of the environment, the impacts of implementing storage and conservation projects independent of the Management Program would be similar to the impacts described in Sections 4.1.1 and 4.1.2. Socioeconomic and land use impacts of not implementing the Management Program are discussed below.

4.2.1.1 Socioeconomics

Short-term impacts

Without the Management Program, construction of new water storage projects and implementation of conservation measures could materialize under existing programs and policies, but implementation probably would move slower because the funding would be smaller and interested parties would lack the Management Program's coordinated efforts to overcome obstacles. The distribution of costs and benefits could be different, because state funds available under the Management Program might not otherwise be available. Without the Management Program's stimulus for investigations into the feasibility of projects and programs, the risks and uncertainties might remain at current levels. These risks and uncertainties could impede farmers and others from initiating storage and water conservation initiatives (National Research Council 2004; Schaible 2000), and progress in these areas would be slower than with the Management Program.

Long-term impacts

The probability of incurring the costs and realizing the benefits of storage projects and conservation programs would be lower without the Management Program because the investigation and implementation of such projects and programs would not be accelerated.

Water users probably could continue to take actions to reduce or compensate for risk of water shortage. Irrigators, for example, probably would continue to apply more water than crops require in order to reduce the risk that crops would become stressed before the next irrigation.

The adverse socioeconomic impacts of past reductions in fish populations would continue absent action to improve instream flow and other aspects of fish habitat. These impacts include losses of value, jobs, and income associated with commercial and recreational fishing, as well as losses of cultural, spiritual, and other non-use values to tribal members and others.

Private parties, communities, and state agencies would likely respond to future drought as they have responded in the past, with the accompanying impacts. The 2005 drought, for example, induced farmers to transfer water from low-value to high-value crops, and from areas with more water to areas with less. Some farmers drilled emergency wells to supplement supplies. Federal, tribal, state, and local entities coordinated their activities to facilitate ensuring that water was available for the most critical demands (Ecology 2006). Markets would respond, where they could, to short-run drought in the future as they have in the past. During the 2001 drought, for example, price increases enabled the total value of the state's potato and apple production to rise 24 percent and 20 percent, respectively, even though the number of acres in production was cut back 8.6 percent and 5.9 percent, respectively (Washington Office of Community, Trade and Economic Development et al. 2005).

Impacts of long-run declines in water supply, stemming from long-run drought or the declining availability of ground water in the Odessa Subarea for example, could be similar in nature, but more extreme. The reduced supply of water, or the increased cost of securing water, might induce some irrigators and businesses to close and some households to leave the area. Bhattacharjee and Holland (2005) have estimated that, if declining ground water in the Odessa Subarea were to cause the cessation of all potato production and all related economic activity in the Subarea, with no off-setting economic adjustments, the total impact in the surrounding counties would be a loss of $630 million in sales, $211 million in income, and 3,650 jobs. As irrigation, business activity, and population decline in one area, however, they would increase in areas elsewhere in the state, if these areas have sufficient water to accommodate growth. Bhattarchajee and Holland (2005) found that if declining ground water in the Odessa Subarea were to cause current producers in the Subarea to cease potato production, but potato processors elsewhere in the Columbia Basin Project were to increase their production to offset the loss, most of the negative regional impacts foreseen in the more extreme scenario would fail to materialize.

Mitigation

Mitigation of negative economic effects under the No Action Alternative would have to be designed to offset the negative effects of individual projects or programs, and implemented subject to appropriate funding. Mitigation of short-run droughts probably would entail actions similar to those that have addressed recent droughts, described above. Mitigation of risks to

species and habitats will also resemble recent actions, and entail both voluntary efforts, such as attempts to improve riparian vegetation, as well as regulatory efforts, such as litigation over the enforcement of environmental legislation. Mitigation of long-run droughts or declines in ground water might include emergency assistance, such as subsidized loans to promote the adoption of water-conserving technology by irrigators and municipal-industrial users. Long-run mitigation also might include increased efforts to expand the economic opportunities for residents and businesses in water-short areas. Such efforts might include, for example, improvements in transportation infrastructure to increase the access of businesses and workers in water-short areas to new economic opportunities in nearby areas.

4.2.1.2 Land and Shoreline Use

Short-term impacts

If the Management Program were not implemented, short-term impacts similar to those described in Section 4.1.1.8 would occur, except that the rate of development of projects would be slower.

Long-term impacts

If the Management Program were not implemented, long-term impacts similar to those described in Section 4.1.1.8 would occur, except that the rate of development of both storage and conservation projects would be slower. Municipal water suppliers would continue to experience difficulty obtaining new water rights; therefore, growth and development in some areas could become constrained by available water supplies in the future.

If reliable irrigation water is not made available, pressure may increase to convert some land holdings in agricultural use to residential use. This may result in a low-density development pattern that may not include commercial agriculture. This low-density pattern of development may be allowed under zoning regulations, but still may be inconsistent with goals for containing most new development within urban service areas, and maintaining and enhancing productivity of agricultural lands. This type of development pressure is already occurring in the project area, especially near urban areas, and could be expected to continue if the lack of reliable water makes commercial agriculture too risky.

Mitigation

Mitigation for individual projects would be developed on a project-by-project basis and could be similar to that described earlier for projects under the Management Program.

4.3 Cumulative Impacts

Many of the cumulative impacts of the Management Program components are included in the discussions in previous sections. This section highlights the major cumulative impacts that could occur from implementation of the Management Program.

A major cumulative impact of the Management Program could be the addition of storage projects to a river basin that has already been extensively dammed. Additional storage facilities could

exacerbate the impacts of existing facilities. For example, on-channel storage could add additional impediments to fish passage and further increase migration times; new dams could add to existing total dissolved gas (TDG) problems in the Columbia River; water quality could be further degraded by releases from reservoirs. These 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. Any proposed storage facility will undergo additional environmental analysis under SEPA and/or NEPA. The analysis of impacts would consider the impacts a project would add to existing conditions and would be evaluated against established water quality and stream flow standards, such as the Total Maximum Daily Load (TMDL) and final Biological Opinion flows.

Fish species, including listed threatened and endangered species, could also be affected by decreases in streamflows from additional withdrawals from the rivers and tributaries. The additional diversions could further impair water quality and increase migration times. Any new water rights will undergo review by Ecology and must not impair existing water rights or instream flows. Several components of the Management Program are intended to improve streamflows and Ecology is developing a strategy for streamflow augmentation; however, despite these measures, some negative impacts could occur.

The combined impacts of the projects proposed under Voluntary Regional Agreements (VRAs) have the potential to affect fish and other natural resources in the Columbia River Basin. VRAs will undergo several levels of environmental review. This Programmatic EIS has evaluated the impacts of how Ecology will implement the VRA program. As a result of the EIS analysis, Ecology has decided to develop Implementation Plans that will detail the actions that will be undertaken for each proposed VRA. The Implementation Plans will be subject to SEPA review. The Implementation Plans will be supplemented by Ecology as new information becomes available or as conditions change. The supplemented Implementation Plans will also be subject to SEPA review. Some of the specific projects proposed as part of a VRA will also be subject to SEPA and/or NEPA review. This phased environmental review process is intended to provide Ecology and the public with opportunities to evaluate the cumulative impacts of VRAs.

The Management Program could further impact shrub-steppe habitat and the wildlife associated with it. Shrub-steppe habitat in the Columbia River Basin has declined by over 50 percent from historic levels through agricultural and other development. Increased water supply from storage or conservation projects could encourage farmers to shift to more permanent crops or expand irrigation in areas not currently cultivated. This expansion could occur in shrub-steppe areas causing further decline of the habitat. An increased loss of shrub-steppe habitat could further impact plant and animal species already in decline. In addition, the changed hydrology associated with conservation projects and lining of irrigation canals could reduce habitat or harm wildlife species.

If the Management Program were implemented, several social opportunity costs would accrue to the state, region, and nation. (These impacts are described in Section 4.1.1.7, 4.1.2.7, and 5.1.1.7). Funding spent in the project area would not be invested elsewhere in the state, which could similarly contribute to a trend toward budget shortfalls. If projects receive federal funds, the federal funds would not be available for uses in other parts of the region or nation.

Another regional impact of the project is the potential that benefits downstream would be at the cost of upstream users, thus continuing or exacerbating current impacts related to water scarcity or lack of availability. As discussed in Section 4.1.1.6, increased lake fluctuations to provide streamflows downstream of storage reservoirs may impact resident fish, adding to existing stresses on those populations. Benefits to upstream users could negatively affect downstream users as well. Benefits that accrue to the project area may have negative impacts in other areas. If the new water availability significantly expands the supply of irrigated crops, market prices for all farmers could be reduced. The distribution of costs and benefits of the Management Program are described in Section 4.1.1.7.

As noted in Sections 4.1.1.3 and 4.1.1.4, large storage projects could impact the local surface and ground water hydrology. Large-scale conservation can decrease recharge of ground water. These hydrology impacts can in turn affect water supply and fish and wildlife habitat. Modifications to existing flow regimes could negatively affect long-term fisheries habitat, if flows to already stressed systems are further reduced. These potential impacts will require careful evaluation on a project-specific basis.

Water that is diverted from the Columbia River will reduce the potential hydropower generation at dams downstream of Grand Coulee, which could cause the regional power system to rely on other forms of power. Those other forms of power could produce more air pollutants. Because power production in the Columbia River Basin is highly regulated, any potential impacts to hydropower production will need to be coordinated with the federal agencies and Public Utility Districts charged with producing and distributing the power.

This Programmatic EIS is the first step in a phased review of the Columbia River Water Management Program. Potential impacts of projects that could be developed have been identified. As stated throughout the EIS, additional project level review will be required for many project components. Project-level review will be used to identify specific projects impacts and ways to avoid or mitigate those impacts. To avoid the potential cumulative impacts of the Management Program, Ecology will continue to coordinate with the local, state, and federal agencies and tribes that manage resources in the area.

CHAPTER 5.0 IMPACTS AND MITIGATION MEASURES FOR EARLY ACTIONS

This chapter describes the impacts and mitigation measures for the early actions evaluated in this programmatic EIS. The early actions are those actions identified for early implementation under the Management Program. The early actions include the additional drawdown of Lake Roosevelt (Section 2.6.1), the Supplemental Feed Route (Section 2.6.2), and processing the first Voluntary Regional Agreement (VRA), which was submitted by the Columbia-Snake River Irrigators Association (CSRIA) (Section 2.6.3). The first two projects involve a partnership with Reclamation. The additional drawdown of Lake Roosevelt is within the normal operation of the lake. Reclamation will complete National Environmental Policy Act (NEPA) analysis of any federal actions such as water service contracts and Trust Water Rights. Ecology will prepare a Supplemental EIS on the drawdowns. Reclamation will prepare a NEPA EA for the Supplemental Feed Route project. In addition, Reclamation will be preparing the appropriate NEPA documentation on future extension of Columbia Basin Project to provide surface water as a replacement for groundwater irrigation in the Odessa Subarea (Section 2.1.2.1)

This programmatic EIS evaluates the impacts associated with the State Environmental Policy Act (SEPA) actions related to the early actions. For the Lake Roosevelt drawdown, the SEPA action would be Ecology's approval of new water rights and water rights changes. The SEPA actions for the Supplemental Feed Routes would be the issuance of permits by Ecology (or other state agencies), including a Hydraulic Project Approval (HPA) and construction stormwater permits. The SEPA action for the CSRIA VRA would be Ecology's signing of the VRA, allowing the agreement to move forward. Some VRA conservation projects, such as on-farm improvements, would be unlikely to require additional SEPA review. Larger conservation projects could require additional SEPA review. Ecology would make a SEPA threshold determination in the future for any new water rights issued as a result of conservation projects undertaken as part of the VRA.

The following sections present brief discussions of the general types of impacts associated with each of the proposed early actions and analyze the impacts of the SEPA actions. Mitigation measures are described. Following the sections on the early actions is a general discussion of the impacts associated with the No Action Alternative.

5.1 Lake Roosevelt Drawdown

There are two proposals for additional drawdowns of Lake Roosevelt—82,500 acre-feet in non-drought years to benefit municipal/industrial supply, the Odessa Subarea, and instream flows; and an additional 50,000 acre-feet in drought years to supply interruptible water rights and augment instream flows (see Section 2.6.1). For both proposals, the amount of drawdown is expected to be within the normal operation of the lake. No construction would be required for the project except possible conveyance structures in the Odessa Subarea.

5.1.1 Impacts at Lake Roosevelt for Non-Drought and Drought Year Withdrawals

5.1.1.1 Earth

Short-term impacts

The annual drawdown of Lake Roosevelt from January through May for flood control purposes ranges from approximately 20 to 82 feet (Figure 3-10). The proposed action would result in an additional 1.0 foot of drawdown (1.5 feet in drought years) during summer months (after spring refill). Drawdown may expose additional lakeshore sediments that would not typically be exposed during the irrigation season; however, drawdown would be within the current operating range of the lake. Depending on the rate of drawdown and soils exposed, shallow sloughing (or slope failure) could occur as pore pressures are released. Slope failure is less likely if well-drained soils or rock are exposed and more likely if fine-grained soils that retain water are exposed. Assuming the rate and methods of drawdown for the proposed action (the additional 1.0 to 1.5 foot) is the same as for the current annual drawdown of approximately 20 to 82 feet, it is unlikely that the additional proposed drawdown would cause significant sloughing during summer months.

Long-term impacts

Long-term impacts for earth would be the same as short-term impacts discussed above.

Mitigation

It is expected that the rate and method of additional drawdown would follow the existing operational management guidelines to reduce the potential for slope failure and erosion; therefore, no additional mitigation is required.

5.1.1.2 Air

Short-term impacts

Because no construction activities are proposed for the additional drawdowns, no short-term impacts on air quality are anticipated.

Long-term impacts

The proposed drawdowns at Lake Roosevelt in both drought years and non-drought years would occur primarily in the summer months of July and August and could increase the area of shoreline exposed. Some areas of shoreline may contain contaminated sediments from the lakebed (see Section 3.3.5). These soils could dry out and become airborne through wind action. Although it is not yet known whether such dust would be a hazard to human health, the additional drawdowns could contribute to the potential problem by extending the length of time that the upper reaches of shoreline are allowed to dry out. However, the daily fluctuation in lake water levels during summer months is such that most or all of the lakebed area that would be exposed by proposed additional drawdowns would likely be rewetted on most days. This would

reduce the likelihood of sediments becoming airborne. Therefore, this project is unlikely to cause a substantial increase in airborne sediments.

The concern regarding windblown dust is primarily during the spring months when the lake is drawn down to its lowest levels in anticipation of spring runoff from the mountains. The U.S. Environmental Protection Agency (EPA) is continuing to study the potential human health effects from airborne sediments in this area (USGS 2006c); results of their study will be incorporated into operational procedures at the lake, and if appropriate, mitigation measures will be developed.

Mitigation

No significant impacts to air quality are anticipated; therefore, no mitigation is proposed. If the US EPA studies show that dust from the lakebed creates a potential hazard to human health, Ecology would work with Reclamation to minimize the potential for sediments to become airborne.

5.1.1.3 Surface Water

Short-term impacts

Water Quantity. Short-term impacts from drawdown will be a reduction in water levels in Lake Roosevelt and an increase in flow in the Columbia River downstream of Grand Coulee Dam. The reduction in water levels could be up to 1.0 foot during non-drought years and 1.5 feet during drought years. The reduction in water levels would occur gradually throughout the irrigation season and peak at the end of the irrigation season in late September. Based on recent operating history, the water levels at the end of September range from approximately 1,282 to 1,289 feet mean sea level (msl). During the dry year in 2003, the water level at the end of September was 1,284.5 feet. A water level reduction of 1.0 to 1.5 feet below the levels experienced in 2003 would still be within the normal operating range of the lake.

Water Quality. The drawdown of Lake Roosevelt would decrease the amount of water in Lake Roosevelt by 82,500 acre-feet during non-drought years and by 132,500 acre-feet (82,500 acre-feet plus 50,000 acre-feet) during drought years. Lake Roosevelt has an active storage capacity of 5.2 million acre-feet. An additional 132,500 acre-feet is less than 3 percent of the active storage capacity. Reduced volume could affect hydrodynamics of the lake and change water quality characteristics such as temperature, dissolved oxygen, and aquatic plant biomass in the lake. However, because of the small relative volume of the additional drawdown, and the fact that it will be spread across and within the normal operating levels of the reservoir, effects to lake water quality are expected to be small. If increased drawdown were to significantly change redox (reduction/oxidation) conditions at the bottom of the lake (at the sediment-water interface), then the dynamics of metals released from lake sediments to the water column could change. The impacts of these water quality changes could be positive or negative depending on a number of factors. Water temperatures, for example, under the increased drawdown could be both cooler and warmer compared to current conditions depending on the time of year and location within the lake.

Further analysis using water quality models of specific drawdown scenarios would be required to quantify the magnitude of potential impacts. However, a 3 percent change in the active storage capacity of the lake is not expected to cause significant changes in water quality.

Long-term impacts

Water Quantity. No long-term impacts from the drawdown would occur as Lake Roosevelt would refill during the next spring runoff period. A small reduction in Columbia River flow would occur in the next spring runoff period to make up for the storage previously released. The reduction in flow would be very small as the lake contains 5.2 million acre-feet of storage. A majority of the flow into Lake Roosevelt occurs during the spring runoff season lasting from April to July, which accounts for 65 to 70 percent of the total annual average inflow volume of 99.3 million acre-feet. The maximum volume released would be 132,500 acre-feet, which represents on average about 0.2 percent of the inflow to Lake Roosevelt during the spring runoff season. The drawdown is also within the normal operating range of Lake Roosevelt so no long-term operational impacts would occur (see Table 2-1).

Water Quality. Long-term effects on water quality from seasonal reductions in water volume should be similar to short-term effects (see above). Long-term impacts to Lake Roosevelt's water quality due to a decrease in reservoir volume are not expected to be significant.

Mitigation

No significant water quantity or quality impacts from the additional drawdown of Lake Roosevelt are expected; therefore, no mitigation is required.

5.1.1.4 Ground Water

Short-term impacts

A seasonal increase in drawdown of Lake Roosevelt may slightly reduce summer ground water levels in the immediate vicinity of the lake for aquifers in direct hydraulic connection with the lake. However, the decline in ground water level is insignificant compared to what occurs every year in the early spring during drawdown for flood protection. Additional summer drawdown is not expected to cause impacts to ground water supplies or ground water discharge to the lake.

Long-term impacts

Long-term effects on ground water from seasonal reductions in water levels should be similar to short-term effects.

Mitigation

Significant impacts to ground water are not anticipated; therefore, no mitigation is required.

5.1.1.5 Water Rights

Short-term impacts

The drawdown of the reservoir could have short-term or long-term impacts depending on the frequency and extent of the drawdown. To the extent Reclamation has senior rights to water in the lake, it has the right to operate the reservoir as it chooses. However, to the extent its rights are junior to other rights from Lake Roosevelt, it may not operate the reservoir in a way that adversely affects the senior rights.

Long-term impacts

In a December 2004 Memorandum of Understanding (MOU) between the state of Washington, Reclamation, and the three irrigation districts within the Columbia Basin Project (South Columbia Basin, East Columbia Basin, and Quincy-Columbia Basin Irrigation Districts), the state, and Reclamation agreed to make best efforts to enter into contracts to allow additional water from Lake Roosevelt to be used downstream (Section 1.3.1.1).

Reclamation is required to apply for a secondary permit to deliver additional water for beneficial use, and Ecology will apply the same four-part test in determining whether to grant the permit as it does for any application for a new water right. "An application filed by the department of ecology or its assignee, the United States Bureau of Reclamation, for a permit to appropriate waters of the Columbia River under Chapter 90.03, for the development of the Grand Coulee project shall be perfected in the same manner and to the same extent as though the appropriation had been made by a private person, corporation or association" (RCW 90.40.090).

The permit is not, however, subject to the Columbia River instream flow rule: "waters withdrawn by the United States pursuant to RCW 90.40.030 prior to the effective date of this rule relating to the second half of the Columbia basin project, and water right permits and certificates hereafter issued by the department of ecology pertaining to such withdrawn waters, are not subject to the provisions of this chapter" (WAC 173-563-020(5)).

To the extent Reclamation has senior rights to water, it has the right to operate the reservoir as it chooses. However, to the extent its rights are junior to other rights from Lake Roosevelt, it may not operate the reservoir in a way that adversely affects the senior rights.

Mitigation

The additional drawdown of Lake Roosevelt is authorized under Reclamation's existing storage rights. Mitigation would be required if exercise of that right would adversely affect senior water rights that divert from Lake Roosevelt. Any required mitigation would be determined by Ecology as the water rights applications are processed.

5.1.1.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. Drawdown of Lake Roosevelt is considered an operational influence on aquatic species. The additional drawdown contemplated under the proposed action is discussed in the following section.

Wildlife and Plants. No short-term impacts to plants and wildlife are anticipated from the drawdown of Lake Roosevelt.

Long-term impacts

Fish. *Non-Drought Drawdown*: The influence of an additional 1.0 foot of drawdown during spring, summer, and early fall months of the irrigation season will be minor relative to existing reservoir operational impacts on aquatic species. Existing drawdowns and subsequent lake elevations during average, wet and dry years are shown in Figure 3-10. Lake elevations under current reservoir operations have the potential to affect:

- Access to tributaries and lakeshore habitats for spawning fish;
- Dewatering of spawning habitats following the spawning season;
- Stranding juvenile fish or aquatic species along shallow littoral habitats including regions near the confluences of major tributaries (Spokane, Sanpoil and Kettle Rivers);
- Water quality by means of suspension of lakeshore sediment;
- Increased likelihood for fish entrainment at the diversion site;
- Reducing the reservoir level will decrease retention time within the reservoir, which could reduce plankton productivity, and result in reduced food sources for fish; and
- Reservoir productivity.

Spring Drawdown: Current spring drawdown for flood control purposes typically begins in mid-March through mid-May when the lake can be drafted (drawn down) 20 to 30 feet, depending on the water year (Figure 3-10). The maximum drawdown during a wet year in 1997 was 81 feet from the full pool elevation of 1,290 feet mean sea level (msl). A 1.0 foot decrease in lake elevations during this time frame is relatively insignificant. However, during the spring season drawdown period, many of the fish species of interest that support lake fisheries either spawn (walleye, yellow perch) or are emerging juveniles (kokanee, rainbow trout). Lakeshore and tributary spawning is limited due to reservoir level fluctuations under current operations (Fickeisen and Geist 1993). Similarly, reservoir drawdown that dewaters existing redds or shallow lakeshore vegetation adversely influences juvenile recruitment to fish populations. An additional 1.0 foot drawdown is not anticipated to alter the current reservoir effects substantially, but may expose more surface area in shallow waters and increase the potential for juvenile fish stranding in specific locales.

Summer Drawdown: After mid-May, the lake is refilled and elevations are maintained in the range of 1,278 to 1,290 feet msl during the summer months. Reclamation operates with the goal of keeping the reservoir above 1,280 feet msl unless below-average water year conditions occur.

Reservoir drafting of an additional 2 feet to 1,278 feet msl is allowed during below-average water years. A 1.0 foot drawdown with the proposed non-drought water right application would increase the risk that lake elevations would fall below 1,280 feet during average as well as below-average water years. As an example, during the dry year in 2003, lake elevations would have fallen to 1,277 feet in late August under the proposed drawdown.

Although the biological effect of slightly lower summer reservoir levels is small, Fickeisen and Geist (1993) suggest existing juvenile walleye rearing habitat downstream of Little Falls Dam can become dewatered due to operations at the dam after mid-July and that further drawdown of Lake Roosevelt from July through August would make such dewatering more severe. Similarly, comments during the scoping meeting on this Management Program EIS suggested shallow water rearing habitat at the mouth of the Kettle River is also sensitive to stranding juvenile fishes during this time frame.

Fall Drawdown: Reclamation prefers to maintain lake elevations in October between 1,283 and 1,285 feet msl to provide kokanee (land-locked sockeye salmon) access to tributary waters, including the Sanpoil River, for spawning and to support brood stock collection at the hatchery facility. During wet years, a small fall drawdown in October, on the order of 5 feet, might be needed to accommodate anticipated inflow to the lake, as occurred in 1997 (Figure 3-10). An additional 1-foot drawdown with the proposed non-drought water right application would increase the risk that lake elevations would fall below 1,283 feet; however, the risk remains only during wet years.

Species Effects: The effects on individual species vary according to the life history stages present and the current fishery management strategies that exist for each species. For example, the fisheries for both kokanee and rainbow trout in the lake are managed by means of hatchery supplementation. The existing fish populations and ongoing fisheries for these species should not be influenced by a 1-foot increase in the irrigation season drawdown. Conversely, Fickeisen and Geist (1993) present information indicating the walleye population in the lake is limited primarily by the abundance of forage fish and that year-class strengths fluctuate substantially with the food base. Forage fish for walleye, including yellow perch, sculpins and cyprinids (minnows), spawn in shallow water. Adhesive eggs of some species are attached to aquatic vegetation. Reproduction of forage fish is limited by reservoir drawdown during spring and summer spawning periods when shoreline vegetation is either not available or dewatered. Annual reservoir refill from mid-May through mid-June prevents the effects of dewatered spawning sites for May spawning fish. However, eggs deposited by early spring spawning species from mid-March through April are at risk of dewatering under current lake management. It is unlikely an additional foot of spring drawdown would have a material influence on walleye or their forage fish that spawn during early spring.

The Colville Tribe is conducting an ongoing resident fish study in the lake to help assess the effects of reservoir levels. Data from the study will be included in the Supplemental EIS for this project.

Drought Drawdown: Like the non-drought drawdown, the influence of 1.5 feet of drawdown during spring, summer and early fall months of the irrigation season under drought conditions will be small. The biological differences between 1.0 and 1.5 feet of added drawdown under

non-drought and drought conditions, respectively, are not measurable and are likely within the range of background daily reservoir fluctuations. The aquatic impacts discussion under non-drought conditions would apply to drought condition drawdowns.

Wildlife and Plants. Operational impacts to plants and wildlife due to the drawdown of Lake Roosevelt would occur during the time period when the water is released from the reservoir. The current operation of Lake Roosevelt includes a large release of water in early spring for flood storage and downstream agricultural use. In average years, a 20- to 25-foot drop in the water level occurs between early April and mid-May (see Figure 3-10). Drawdown of reservoir water levels can affect wildlife species that occupy habitats along the water's edge through the loss of floating vegetation and draining of side channels (USFWS 1982). Conversely, drawdowns may increase shorebird use of additional exposed mudflat areas or use by herons, bald eagles, or other fish-eating birds taking advantage of fish caught in shallow pools (USFWS 1982; Sprandel et al. 2002). Nesting waterfowl and breeding amphibians along the edge of Lake Roosevelt, including geese, ducks, and frogs, are currently impacted by the rapid annual fluctuation of water levels due to reservoir operations. The current drawdown results in loss of eggs, nests, and young each year. Comments received during the scoping meeting on this Management Program EIS suggested that spotted frogs occur in shallow waters at the mouth of the Kettle River and are sensitive to change in water levels. The additional drawdown of the lake is not anticipated to increase the current level of impact substantially, but may expose more surface area in shallow waters.

The proposed drawdown could result in a 1.0 to 1.5-foot decrease in water levels between April and October annually. The water level decrease is expected to be within the normal operation drawdown of the reservoir. Nesting waterfowl and breeding amphibians would be exposed to an increased level of impact with the proposed additional drawdown. However, the slight increase in the current level of impact is not considered to be significant.

Mitigation

Fish. Although the proposed drawdown of Lake Roosevelt is within the normal operation of the reservoir, the potential impacts to resident fish are not known. The net impact of 1.0 or 1.5 feet of additional drawdown of the lake compared to baseline drawdown is not likely measurable. The Colville Tribe is conducting an ongoing resident fish study in the lake to assess the effects of reservoir level fluctuations. This study may identify the need for mitigation which would be resolved as part of the Agreement in Principle (AIP) between the state of Washington and the Confederated Tribes of the Colville Reservation (Section 1.3.1.2). The AIP indicates the state of Washington will pursue replacement water for the Lake Roosevelt drawdown and will:

- Provide for investigation of potential impacts of the Lake Roosevelt drawdown and compensation of the Confederated Tribes of the Colville Reservation for impacts;
- Create an economic development capital fund for the Tribe; and
- Create a fisheries enhancement capital fund and provide for joint work on fisheries management.

The Lake Roosevelt drawdown project includes streamflow augmentation of the Columbia River with 27,500 acre-feet (approximately 460 cfs if the water is distributed over a one-month period) under non-drought conditions, and 44,500 acre-feet (approximately 750 cfs if distributed over one month) of water under drought conditions (see Table 2-1). The water would be put initially into Ecology's Trust Program, but it is planned for downstream flow augmentation in the mainstem Columbia River during low flow conditions. The actual timing and location of Trust Program water discharge will be determined with subsequent agency and tribal consensus. Downstream annual flow augmentation of 460 to 750 cfs could be used to potentially increase water velocities, lower water temperatures and improve water quality conditions in the mainstem river, reducing the risk of these factors on juvenile fish survival, migration delays, and increased prevalence of disease during summer low flow conditions.

The National Research Council report suggests there is a potential risk in maintaining sufficient instream flow levels in the Columbia River mainstem during dry water years in the months of July and August (National Research Council 2004). Smolt migration flow targets are not always met and it is difficult to maintain mainstem flows above the NOAA Fisheries target for the entire fish migration period (National Research Council 2004). In dry years, decreased flow regimes in the Columbia River are problematic and flow targets are routinely missed. The mainstem discharge contemplated as mitigation under this program will assist in reducing such risk. However, as pointed out by other reviewers of the National Research Council report, shifting more water into the July to August period for the mainstem Columbia River may not guarantee measurable benefits to ESA-listed fish species (Olsen 2005).

The largest amount of water contemplated under this mitigation program during drought conditions, if concentrated and discharged annually during the lowest monthly flow (750 cfs compared to the lowest mean monthly flow on record at Priest Rapids Dam; 56,700 cfs), represents a 1.3 percent increase in flow conditions in the free-flowing Hanford Reach section of the Columbia River. Under average conditions the 450 cfs discharged during normal August flow conditions (120,000 cfs below Priest Rapids Dam; USGS, 2006) represents 0.4 percent increase in flow. Such flow level increases are unlikely to have a measurable influence on river temperatures, habitat conditions or aquatic resources in the mainstem Columbia River. Holding water in the Trust Program and discharging only during drought conditions might result in a greater benefit to flow and habitat conditions downstream of Lake Roosevelt than an annual release strategy. Other options for use of this water to leverage benefits to streamflows and fish species (e.g., augmentation during other months of the year, enhancement of tributary flows and source water exchanges) will be explored with the resource agencies.

Wildlife and Plants. No mitigation is expected to be required for impacts to plants and wildlife.

5.1.1.7 Socioeconomics

Short-term impacts

There would be few socioeconomic impacts other than increased activity to implement each drawdown. Owners of some marinas and private boat docks might take steps to anticipate or adjust to each drawdown.

Long-term impacts

No long-term socioeconomic impacts are anticipated.

Mitigation

No adverse impacts to socioeconomics are anticipated; therefore, no mitigation is required.

5.1.1.8 Land and Shoreline Use

Short-term impacts

Drawdowns from Lake Roosevelt already occur on a daily and seasonal basis and no construction or short-term activities would be necessary to accomplish the additional drawdowns for this project. Therefore, no direct short-term impacts on land use are anticipated.

Long-term impacts

Drawdowns at Lake Roosevelt would not be likely to result in long-term changes in land use in the Lake Roosevelt area, because they are within the range of drawdowns that already occur each year. While some individual recreational uses may be affected, the drawdowns are not expected to cause any major shifts in the types of recreation that occur on and adjacent to the lake.

Mitigation

No mitigation is proposed for land use impacts in the Lake Roosevelt area.

5.1.1.9 Cultural Resources

Short-term impacts

No short-term impacts to cultural resources are anticipated as a result of additional drawdowns within the normal range of reservoir operation fluctuations.

Long-term impacts

Depending on the time of year the drawdown occurs, there may be an adverse effect on cultural resources due to the additional drawdown of Lake Roosevelt. The most significant adverse effect during the spring drawdown would be vandalism, particularly off-road vehicle use on exposed beaches and purposeful looting (Yu 2006). An additional 1.5-foot of drawdown during this time could exacerbate the existing adverse effect. Similarly, additional drawdown during times of heaviest recreational use (generally between Memorial Day and Labor Day) could be expected to contribute to the existing adverse effect. The active drawdown zone (approximately 1,220 to 1,290 feet above mean sea level) would be most impacted by the proposed additional drawdown (Galm 1994).

Other impacts to cultural resources could include exacerbation of erosion from wind and water; chemical weathering of organic specimens; and changes to soil chemistry and sediment structure. All of these adverse effects are currently ongoing in the reservoir. Because the additional

drawdown would be within the normal range of reservoir operations, no significant impacts to cultural resources are anticipated.

Mitigation

Because the additional drawdown would be within the normal range of reservoir operation fluctuations, mitigation measures are being conducted by Reclamation to address the ongoing impacts. No further mitigation measures would be necessary.

5.1.1.10 Transportation

Short-term impacts

Drawdowns from Lake Roosevelt occur on a daily and seasonal basis and no construction or short-term activities would be necessary to accomplish the additional drawdowns for this project. Therefore, no short-term impacts to transportation systems are expected from the drawdowns.

Long-term impacts

Drawdowns at Lake Roosevelt would not likely result in long-term effects on transportation systems in the Lake Roosevelt area. Since the drawdown is within the normal range of operations, the Keller Ferry on State Route 21 would not be affected.

Mitigation

No impacts to transportation are expected; therefore, no mitigation is required.

5.1.1.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

Drawdowns from Lake Roosevelt occur on a daily and seasonal basis, and no construction or short-term activities would be necessary to accomplish the additional drawdowns for this project. Some recreational sites may need to adjust the length of docks, boat ramps, and other structures to accommodate lower lake levels. Because most facilities are designed to accommodate the wide fluctuations that already occur, most facilities will not need modifications. Therefore, only minor short-term impacts to recreation and scenic resources are expected from the drawdowns.

Long-term impacts

Drawdowns at Lake Roosevelt would not likely result in long-term adverse effects on recreational uses in the area. The drawdowns would likely occur during summer months, when recreational use is at it highest. However, the drawdowns would take place gradually and be within the normal range of daily fluctuations during the summer months (approximately 6 to 10 feet). Therefore, it would be difficult for most users to notice the change. At the end of the summer season, the drawdowns would have cumulatively reduced the average high water level of the lake by approximately 1.0 foot in non-drought years, and by approximately 1.5 feet in drought years. This would expose slightly more land above the water's edge, which would create wider beaches in most areas, and higher banks above the water in other areas. While some

individual recreational uses may be affected, the drawdowns are not expected to cause any major shifts in the types of recreation that occur on and adjacent to the lake.

The additional drawdowns for non-drought years would not significantly change the appearance of the shoreline at Lake Roosevelt. The maximum water level for the lake would remain the same, even though the average high and low water levels would be slightly lower in late summer. However, some individuals may notice the changes and perceive them negatively.

Mitigation

No mitigation measures for impacts to recreation are proposed because reservoir fluctuations will be within normal operations.

5.1.1.12 Public Services and Utilities

Short-term impacts

Drawdowns from Lake Roosevelt occur on a daily and seasonal basis and no construction or short-term activities would be necessary to accomplish the additional drawdowns for this project. Therefore, there no short-term impacts on are expected from the drawdowns.

Long-term impacts

Drawdowns at Lake Roosevelt would require the use of additional electricity to pump water from Lake Roosevelt to Banks Lake for delivery to the Odessa Subarea. The increased electrical use would be offset somewhat by increased generation at the Main Canal Headworks and Summer Falls hydroelectric plants as the water is conveyed through irrigation facilities to the East Low Canal.

Power generation at Grand Coulee Dam would change due to the water diverted to the Columbia Basin Project; however, these changes are expected to be within the normal operation of the lake.

Mitigation

Since the proposed drawdowns will be within the normal range of reservoir operations, no mitigation is proposed.

5.1.2 Impacts in Receiving Areas

There are four general receiving areas for the additional water withdrawn from Lake Roosevelt. A total of 30,000 acre-feet will be diverted to the Odessa Subarea to offset some ground water use for irrigation. Instream flows will be provided in the Columbia River downstream of Grand Coulee Dam. Additional water will be supplied to municipal/industrial users in the project area. During drought years, water will be available to supply interruptible water rights holders on the Columbia River mainstem. The impacts of supplying additional water to these areas are described in this section.

No additional studies are proposed for supplying 30,000 acre-feet to the Odessa Subarea. Reclamation will prepare a NEPA EIS on its proposal to supply additional water (above the 30,000 acre-feet). That EIS will be prepared in 2007 (see Section 2.1.2.1).

5.1.2.1 Earth

Short-term impacts

Short-term earth related impacts to receiving areas could result from construction if new or modified conveyance or storage structures are needed to transport the additional water from Lake Roosevelt to the receiving areas (e.g., Odessa Subarea). Typical construction-related earth impacts are discussed in Section 4.1.1.1. Augmenting instream flows and supplying water to municipal/industrial uses or interruptible water rights will not likely cause any short-term impacts to earth.

Long-term impacts

Long-term impacts to earth would be associated with maintenance of any newly constructed infrastructure. This may require maintenance roads to access the infrastructure. Typical construction-related impacts are discussed in Section 4.1.1.1. Augmenting instream flows and supplying municipal/industrial uses or interruptible water rights will not likely cause any long-term impacts to earth.

Mitigation

Appropriate mitigation for construction-related earth impacts is described in Section 4.1.1.1. No mitigation is required for augmenting instream flows.

5.1.2.2 Air

Short-term impacts

No construction would result directly as a result of the additional drawdowns. Indirect impacts could occur if development increases as a result of municipal water suppliers benefiting from the new water supplies. Construction of new infrastructure for the Odessa Subarea could also cause indirect air quality impacts. Construction activities would cause temporary increases in airborne dust and vehicle emissions, but these impacts are not expected to be significant.

Long-term impacts

The only long-term impacts to air quality that could occur indirectly as a result of the additional drawdowns would be associated with development in areas served by municipal water supplies. New urban development would include increased vehicle and other emissions. These emissions are regulated and are not expected to be significant.

Mitigation

Mitigation for construction activities and for long-term impacts would be provided through compliance with local, regional, and state regulations protecting air quality. Mitigation measures would be similar to those described in Section 4.1.1.

5.1.2.3 Surface Water

Short-term impacts

Water Quantity. An increase in the amount of water conveyed through Banks Lake, the Main Canal and the East Low Canal would result from providing a surface water supply to irrigators in the Odessa Subarea. This action could require construction of irrigation water conveyance structures (pump stations, pipelines, canals) from the East Low Canal to areas being served in the Odessa Subarea.

Diversion facilities such as pump stations and fish screens may be needed for municipal/industrial water users that will use water supplied by the drawdown. Short-term construction related impacts could occur similar to those described in Sections 4.1.1.3 and 4.1.2.3.

An increase in flow in the Columbia River downstream of Grand Coulee Dam would result if water is released from storage to meet municipal/industrial and irrigation needs along the Columbia River and to benefit instream flows. The increased flow includes an increased ability to meet minimum mainstem Columbia River flow targets established by NOAA Fisheries, and reserved tribal rights to water to hunt and fish in usual and accustomed places.

The total additional volume of water to be discharge from the lake to the Columbia River as part of the Lake Roosevelt drawdown during non-drought years may be 52,500 acre-feet, and during drought years up to 102,500 acre-feet. The 30,000 acre-feet of water for the Odessa Subarea would not be released into the Columbia River. The total additional flow released from Lake Roosevelt in non-drought years would be approximately 430 cfs (assuming a release over two months) or 850 cfs (assuming a release over one month). Approximately 230 cfs (release over two months) or 450 cfs (release over one month) is allocated specifically for instream flow augmentation during non-drought years. During drought years, the total additional flow released from Lake Roosevelt would be approximately 840 cfs or 1,700 cfs assuming a release over two months or one month, respectively. Approximately 360 cfs (release over two months) or 725 cfs (release over one month) of this drought-year release is allocated specifically for instream flow augmentation during drought years. Water released to benefit downstream interruptible water right holders and municipal/industrial water users would also have an instream flow benefit to the point the water is withdrawn. However, the exact location of downstream withdrawals is not known at this time. As a comparison, the mean monthly flow in the Columbia River downstream of Grand Coulee Dam was 50,590 cfs during July 2001 and 68,700 cfs during August 2001, a severe drought year (USGS 2006f).

Water Quality. Short-term water quality impacts to receiving areas from Lake Roosevelt drawdown would primarily be construction-related if modified or new storage facilities are required to convey the additional waters associated with the project. Impacts to surface water

quality caused by construction of conveyance and small storage have been discussed previously (Section 4.1.1.3). Where water from Lake Roosevelt is used to replace existing ground water use in the Odessa Subarea, the water quality of the surface water, after conveyance to the Odessa Subarea, could be of poorer quality or better quality than the existing ground water source(s) currently used to service the receiving area.

Long-term impacts

Water Quantity. As long as the capacity of the Main Canal and the East Low Canal is sufficient to supply surface water to irrigators in the Odessa Subarea, no long-term operational impacts would result from the conveyance of additional water through the irrigation canals. The capacity of the canals will be studied by Reclamation as part of its NEPA EIS on the Odessa Subarea project.

An increase in the amount of surface water supplied to irrigated acres may increase return flow in the Columbia Basin Project if the irrigators use more surface water than their previous ground water supply. The increase in return flow could increase flow in drainages that are currently dry during the summer, and could increase sedimentation loading in surface water bodies. The increased return flow would most likely end up in Potholes Reservoir, increasing the water supply for the South Columbia Basin Irrigation District. The impacts of this are likely to be small as the irrigators will pump from the East Low Canal to their farms, incurring power costs and providing an incentive to conserve water. The farmers also all currently use pressurized sprinklers, which keep return flow to a minimum.

The additional non-drought releases of 27,500 acre-feet for instream flow and 25,000 acre-feet for municipal/industrial use associated with this project would slightly increase instream flow downstream of Grand Coulee Dam on a permanent basis. The increased flow may result in an increased ability to meet minimum mainstem Columbia River flow targets established by NOAA Fisheries, and reserved tribal rights to water to hunt and fish in usual and accustomed places. However, the flow increase would be a small percentage of the average flow in the river.

Water Quality. Long-term water quality impacts to receiving areas from Lake Roosevelt drawdown would primarily be related to differing water quality in surface waters or in infiltration to shallow ground waters.

The increased amount of water conveyed through Banks Lake, the Main Canal and the East Low Canal may cause increased sedimentation loading of surface water bodies. More detail is needed to assess sedimentation; this potential would be assessed when the project-specific evaluation is conducted.

An increase in flow in the Columbia River downstream of Grand Coulee Dam would result if water is released from storage to meet municipal/industrial and irrigation needs along the Columbia River and to benefit instream flows. Although this increase in flows is small in comparison to overall flow in the Columbia River (see Water Quantity section above), it is possible that small improvements to water quality in the Columbia River could occur from increased releases from Lake Roosevelt. Specific temperature and other water quality impacts of

increased discharge from Lake Roosevelt to receiving waters will be investigated as part of the Supplemental EIS that Ecology will prepare on the Lake Roosevelt drawdowns.

Mitigation

Water Quantity. The amount of surface water supplied to irrigators in the Odessa Subarea should be limited to that needed for efficient operation of their irrigation system.

Mitigation such as best management practices (BMPs) to prevent construction impacts would be implemented, as described in Sections 4.1.1.3 and 4.1.2.3.

Water Quality. The mitigation of surface water quality associated with the conveyance of water to the receiving area would be addressed in project-specific water quality plans if necessary. Real-time monitoring of inflowing water quality would allow observation and mitigation of introduced contaminants through conveyance. Sediment filters, bioswales, settling ponds, and/or removal of accumulated sediments may help limit the accumulation of contaminants or sediments in the impoundment structures and other surface water bodies.

5.1.2.4 Ground Water

Replacement of ground water use with surface water sources in the Odessa Subarea could reduce the rate of ground water level decline in the Odessa Subarea. The 30,000 acre-feet of irrigation water from Lake Roosevelt will replace ground water supplies in the Odessa Subarea, but is not intended to recover ground water levels to pre-development conditions. However, it will improve the rate at which historical ground water level declines have occurred over the past 50 years. Information on current levels of ground water pumping in the Odessa Subarea is not available for this EIS, but will be included in the NEPA environmental documentation that Reclamation will prepare on the Odessa Subarea Special Study.

Use of surface water, rather than ground water, for irrigation could result in changes to water quality in shallow aquifers that receive irrigation recharge, either from on-farm irrigation or from canal leakage.

Short-term impacts

Short-term impacts from replacement of ground water sources in the Odessa Subarea with surface supply from Lake Roosevelt will primarily be associated with improving or building conveyance to bring additional water to the receiving areas (discussed in Section 4.1.1.4).

Long-term impacts

Long-term impacts from replacement of ground water sources in the Odessa Subarea with surface supply from Lake Roosevelt include a reduction in the rate of declining ground water levels in the Odessa Subarea. A recovery of ground water levels (e.g., increases in ground water levels to pre-development levels) is not expected because the amount of replacement is small relative to total ground water use in the Subarea. Replacement of ground water sources may also change local gradients and flow directions.

Ground water quality in shallow aquifers could change as a result of different water quality in irrigation water or in water conveyed to the Odessa Subarea in open canals. Impacts to shallow ground water quality could be positive or negative depending on specific soil and water application characteristics.

Impacts could also be negative in specific areas if shallow water tables cause drainage problems, such as local flooding, inundation, or water-logging of agricultural soils.

Mitigation

Ground water quality and ground water level monitoring in the Odessa Subarea would help to establish current conditions and to assess impacts to water quality from replacement of ground water sources. Additional drains and wasteways may be required to help capture and direct additional surface and ground water.

5.1.2.5 Water Rights

Short-term impacts

No short-term impacts to water rights are anticipated.

Long-term impacts

Municipal/Industrial Areas. According to the December 2004 Memorandum of Understanding (MOU), Reclamation and the state, acting through Ecology, will make their "best efforts" to enter into a water service contract (Municipal and Industrial Contract) to deliver an additional 37,500 acre-feet of water (MOU, Section 12) (see Section 1.3.1.1).[1] Under the MOU, the water would be transferred to the State Trust Water Rights Program as Trust Water Rights. Of the total amount of water, 25,000 acre-feet would be made available to mitigate new water rights for municipal/industrial uses as the need arises, and 12,500 acre-feet would remain as instream flow to benefit flows and fish downstream of Grand Coulee Dam. The MOU also provides that water under the Municipal and Industrial Contract will be allocated to the state in "increments of time and quantity based on satisfactory performance" under the agreement in the MOU regarding the Odessa Subarea (MOU, Section 13). The MOU provides that the first increment of water was to be from January 2006 through December 2007. After that time, increments will run for six-year periods "to align water supply decisions with the next increment of municipal growth as projected through municipal water supply plans required by state law" (MOU, Section 13).

Reclamation holds two state water right certificates to store 6.4 million acre-feet of live storage in Lake Roosevelt and an additional 3,162,000 acre-feet of dead storage in the lake (see Table 3-15). Reclamation currently has beneficial use water right certificates for the delivery of approximately 3 million acre-feet per year for consumptive uses.[2] Therefore, the agency will not

[1] Water service contracts are appropriate where Reclamation has a water right to store the water and the recipient of the water will beneficially use the water under existing water rights.

[2] Reclamation has additional water rights for non-consumptive hydropower generation.

need to store additional water to provide water under the Municipal and Industrial Contract.[3] Providing additional water from storage for new instream and out-of-stream water rights is wholly consistent with the Columbia River Water Management Act.

Odessa Subarea. In Section 14 of the MOU, the parties agreed "to support and pursue the diversion and delivery of an additional 30,000 acre-feet of water from Lake Roosevelt to the Odessa Subarea" (MOU, Section 14). The purpose is to make water available to existing agricultural land within the Subarea, and the priority is to supply water to "lands currently irrigated under state ground water permits where the Odessa aquifer is declining" (MOU, Section 14). The MOU provides that lands that receive water from Reclamation shall not divert water under their ground water permits. The ground water code has a specific provision to address such situations:

> The department shall issue a superseding water right permit or certificate for a ground water right where the source of water is an aquifer for which the department adopts rules establishing a ground water management subarea and water from the federal Columbia basin project is delivered for use by a person who holds such a ground water right. The superseding water right permit or certificate shall designate that portion of the ground water right that is replaced by water from the federal Columbia basin project as a standby or reserve right that may be used when water delivered by the federal project is curtailed or otherwise not available. The period of curtailment or unavailability shall be deemed a low flow period under RCW 90.14.140(2)(b). The total number of acres irrigated by the person under the ground water right and through the use of water delivered from the federal project must not exceed the quantity of water used and number of acres irrigated under the person's water right permit or certificate for the use of water from the aquifer (RCW 90.44.510).

On August 19, 2005, Reclamation filed an application with Ecology for a permit for 30,000 acre-feet to irrigate 10,000 acres of land within the Columbia Basin Project. Specifically, the place of use is an area capable of being served by the Columbia Basin Project distribution system within "Adams, Franklin, Grant and Lincoln Counties and within the boundaries of the Odessa Subarea" (2005 Reclamation Water Right Application). Reclamation states in the application that "[w]ater under the 1938 Withdrawal is currently stored in Franklin D. Roosevelt reservoir for irrigation and power generation. No additional storage is sought or required by this application" (2005 Reclamation Water Right Application).

As is the case for any water right application, Ecology may only approve Reclamation's water right application if there is water available (here from storage in Lake Roosevelt), it will be put to a beneficial use (here irrigation), it will not impair existing rights, and it will not be detrimental to the public interest. Because Reclamation will not need to store additional water, there should be no impairment of existing rights. If it is determined that it is in the public interest to continue irrigated agriculture in the Odessa Subarea, granting Reclamation's permit should be in the public interest.

[3] The reservoir certificates list only irrigation and hydropower as purposes of use of the stored water. However, two beneficial use certificates issued to Reclamation, which have the same priority date as the reservoir certificates, list as purposes of use irrigation, hydroelectric, recreation, municipal, industrial.

Instream Flow Enhancement Downstream of Grand Coulee. The additional instream flow would be acquired through the Municipal and Industrial Contract discussed above. A total of 12,500 acre-feet would be transferred to the Trust Water Rights Program specifically for instream flow. As discussed above, Reclamation would not need a new water right to store additional water because it has sufficient storage capacity under its existing reservoir certificates. There should not be any adverse impacts on existing water rights. To the contrary, the additional water for instream flows would contribute to attaining minimum flows set by rule as well as the flows under the federal Biological Opinion (see discussion of Biological Opinion flows in Sections 3.4.1.1 and 3.6.1.6).

Providing Uninterruptible Flows during Drought Years. Sections 9 through 11 of the MOU include provisions for Reclamation to supply additional water during drought years both for out-of-stream interruptible water right holders and for instream flow enhancement. The state and Reclamation agreed to use best efforts to enter into a contract (the Drought Relief Contract) under which Reclamation would agree to make available up to 50,000 acre-feet of water from Columbia Basin Project storage in Lake Roosevelt during any year when the National Weather Service March 1 runoff forecast at The Dalles for April through September is less than 60 million acre-feet, and the Governor of the state makes a formal request in accordance with the Reclamation States Drought Relief Act of 1991 (P.L. 102-250, the Drought Relief Act).

Under the Drought Relief Contract, Reclamation would provide up to 33,000 acre-feet for existing state-based water rights "along the mainstem" that are currently subject to interruption when flows fall below those set in the 1998 Columbia River Instream Flow Rule (Chapter 173-563 WAC). Reclamation would make available up to an additional 17,000 acre-feet of water to improve instream flows during the drought. Parties holding interruptible water rights would be required to apply to Ecology for a temporary permit. Reclamation would temporarily donate the water for instream flow to the Trust Water Rights Program.

The parties acknowledged in the MOU that the federal Drought Relief Act was set to expire on September 30, 2005, and that any subsequent renewals of the Drought Relief Contract would depend upon extension or reauthorization of the Act (MOU, Section 11). The Drought Relief Act was extended to September 30, 2010 by Title 2, Chapter 3, Sec. 2306 of Public Law 109-234, June 5, 2006 (Emergency Supplemental Appropriations Act for Defense, The War on Terror, and Hurricane Recovery, 2006).

The fact that Reclamation has agreed to provide additional water during drought years, within the bounds of the MOU and any Drought Relief Contract, indicates they have adequate storage capacity and water rights to make such deliveries. The potential impacts on water rights are positive for those holding interruptible water rights and for instream flows and fish.

Mitigation

Appropriate mitigation for any impacts to water rights would be determined by Ecology during the processing of applications for new water rights or water rights changes.

5.1.2.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. No short-term impacts to fish are anticipated, but long-term impacts are described below.

Wildlife and Plants. No short-term impacts to plants and wildlife are anticipated. Some construction may be required for infrastructure to supply the Odessa Subarea.

Long-term impacts

Fish. The location and timing of Trust Program water discharge has not been defined to date, making assessment of the adverse or beneficial influences to aquatic resources difficult. In general, prevailing management strategies suggest the more mainstem water volume the better, especially during less-than-average water years in July and August when meeting target instream flow levels at McNary Dam is problematic (National Research Council 2004). However, the contemplated flow increases from Lake Roosevelt drawdown of 460 to 750 cfs on a single month basis during non-drought and drought years, respectively, represents only 1.3 percent of the seasonal minimum monthly flow on record and 0.3 percent of the mean monthly August flow at Priest Rapids Dam. This relatively insignificant magnitude of flow increase makes the augmentation from Lake Roosevelt drawdown inconsequential with respect to biological resources.

With respect to providing uninterruptible flows during drought years, the National Research Council (2004) review of the Columbia River Initiative did not recommend providing uninterruptible water rights. They stated:

> Conversion of interruptible water rights to uninterruptible status makes an adaptive management response to the benefit of aquatic resources and ESA listed species more difficult. Interruptible water rights are interruptible so that at times of scarcity, instream flows can be protected. Making any out-of-stream right uninterruptible reduces flexibility to retain water in the river when salmon mostly need it during low-flow periods.

The National Research Council (2004) concluded:

> The conversion of water rights to uninterruptible status will decrease flexibility of the [water management] system during critical periods of low flows and comparatively high water temperatures. Conversions to uninterruptible rights during these critical periods are not recommended.

Similarly, Battelle, Pacific Northwest Division suggested in a letter report to the Columbia-Snake River Irrigators Association (CSRIA) that uninterruptible water rights in their water management plan proposal might not be supportable (Dauble et al. 2006).

Drawdown of Lake Roosevelt for the Management Program will result in increased water flow through Banks and Billy Clapp Lakes. Both of these reservoirs are common to all of the Supplemental Feed Routes. Reclamation and Ecology have not identified Banks Lake storage

and drawdown operating options under the Management Program. Consequently, the timing, magnitude, and duration of resulting elevations and flow velocities in Banks and Billy Clapp Lakes have not been determined to date. These project specifics will be addressed in the Lake Roosevelt Drawdown Supplemental EIS. Possible short- and long-term effects on aquatic resources in the lake based on altered flow regimes include the following ecosystem-related issues:

- Changes in shoreline vegetation and nearshore habitat structure and resulting disruption of fish spawning, rearing and refuge sites;
- Changes in water quality, including seasonal dissolved oxygen and turbidity levels;
- Changes in lake productivity, including phytoplankton, zooplankton and subsequent food chain issues for all aquatic consumers;
- Altered predator/prey relationships;
- Altered fish population dynamics as a result of the habitat, productivity and predation changes; and
- Changes in fish entrainment with increased flows in Banks Lake.

Wildlife and Plants. No long-term impacts to plants are anticipated. Increased flow volumes during drought years may help to sustain riparian habitat in those reaches affected by declining water levels. Long-term impacts to the migratory mule deer population may be increased from current levels if infrastructure such as canals were built to supply water to the Odessa Subarea. Mule deer in the Odessa Subarea could experience direct mortality by falling into concrete-lined canals, and the canals can act as a barrier to deer migration.

Mitigation

Fish. Greater beneficial effects for instream habitat conditions and aquatic resources can be realized by storing the mitigation water in the Trust Program and releasing larger volumes during drought years than through an annual release for downstream flow augmentation. The drought cycle over the past century is approximately one drought in seven years. Releasing Trust water stored in Banks Lake once in seven years downstream in the mainstem Columbia River would result in approximately a 10 percent increase in mean monthly flows at Priest Rapids Dam. This level of flow release is more meaningful and it could be timed when aquatic resources would need it the most. Other options for use of this water to leverage benefits to streamflows and fish species (e.g., enhancement of tributary flows and source exchanges) will be explored with the resource agencies.

Wildlife and Plants. Mitigation for construction activities and for long-term impacts would be provided on a project-by-project basis and would be similar to measures described in Section 4.1.1.6.

5.1.2.7 Socioeconomics

Short-term impacts

Increased certainty of water for irrigation might increase the expected future productivity of irrigated land. This in turn could trigger increases in the market value of irrigated farmland and farm-related residential and commercial/industrial land.

Long-term impacts

In general, impacts associated with irrigation, municipal/industrial, and other uses of diverted water could be similar, on a per-unit basis, to those associated with potential uses of increased supplies under the storage option. The availability of surface water for irrigation in the receiving areas would likely enable continuation of current economic activities associated with irrigated agriculture. This would be especially evident for potatoes and other water-intensive crops that otherwise would cease because of the declining supplies of ground water in these areas. Bhattacharjee and Holland (2005) estimated the annual production of potatoes in the Odessa Subarea generates $179 million in sales in the surrounding counties, 1,136 jobs, and $54 million in income. They also found the economic effects of potato processing are more than twice as large. Changes in crop production stemming from new surface water supplies would interact with agricultural markets: increases in production generally would lower prices, and decreases in production would raise them. Irrigators' net earnings would increase or decrease proportionately with the change in costs of irrigating with new surface water supplies. 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. Increased reliance on surface water, rather than on ground water, may increase irrigators' susceptibility to declines in water supplies during periods of drought, and expand future demands placed on public and private drought-assistance programs. Increased flows may affect the amount of water available to generate hydropower.

Mitigation

Adverse impacts, if any, may induce affected parties to seek mitigation.

5.1.2.8 Land and Shoreline Use

Short-term impacts

Indirect impacts could occur if development increases as a result of municipal water suppliers benefiting from the new water supplies. Because the municipal service areas that might receive the water are generally small and spread over a large region, new water supplies for these areas are not expected to result in large amounts of growth in any one location, or in significant short-term impacts to land use.

Long-term impacts

No new development would result directly as a result of the additional drawdowns. Indirect long-term land use impacts could occur as a result of development in areas served by municipal water supplies that currently have interruptible water rights. Indirect impacts could also occur from the conversion of land from one type of agriculture to another. Impacts from these types of crop conversion are discussed in Section 4.1.1.8. In the Odessa Subarea, the additional water supply is expected to allow existing agricultural practices to continue. Changes in types of agriculture on properties with interruptible water rights are not likely to produce significant changes in land use, but minor changes in land use patterns could occur as discussed in Section 4.1.1.8.

All counties potentially affected by these new water supplies, except for Lincoln and Okanogan, are fully planning under GMA, and therefore have considered the impacts of development as part of their comprehensive planning process. Compliance with these comprehensive plans is expected to minimize any significant impacts to land use. Any large development project would undergo separate SEPA review prior to proceeding, which would provide an additional opportunity to examine land use impacts.

Lincoln and Okanogan Counties have not developed comprehensive plans. They also do not have any major cities and have relatively low growth rates. The largest municipalities in Okanogan County include Omak (population: 4,495), Brewster (2,055), Oroville (1,615), Tonasket (1,025), Twisp (1,000), Coulee Dam (890), and Pateros (595) (Okanogan 2006). The largest municipalities in Lincoln County include Davenport (1,730), Odessa (957), Wilbur (914), Reardon (608), Sprague (490), and Harrington (426) (OFM 2006). Growth as a result of the availability of new water supplies for these municipal areas is not expected to result in significant land use impacts because of the relatively small sizes of the towns. As discussed above, any large development project would undergo separate SEPA review prior to proceeding, which would provide an additional opportunity to examine land use impacts.

Mitigation

Mitigation for construction activities and for long-term impacts would be provided through compliance with local and state regulations regarding land use. Mitigation measures for land use impacts would be similar to those described in Section 4.1.1.8.

5.1.2.9 Cultural Resources

Short-term impacts

Short-term impacts in receiving areas are expected to be generally low. Ground-disturbing activities such as construction have the potential to impact cultural resources. Providing additional water could allow diversification of agricultural land use, which has the potential to impact cultural resources during planting of orchards or plowing. Possible impacts could occur to any historic structures that might be present in the receiving areas.

Long-term impacts

Long-term impacts in receiving areas are expected to be generally low. Municipal or industrial uses may eventually increase land development, which could impact cultural resources. Flow enhancement may impact cultural resources by increasing erosion due to fluctuations in water levels and potential additional influx of cattle.

Mitigation

Development of a Cultural Resources Management Plan (CRMP), as described in Section 4.1.1.9, would include identification of appropriate mitigation measures for impacts in receiving areas. Impacts may be mitigated through avoidance of cultural resources.

5.1.2.10 Transportation

Short-term impacts

No significant short-term impacts on transportation are expected, because construction in the receiving areas would be very limited and spread over a wide area. Construction activities would have transportation impacts similar to those described in Section 4.1.1.10. If new infrastructure were required to deliver water to the Odessa Subarea, it would likely include canals and pipes. Canals and pipes, because of their linear nature, would likely intersect with roads and result in construction delays in some areas. If major infrastructure improvements are needed, additional environmental review will be conducted on the specific projects.

Long-term impacts

Development in areas served by municipal water supplies that would benefit from the project could increase, which would increase demands on transportation systems. As described in the land use section above, new development expected as a result of the new water supplies is expected to be consistent with adopted land use plans and policies, which have incorporated transportation requirements to accompany growth projections.

Mitigation

Mitigation for construction impacts on transportation systems would be provided on a project-by-project basis, and would be similar to measures described in Section 4.1.1.10.

5.1.2.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

No construction would result directly as a result of the additional drawdowns. The only construction that could occur indirectly as a consequence of the new water supplies would be associated with development in areas served by municipal water supplies that would benefit from the project, and construction of new irrigation infrastructure for the Odessa Subarea.

Construction activities would have impacts similar to those described in Section 4.1.1.11. Most of these construction activities would occur in or near already developed areas, or on agricultural

lands. Thus, the temporary aesthetic impacts of construction would not likely be as noticeable or as adverse as they would if they were to occur in natural areas.

Recreation resources in the receiving areas, including parks and wildlife areas, could be affected by some of the construction activities described above, depending on the location of the development. These temporary impacts are not expected to be significant.

Long-term impacts

As a consequence of the new water supplies, development in areas served by municipal water supplies that would benefit from the project could increase. This could affect scenic resources if the development occurs within scenic areas. 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 thus additional development would not likely have significant adverse impacts.

Providing non-interruptible water supplies to existing interruptible water rights holders would not likely adversely affect recreation or scenic resources. Recreation facilities, such as playfields and parks, could benefit from more reliable municipal water supplies. This could also encourage new development, increasing the demand for recreational resources.

Mitigation

Mitigation measures for recreation and scenic impacts would be similar to those described in Section 4.1.1.11.

5.1.2.12 Public Services and Utilities

Short-term impacts

Because construction in the areas receiving water from the drawdown would be limited and spread over a wide area, no significant short-term impacts on public services and utilities are expected. Construction activities would have impacts similar to those described in Section 4.1.1.12.

Long-term impacts

Water from drawdowns would benefit municipal water suppliers and irrigation districts by providing more water to meet growing demand and by providing more dependable water supplies in drought years. The increase in electrical demand associated with pumping from the East Low Canal to the Odessa Subarea may be offset by reduced electrical demand when pumping from deep wells ceases.

Mitigation

Mitigation for construction impacts on public services and utilities would be provided on project-by-project basis, and would be similar to measures described in Section 4.1.1.12.

5.2 Supplemental Feed Route

Reclamation is proposing three alternatives for a Supplemental Feed Route to supply water to Potholes Reservoir—Crab Creek, W20 Canal, and Frenchman Hills Wasteway. The purpose of the Supplemental Feed Route is to provide a more reliable supply to Potholes Reservoir. Reclamation is currently conducting feasibility studies on the feed route alternatives. Results from some of the studies will be included in the NEPA EA that Reclamation will prepare on the Supplemental Feed Route.. Reclamation will be preparing a NEPA EA on the Supplemental Feed Routes in 2007. The EA will determine the specific impacts and mitigation of the proposal. The following sections describe the general impacts that would be associated with the alternative routes.

5.2.1 General Impacts of a Supplemental Feed Route

5.2.1.1 Earth

Short-term impacts

This action includes construction or modification of feed water conveyance facilities (open canals and channels, pipelines, siphons, hydraulic structures). Construction of new conveyance facilities and/or drains and wasteways will involve earth disturbances. Typical construction-related earth impacts are discussed in Section 4.1.1.1.

Long-term impacts

The range of proposed flow contributions to Crab Creek is approximately 100 to 500 cubic feet per second (cfs). The flows exceed this level 90 percent of the time. The Crab Creek flows range from approximately 10 to 40 cfs from April to September. The channel governing flow (bank full flow) in Crab Creek is approximately 300 cfs (see Section 5.2.1.3, Surface Water). The increased flow contribution may cause changes in channel morphology, and may increase erosion and sedimentation. Increased flow contributions may also change localized drainage characteristics. Specific impacts will be evaluated by Reclamation in its NEPA EA on the Supplemental Feed Route project. Reclamation is currently conducting a study on the erosion and sedimentation potential on the proposed Crab Creek alternative. The results of that study will be included in the NEPA EA that Reclamation will prepare on the Supplemental Feed Route..

Mitigation

Mitigation of typical construction-related earth impacts is discussed in Section 4.1.1.1. Mitigation for changes in soil saturation, localized impacts from changes in water table elevations, and drainage conditions will be evaluated by Reclamation in its NEPA EA on the project. Assessment of potential impacts and the development of mitigation approaches to channel morphology require a more detailed inventory and characterization of the existing geomorphic and hydrologic channel conditions.

Mitigation measures addressing potential erosion and sedimentation would be developed using input from the channel geomorphic inventory to delineate potential problem areas. Mitigation approaches may include:

- Modification of the operation of additional flow releases to match and/or maintain stable channel conditions;
- Erosion protection and bank stabilization projects;
- Sediment management projects such as sediment filters;
- Bioswales, settling ponds, or placement and/or removal of accumulated sediments;
- Inventory and/or monitoring of problem erosion areas;
- Enhanced vegetation planting programs;
- Improvement of floodplain connectivity; and
- Long-term monitoring of channel conditions in order to support adaptive management approaches.

5.2.1.2 Air

Short-term impacts

The Frenchman Hills route would require minor construction. The Crab Creek and W20 Canal routes would require major construction. Air quality impacts associated with construction for the alternative routes would be similar to those described in Section 4.1.1.2.

Long-term impacts

Rerouting water through any of the routes is not likely to affect air quality or climate over the long term.

Mitigation

Mitigation measures for air quality impacts during construction would be similar to measures described in Section 4.1.1.2.

5.2.1.3 Surface Water

Short-term impacts

Water Quantity. This action includes construction or modification of feed water conveyance facilities (open canals and channels, pipelines, siphons, hydraulic structures). Short-term construction impacts to surface water bodies could occur similar to those described in Section 4.1.1.3.

Water Quality. The three Supplemental Feed Route alternatives involve varying levels of construction or modification of feed water conveyance facilities. Construction and modification of new conveyance facilities and/or drains and wasteways will involve earth disturbances that could cause short-term impacts to surface water quality. Typical construction-related water quality impacts are discussed in Section 4.1.1.3.

The Crab Creek route will require modifications to the outlet at Pinto Dam to minimize the potential for erosion; modifications to the outlet of Brook Lake to prevent inundation of the toe drains at Pinto Dam; modifications (deepening) to the Crab Creek channel from Brook Lake to Round Lake; and replacement of culverts at Stratford Road. Erosion and sedimentation are likely to occur with channel modification and construction and the higher flows associated with the Crab Creek alternative (see Section 4.1.1.3). Reclamation is currently studying the potential for erosion and sedimentation in Crab Creek. The results of the study will be included in the NEPA EA Reclamation will prepare on the Supplemental Feed Route.

The W20 Canal route would require the construction of approximately two miles of new conveyance to connect to the Rocky Ford arm of Moses Lake along with other improvements. Construction may impact surface water quality as described in Section 4.1.1.3.

The Frenchman Hills option is not expected to require additional construction of conveyance facilities other than modification of road culverts. Impacts of culvert modification to surface water quality are described in Section 4.1.1.3.

Long-term impacts

Water Quantity. For the Crab Creek Supplemental Feed Route alternative, water would be discharged from Billy Clapp Lake to Brook Lake and routed down middle Crab Creek, increasing the volume of water typically conveyed down the stream at certain times of the year. The rate of flow that may be conveyed down lower Crab Creek could range from 100 to 500 cfs, with the higher flows anticipated for the summer period in drought years under one operational alternative. The increased flow could exceed the two-year recurrence interval peak discharge for Crab Creek near Moses Lake, which is 322 cfs (USGS 2006). A two-year flood is the approximate "channel forming" flow that creates the channel shape. Therefore, the Crab Creek channel may enlarge in response to higher flows causing erosion in excess of what currently occurs as the channel changes shape to meet a new "channel forming" flow.

Some of the water discharged into Crab Creek will infiltrate into ground water, reducing the increase in flow in Crab Creek. The ground water is expected to resurface in Rocky Ford Creek, increasing surface water flow in that stream. The amount that will infiltrate is not known at this time; tests have been undertaken by Reclamation to estimate that amount.

An increase in flow during the spring (without a change in the total annual volume of feed flow to the Potholes) could also occur in the feed route path to Moses Lake for the W20 Canal route. For this feed route alternative, 500 to 600 cfs would be delivered through the W20 system to a new outlet at Moses Lake. The feed would need to be scheduled prior to May 18 to avoid a conflict with discharge regulations for aquatic herbicides. The feed would occur through existing or new irrigation canals and pipelines. An increase in flow through Moses Lake may also occur depending on the amount of water discharged through this route compared to the amount that currently flows through Moses Lake from the existing feed route through Rocky Coulee Wasteway.

An increase in flow in the Frenchman Hills Wasteway during the spring would occur in the feed route to Potholes Reservoir for that alternative. Road culverts at Dodson Road and Road C SE

would need to be replaced to allow the additional feed. A maximum feed of 700 cfs may be conveyed through Frenchman Hills Wasteway during the spring when sufficient space in the West Canal is available and prior to the need to apply aquatic herbicides to the canal.

Reclamation is conducting a feasibility study of the three alternatives and an erosion and sedimentation study on the Crab Creek alternative. These studies will be included in the NEPA EA Reclamation will prepare on the Supplemental Feed Route. In addition, Reclamation will be preparing a NEPA EA on the Supplemental Feed Route, which will evaluate potential impacts to surface water.

Water Quality. The Supplemental Feed Route alternatives will all involve linking water bodies and conveyance facilities that have different water quality. Ultimately, water quality in Potholes Reservoir could change because the timing of the additional flows in the Supplemental Feed Routes would change. Depending on the feed route chosen, water quality in Lake Roosevelt, Banks Lake, Billy Clapp Lake, Brook Lake, Upper Crab Creek, Moses Lake, Rocky Ford Creek, Rocky Coulee Creek, West Canal, and the Frenchman Hills Wasteway all have the potential to impact water quality in Potholes Reservoir. Water quality impacts are being evaluated as part of the EA on the Supplemental Feed Routes.

The Crab Creek alternative is not longer than the current route and is therefore not expected to increase the temperature of the water flowing into the receiving areas. However, the Crab Creek route could decrease Rocky Coulee Creek's temperature by potentially increasing ground water inputs from the additional infiltration from Crab Creek. Although the W20 Canal and Frenchman Hills alternatives are longer than the existing route, the use of these routes would end in mid-May and would not occur during the summer months when temperature issues are most critical.

Fecal coliform found in Crab Creek may lead to increased loading in Potholes Reservoir. Similarly, the excess nutrients, 2,3,7,8-TCDD and total PCBs found in Moses Lake may lead to increased loading in Potholes Reservoir for both the Crab Creek and W20 feed route alternatives which convey water through portions of Moses Lake. Changing the quantities of feed flow through the Supplemental Feed Routes at different times of the year may result in an increase in contaminant concentrations as the water flows through the system. Spreading the total volume of feed flow over a longer period (the annual volume of feed flow is not expected to change) decreases the dilution effects from larger volumes of flows through the Supplemental Feed Route(s).

The temperature of water delivered to Moses Lake could have an influence on lake dynamics and trophic state. Depending on the timing of delivery, larger inflows of cooler water could improve water quality and existing eutrophic or hypereutrophic conditions present during the summer months. The Crab Creek alternative has the potential to improve the water quality in Moses Lake. The additional water fed through the lake in the summer months could dilute the concentration of total phosphorus and reduce algal mass (Ecology, 2006c). However, the Crab Creek alternative may introduce additional phosphorus as it migrates through the Adrian Sink from Crab Creek to Rocky Ford Creek. The W20 and Crab Creek alternatives could increase water circulation and flush phosphorus from the main arm of the lake below the mouth of Rocky Ford Creek. Increased sediment loads could increase nutrient or other contaminant loads and

further degrade water quality. The Frenchman Hills route would not convey water through Moses Lake.

Reclamation will evaluate potential water quality impacts of the Supplemental Feed Route in its NEPA EA on the project.

Mitigation

Water Quantity. A review of the potential for erosion and flooding along each feed route path would be conducted during the project-specific evaluation. Mitigation such as best management practices to prevent construction impacts would be implemented, as described in Sections 4.1.1.3 and 4.1.2.3.

Water Quality. Reclamation plans to study phosphorus and nitrogen levels in the proposed W20 Canal reach and Crab Creek area and is currently developing a water quality study for the Frenchman Hills Wasteway. The results from these evaluations will be incorporated into the project design. Past surface water quality sampling has occurred only during the irrigation season so Reclamation intends to begin sampling during the non-irrigation season. The additional sampling will provide a better understanding of background phosphorus and nitrogen levels and indicate the contribution of phosphorus and nitrogen to surface water bodies via irrigation water (Hoff, personal communication, 2006). The NEPA EA that Reclamation will prepare will determine appropriate mitigation measures for impacts to surface water.

5.2.1.4 Ground Water

Short-term impacts

Short-term impacts to ground water associated with the development of any of the three feed route alternatives would primarily be associated with construction or modification of feed water conveyance facilities. Impacts to ground water due to these types of construction activities have been discussed previously in Section 4.1.1.4.

The Crab Creek route is a natural waterway and is expected to require some channel modification to accommodate increased flows. Given the hydraulic continuity between ground water and surface water over some reaches in this stream, it is expected that impacts may include short-term changes to shallow ground water levels and ground water/surface water interaction associated with channel modifications.

The W20 Canal route would require the construction of approximately two miles of new conveyance to connect to the Rocky Ford arm of Moses Lake along with other improvements. Construction could temporarily impact shallow ground water.

The Frenchman Hills option is not expected to require additional construction of conveyance facilities other than modification of road culverts. These modifications would have minimal potential to impact ground water.

Long-term impacts

The addition of surface water in any of the lakes, canals and wasteways for any of the Supplemental Feed Route alternatives may increase ground water levels along the route and in the vicinity of the impoundments due to an increased hydraulic head in the impoundments and seepage along the conveyance facilities. Additional water from the Supplemental Feed Routes will not increase the water level of Potholes Reservoir. Therefore, there would be minimal changes in ground water flow around Potholes Reservoir due to implementation of any of the Supplemental Feed Route alternatives over the long term.

Development of a Supplemental Feed Route would provide flexibility to deliver replacement water for ground water use in the Odessa Subarea. The replacement water would decrease ground water use and declines in ground water levels.

Crab Creek Alternative. Crab Creek becomes a perennial waterway just upstream of Irby (Garrett 1968). If the Crab Creek route is chosen, ground water may be recharged along the stream's natural route. From Brook Lake above Stratford, through Adrian, ground water is present in gravels directly below the surface drainage of Crab Creek. Crab Creek loses much of its flow to ground water in this reach. The Adrian sink extends for nearly three miles about midway between Adrian and Soap Lake; the normal flow and even moderately high flows of Crab Creek are absorbed by the gravels, and only during extreme flood conditions does any surface drainage reach Moses Lake through Crab Creek (Mundorff et al. 1952; Blanchard, personal communication, August 2006). The ground water is expected to resurface in Rocky Coulee Creek, which drains to Moses Lake, increasing surface water flow in that stream. Water temperatures in Rocky Coulee Creek often exceed the 18º C criterion from May through August (Ecology 2006c). Additional ground water flow to Rocky Coulee Creek could be a source of cool water for the stream that could improve the stream's water quality.

As part of the Supplemental Feed Route Study for Potholes Reservoir, Reclamation is conducting hydraulic testing of Crab Creek. Test flows were initiated in August 2006 to determine how water is flowing through Crab Creek below Brook Lake to determine the stream's potential as a supplemental route to convey water downstream and through Moses Lake to Potholes Reservoir. This test should provide data regarding potential surface water losses to ground water in the vicinity of Adrian Sink, as well as concerns about erosion and sediment that might be subsequently transported to Moses Lake. Results of this study will be included in the NEPA EA Reclamation will prepare on the Supplemental Feed Route.

W20 Canal Alternative. Much of the W20 route is unlined and it is expected that there would be hydraulic connection between flow in the canal and shallow ground water. Canal seepage to shallow ground water would occur along the route and could potentially increase as a result of additional water in the canal.

Frenchman Hills Wasteway Alternative. The majority of the Frenchman Hills route is unlined, open channel with no impoundments. Therefore, it is expected that surface water to ground water interaction and general canal seepage in the vicinity of this route would occur and could potentially increase as a result of additional water in the canal. Additional surface water in the Frenchman Hills Wasteway may slow the rate of ground water discharge into the wasteway.

Mitigation

Impacts to ground water resulting from the implementation of Supplemental Feed Route may be mitigated by conducting appropriate hydrogelogical studies prior to project implementation and incorporating the results of these investigations into project design. The degree of study would depend on the magnitude of the project's impact to that area.

Because drainage is a consideration throughout the project area, drains and wasteways have been constructed to help mitigate drainage impacts (Reclamation 2006e). Additional drains and wasteways may be required to help capture and direct additional surface and ground water resulting from additional water from the feed routes.

While natural mixing and dilution of ground water may sufficiently mitigate localized changes to ground water quality, increased public awareness and sensitivity to the potential problem may help ensure ground water quality. Decreasing potential contamination pathways, such as the removal of contaminated sediments in areas expected to become saturated, will help decrease the likelihood of contaminants leaching into the ground water.

5.2.1.5 Water Rights

Short-term impacts

No changes to Reclamation's water rights would be required to deliver water via a Supplemental Feed Route. No water right impacts are anticipated.

Long-term impacts

Reclamation currently moves water from storage in Banks Lake to the Potholes Reservoir via the East Low Canal. The development of Supplemental Feed Routes would not require new water rights; however, several sections of Chapter 90.40 RCW do govern such activities. RCW 90.40.020 provides that "[t]he United States shall have the right to turn into any natural or artificial water course, any water that it may have acquired the right to store, divert, or store and divert, and may again divert and reclaim said waters from said course for irrigation purposes subject to existing rights."

RCW 90.04.050 addresses lands owned by the state, "including the beds and shores of any lake, river, stream, or other waters" and requires the United States to list the lands where the United States acquires rights-of-way for canals, ditches, or laterals, which are then reserved from sale by the state. "The title to the beds and shores of any navigable lake or stream utilized by the construction of any reservoir or other irrigation works created or constructed as a part of "an appropriation by the United States, "shall vest in the United States to the extent necessary for the maintenance, operation and control of such reservoir or other irrigation works" (RCW 90.40.040).

No changes to Reclamation's water rights would be required to deliver water via a Supplemental Feed Route. No water right impacts are anticipated.

Mitigation

No impacts to water rights are anticipated; therefore, no mitigation is required.

5.2.1.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. Potential impacts related to using alternative routes to supply supplemental feed water to Potholes Reservoir from Billy Clapp Lake will depend the type of channel and the presence of aquatic resources. The three Supplemental Feed Routes include middle Crab Creek, the W20 Canal, and Frenchman Hills Wasteway. The existing conditions and biological resources present within each of these routes have been described in Section 3.7.1 and Section 5.2.1.3.

The middle section of Crab Creek between Brook Lake and Willow Lakes is a natural but ephemeral channel bed. The stream is routinely dry along major portions of this reach for years at a time. This reach readily loses water to the aquifer and is seldom flowing. The channel does not support aquatic species use and provides only patchy areas of habitat for aquatic invertebrate organisms. The W20 Canal and Frenchman Hills Wasteway are developed irrigation canals. Although fish can occasionally find their way into the canals, these alternative routes are not regarded as waterways that support aquatic species production.

Construction impacts for improvements to all three of the Supplemental Feed Routes will comply with WDFW Hydraulic Project Approval (HPA) permits where appropriate to minimize adverse influence to aquatic species due to activities below the Ordinary High Water Mark (OHWM). Short-term waivers for water quality standards including turbidity might be needed during construction of channel capacity improvements in Crab Creek.

Wildlife and Plants. Reclamation is currently studying the Supplemental Feed Routes. Construction of the new conveyance line will result in disturbance and removal of vegetation. If the areas provide habitat for wildlife, that habitat will be lost. Similarly, wildlife occupying those habitats, such as birds, small mammals, amphibians or reptiles, could be lost or displaced by construction. If the habitat is shrub-steppe and supports wildlife species dependent on shrub-steppe habitat, the impact will be considered significant due to the lack of habitat in the project area and the difficulty in restoring disturbed soils or vegetation. Wildlife in the vicinity of the construction areas would also be temporarily disturbed and displaced by noise and construction activities.

Long-term impacts

Fish. Reclamation modeled preliminary flow volumes and rates for the Supplemental Feed Routes (see Section 3.4.3.2; Blanchard 2006). Supplemental feed from Billy Clapp Lake is estimated to range from 100 to 500 cfs, with the highest flows occurring in summer (Blanchard 2006). For the Crab Creek alternative route, some of the 100 cfs release is anticipated to be lost to ground water. Reclamation is currently studying the amount of infiltration to ground water.

The two-year peak flow event in Crab Creek near the Moses Lake gaging station (USGS 12467000) is 322 cfs. Hydrologists consider a two-year event to be representative of a channel-forming flow, meaning the flow is sufficient to scour and move bed materials and realign the stream banks. Transporting an estimated 400 to 450 cfs of supplemental feed in Crab Creek in April and May will exceed the existing two-year event on an annual basis. This volume of water in the natural channel will likely increase the risk of bed scour and bank erosion, and could realign the channel on an annual basis until a state of equilibrium is reached with the channel banks. The potential impacts to aquatic species include scoured shellfish beds or spawning sites for early spring spawning fish species in Crab Creek, and/or increased magnitude and frequency of turbidity and sedimentation of existing shellfish beds and spawning sites, compared to current conditions in both Crab Creek and possibly Moses Lake. Increased levels of turbid water may also have an adverse influence on fish feeding behavior and rearing success. Contaminants associated with re-suspended sediments might also lower aquatic productivity.

An increased stable streamflow level in Crab Creek and additional flow in Rocky Ford Creek for the balance of the year should provide benefits to all aquatic species. Such benefits are likely given the low overall streamflows prevalent in Crab Creek and a near doubling of streamflow in Rocky Ford Creek (Blanchard 2006).

Using either the W20 Canal or the Frenchman Hills Wasteway to transport an additional 500 to 600 cfs in April and early May is unlikely to have an influence on aquatic habitat. There are no known spawning or rearing habitat features or native freshwater shellfish in the developed irrigation canal system.

Moses Lake reservoir elevations are not anticipated to fluctuate substantially with the Crab Creek feed route alternative. However, deposition of sediments and increased turbidity with the release of 500 cfs in Crab Creek in April and May could have an influence on the walleye fishery in Moses Lake that peaks in intensity during the same period as the release of feed water.

Wildlife and Plants. The W20 Canal and Frenchman Hills Wasteway routes would not cause long-term impacts to wildlife and plants. The Crab Creek route may benefit some species by providing water during dry seasons. The current Crab Creek drainage is an ephemeral system composed of dry grassland and shrub-steppe habitats and ponds. Introducing permanent water flow through the system will likely alter vegetation communities in the long term, converting arid habitats to riparian areas, wetland marshes, or shallow ponds. Additional water in Crab Creek may create new habitat for waterfowl species, especially during spring and fall migration. However, species currently using the grassland and shrub-steppe would be displaced to adjacent habitats. Those species dependent on shrub-steppe habitats would experience loss of habitat over time and associated decreased populations.

Mitigation

Fish. Reclamation is considering improving Crab Creek in this reach to minimize erosion and sediment transport issues. Flow tests are underway to identify the loss rate to ground water and channel capacity in Crab Creek. Results will help identify proper techniques for minimizing adverse influence to aquatic habitats based on the increased potential for scour and erosion with this alternative. No mitigation would be required for the W20 Canal or Frenchman Hills

Wasteway alternatives. Mitigation related to altered flow regimes in Banks and Billy Clapp Lakes will be addressed in the Lake Roosevelt Drawdown Supplemental EIS.

Wildlife and Plants. No mitigation measures are anticipated for this early action. A NEPA EA for the Supplemental Feed Routes is currently being developed and is scheduled for release in July 2007. The EA will evaluate environmental impacts and propose appropriate mitigation measures to avoid or reduce impacts to plants and wildlife, particularly listed species. Impacts to fish, plants, and wildlife will also be evaluated during state permitting process for in-water work and the stormwater permit.

5.2.1.7 Socioeconomics

Short-term impacts

The design and scope of individual projects would determine the levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty. Design, pre-construction, and construction activities would have impacts similar in nature to those associated with the proposed storage option. Job opportunities may be filled by local residents or in-migrants. Increased income earned locally would stimulate local sales of consumer goods and services. The degree of funding from outside sources would influence the extent to which costs are borne by Washingtonians.

Long-term impacts

The design and scope of individual projects would determine the levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty.

Mitigation

Adverse effects, if any, may induce affected parties to seek mitigation in the form of compensation or other measures.

5.2.1.8 Land and Shoreline Use

Short-term impacts

Each of the Supplemental Feed Routes under consideration would require a limited amount of construction that is not expected to cause any major disruptions to land uses along the routes or in the Potholes Reservoir or Moses Lake areas.

Long-term impacts

Rerouting water through any of the routes is not likely to significantly affect land use over the long term. However, increased availability of irrigation water could result in pressure to convert habitat areas to agricultural production. Providing a reliable water supply to the Potholes Reservoir would help to ensure that existing agricultural land uses served by that reservoir would continue.

Mitigation

No adverse land use impacts are expected and no mitigation is proposed.

5.2.1.9 Cultural Resources

Short-term impacts

Ground disturbance activities could result in short-term impacts to cultural resources. Impacts to cultural resources that may be present could occur at the location and in the vicinity of construction or improvements related to the selected Supplemental Feed Route and any new conveyance systems, as well as any staging areas. Possible impacts could occur to historic structures that might be present in the construction areas.

Long-term impacts

Long-term impacts to cultural resources could occur along Supplemental Feed Routes. Based on a cursory review of identified cultural resources and the lack of cultural resources investigations in the vicinity of the three alternatives, it is assumed that impacts would include adverse effects. Impacts could include year-round inundation of cultural resources that were formerly exposed during seasonal drought; alterations to historic structures related to the waterways; impacts from erosion and land development; and changes to soil chemistry.

Mitigation

Mitigation for any identified impacts would vary based the nature of the identified resource and the potential impact. Mitigation measures would be determined by Reclamation in consultation with DAHP, the affected tribes, and other interested parties during the NEPA Environmental Assessment process.

5.2.1.10 Transportation

Short-term impacts

Each of the Supplemental Feed Routes under consideration would require a limited amount of construction that is not expected to cause any major disruptions to transportation systems along the routes or in the Potholes Reservoir or Moses Lake areas. Some road and/or railroad crossings could be required, which could result in temporary delays or detours during construction.

Long-term impacts

None of the Supplemental Feed Routes would result in long-term transportation impacts. Periodic maintenance of crossings at roads and railroads would be required, and could generally be accomplished without disrupting traffic.

Mitigation

Mitigation for construction impacts on transportation systems would be similar to measures described in Section 4.1.1.

5.2.1.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

The construction required for the Supplemental Feed Route is not expected to cause major disruptions to recreation uses along the routes or in the Potholes Reservoir or Moses Lake areas. Minor effects on scenic resources due to construction activities, similar to those described in Section 4.1.1.11, would occur with any of the alternatives. These temporary impacts are not expected to be significant.

Long-term impacts

Providing a reliable water supply to the Potholes Reservoir would help to ensure that existing recreational uses, including Potholes Wildlife Area, Potholes State Park, and the reservoir itself, would have adequate water in the future. These areas are used for camping, swimming, boating, hunting, fishing, and other recreational purposes. These areas are also considered scenic resources.

Mitigation

Mitigation measures for impacts to recreation resources would be similar to those described in Section 4.1.1.11.

5.2.1.12 Public Services and Utilities

Short-term impacts

Each of the Supplemental Feed Routes under consideration would require some construction that is not expected to cause major disruptions to public services and utilities along the routes or in the Potholes Reservoir or Moses Lake areas. Some utility crossings, including water, sewer, and gas lines, could be required, which could result in temporary disruptions in service during construction.

Long-term impacts

None of the Supplemental Feed Routes would result in significant public services and utilities impacts in the long term. Irrigation districts and Reclamation would have to maintain and operate the Supplemental Feed Routes in the long term. However, all of the routes would reduce maintenance demands on the existing routes; so in the long term, overall maintenance costs may be similar to those of the current system.

Another objective of the Supplemental Feed Route project is to provide dependable water supplies while protecting against flood flows in the system. All of the proposed routes would accomplish these objectives to some degree, by allowing fall water levels at Billy Clapp Lake to

be lowered to better accommodate flood flows while still providing enough water to keep the reservoir full enough for summer use (Blanchard, personal communication, 2006). A dependable water supply would benefit the South Columbia Basin Irrigation District. By reducing flood risk, emergency services and repair work to public infrastructure would also be less likely to be needed in areas downstream from Potholes Reservoir than under current management practices.

Mitigation

Mitigation for construction impacts on public utilities would be similar to measures described in Section 4.1.1.12.

5.2.2 Comparison of Impacts for Alternative Routes

Table 5-1 compares the potential impacts of the proposed Supplemental Feed Routes. The table highlights the major differences in impacts of the three routes. The table also includes potential impacts that could occur in the receiving areas for the water—Moses Lake and Potholes Reservoir.

Table 5-1. Comparison of Impacts for Feed Route Alternatives and Receiving Areas

Element of the Environment	Crab Creek Route	W 20 Route	Frenchman Hills Route	Receiving Areas
Earth *Short-Term* *Long-Term* *Mitigation*	Includes construction or modifications to Brook Lake, Crab Creek and culverts at Stratford Road that would have construction related impacts. Increased flow in the natural stream channel may result in increased erosion	Includes construction of two miles of new conveyance to Moses Lake that would have construction-related impacts.	Improving the Frenchman Hills route would have construction-related impacts that are smaller and more localized than the W20 route.	Crab Creek route may result in increased sediment loading in Moses Lake. Same impacts from all three routes to Potholes Reservoir assuming construction related sedimentation is mitigated.
Air *Short-Term* *Long-Term* *Mitigation*	Minor construction would have short-term impacts similar to impacts described in 4.1.1. No long-term impacts to air are expected. Mitigation for short-term impacts would be similar to measures described in section 4.1.1.	Same as for Crab Creek Route, however, impacts would be greater in magnitude because construction is larger is scale. No long-term impacts are expected.	Same as for Crab Creek Route, but with few construction impacts.	No short- or long-term impacts to air are expected on air quality in the Moses Lake or Potholes Reservoir areas.
Surface Water *Short-Term* *Long-Term* *Mitigation*	Quantity. Additional flows would be delivered through Crab Creek which is a more natural channel than other alternatives; increased flow may cause erosion to stream channel. Quality. Increased erosion may increase sedimentation, which would impact surface water quality. No change in length of existing Crab Creek route so no expected water temperature increases. Possible decrease in temperature in Rocky Coulee Creek because of increased inputs of cool ground water from the additional infiltration from Crab Creek.	Quantity. Construction-related impacts would occur from construction of new siphon, improvement of canals and new outlet to Moses Lake from the W20 lateral. Quality. Route is longer than Crab Creek, but the use would end in mid-May and not occur in summer when temperature issues are most critical.	Quantity. Fewer construction-related impacts would occur than the other alternatives. Less impact to Moses Lake would occur. Quality. Route does not include Moses Lake and associated water quality problems. Longest route . but the use would end in mid-May and not occur in summer when temperature issues are most critical.	Quantity. More water would flow through Moses Lake in the spring with the Crab Creek and W20 alternatives. No change in flow in Moses Lake would occur for the Frenchman Hills alternative. Quality. Relative impacts to receiving areas would be based on the quantity and quality of the inflow associated with each route. Requires modeling or additional data to assess.
Ground Water *Short-Term* *Long Term* *Mitigation*	Possible increases in ground water recharge may increase shallow ground water levels along the route and in the vicinity of impoundments. Potential leaching of contaminants into the ground water. Additional ground water flow to Rocky Coulee Creek could be a source of cool water for the stream that could improve the stream's water quality. Mitigation could include conducting appropriate hydrogeologic studies and monitoring of potential ground water contamination from surface water.	Possible increases in ground water recharge may increase shallow ground water levels along the route and in the vicinity of impoundments. Potential leaching of contaminants into the ground water (channel is primarily unlined).	Possible increases in ground water recharge, which may increase the ground water levels along the route (channel is unlined). No ground water level increases through impoundments (no impoundments).	No impacts to ground water are anticipated.
Water Rights *Short-Term* *Long-Term* *Mitigation*	No changes to water rights would be required; therefore, no impacts are anticipated.	No changes to water rights would be required; therefore, no impacts are anticipated.	No changes to water rights would be required; therefore, no impacts are anticipated.	No changes to water rights would be required; therefore, no impacts are anticipated.

Element of the Environment	Crab Creek Route	W 20 Route	Frenchman Hills Route	Receiving Areas
Fish *Short-Term* *Long-Term* *Mitigation*	Existing aquatic resources should benefit with enhanced flow ranging between 40 and 60 cfs during June through March annually in middle Crab Creek and Rocky Ford Creek. This benefit could extend over approximately 35 miles of streambed between Brook and Moses Lakes. Flows in Crab Creek from 400 to 450 cfs during April and May will exceed the 2-year channel forming flow of 322 cfs at USGS gauging station #12467000 near Moses Lake, creating the potential for bed scour, bank erosion and channel realignment with adverse effects on early spring spawning fish species, increased magnitude and frequency of sediment yield and potential for water quality effects and sediment deposition.	No existing aquatic resources of concern would be affected.	No existing aquatic resources of concern would be affected.	Increased flow through Banks Lake may have an influence on primary and secondary productivity of the lake with associated changes in fish food webs. Flow fluctuations may also influence warmwater fish spawning along the shoreline. Increased bed and bank scour and sediment yield in the Crab Creek alternative has the potential to adversely influence water quality and sediment deposition in the upper section of Moses Lake with attendant effects on local aquatic species. No adverse influences of the Supplemental Feed routes are anticipated on aquatic species in Potholes Reservoir since lake elevations are forecast to rise less than 1 foot under the alternatives. Increased frequency of spill from the Potholes Reservoir into lower Crab Creek is possible with supplemental feed, but the rate will comply with existing limitations to spill and the end of month Potholes rule curve.
Wildlife and Plants *Short-Term* *Long-Term* *Mitigation*	Short-term impacts anticipated due to construction of conveyance lines. Long-term impacts include alteration of plant communities and wildlife habitats from arid habitats to riparian areas and wetlands.	Construction of new conveyance line between West Canal and Moses Lake would result in short-term noise and construction activity impacts to plants and wildlife. Long-term impacts would be habitat loss.	Minor short-term impacts anticipated. Long-term impacts are the same as the Crab Creek Route.	Long-term impacts could include the conversion of shrub-steppe and grassland habitats to agricultural uses and a shift in shrub-steppe associated wildlife species to generalist species.
Land and Shoreline Use *Short-Term* *Long-Term* *Mitigation*	Minor disturbances to land use could occur from construction. No long-term impacts to land use are anticipated.	Construction would require minor disturbances to land use in an area that is mainly non-irrigated shrub- steppe. No long-term impacts to land use are anticipated.	Minor construction is expected to be required along the existing canal and would not disturb adjacent land uses. No long-term impacts to land use are anticipated.	No short- or long-term impacts on land use are expected in the Moses Lake or Potholes Reservoir area.
Socioeconomics *Short-Term* *Long-Term* *Mitigation*	Final design and funding decisions would determine the levels of costs and benefits, impacts on jobs and income, distribution of costs and benefits, interactions with the socioeconomic structure, and levels of risk and uncertainty. Preliminary information indicates this alternative would have intermediate construction costs.	Preliminary information indicates this alternative would have the highest construction costs.	Preliminary information indicates this alternative would have the lowest construction costs.	Surface water would displace ground water used for irrigation. This could reduce, and perhaps reverse, depletion of ground water. Funding decisions will determine distribution of costs among water users and others. Reduction in users' costs will influence future feasibility of growing potatoes and other irrigated crops.
Cultural Resources *Short-Term* *Long-Term* *Mitigation*	Short-term impacts are anticipated to be moderate because of required construction modifications. Long-term impacts may include adverse effects to cultural resources because the stream would flow year-round	Short-term impacts are anticipated to have moderate to high potential to adversely affect cultural resources because this option would require construction of a new conveyance system. Long-term impacts	Short-term impacts are anticipated to be the lowest of all alternatives since the only construction proposed is expansion of existing road culverts. Long-term impacts would be similar to other alternatives but	Short-term impacts in the Potholes Reservoir area are anticipated to be low since the level of the reservoir would be within normal reservoir operations. A more reliable water supply may encourage crop

Element of the Environment	Crab Creek Route	W 20 Route	Frenchman Hills Route	Receiving Areas
	increasing the potential for erosion, changes in vegetation, and changes in land development. Mitigation measures should be identified during project-level environmental review.	would be less likely to include adverse effects because the canal system would minimize ongoing impacts to buried cultural deposits. It may be feasible to locate new construction to avoid cultural resources.	may be greater due to the length of the route and because the route is composed of undefined channels and pothole lakes which may have cultural resources associated with them.	diversification in the area south of Potholes Reservoir. Planting orchards and plowing could affect cultural resources.
Transportation *Short-Term* *Long-Term* *Mitigation*	Construction would be required at Stratford Road to improve culverts. Temporary traffic disruptions could occur.	Improvements to the Naylor Siphon could require construction under State Route 28 and BNSF railroad tracks, which could cause temporary traffic delays.	Minor construction for this route would include modifying two existing road crossings, which could result in traffic delays.	No short- or long-term transportation impacts are expected in the Moses Lake or Potholes Reservoir areas.
Recreation and Scenic Resources & Aesthetics *Short-Term* *Long-Term* *Mitigation*	The additional flows could benefit recreational users if they are also managed to enhance habitat value, such as for bird watching, hunting or fishing.	No impacts to recreation are anticipated.	The Frenchman Hills route would include only minor construction to improve crossings of the canal under roads. This route would deliver water to the west side of Potholes Reservoir in the Potholes Wildlife Area, which could enhance that area for recreational users by improving habitat value.	Providing a reliable water supply to the Potholes Reservoir would help to ensure that existing recreational uses, including the Potholes Wildlife Area, Potholes State Park, Desert Wildlife Area, and the reservoir itself, would continue to have adequate water in the future. These areas are also considered scenic resources, and could be enhanced by additional water supplies.
Public Services & Utilities *Short-Term* *Long-Term* *Mitigation*	Because the Crab Creek route is a natural drainage route, erosion could be more than under other alternatives, requiring higher maintenance costs. This route and the W20 route would provide the highest level of flood risk protection (Blanchard, personal communication, 2006).	The W20 route would have the highest initial costs, which would be borne by the irrigation districts and/or federal and state agencies. This route and the Crab Creek route would provide the highest level of flood risk protection (Blanchard, personal communication, 2006).	This route would provide better flood risk protection than the current routes, but slightly less protection than the W20 route or the Crab Creek route. (Blanchard, personal communication, 2006)	South Columbia Basin Irrigation District would benefit from a more dependable water supply from Potholes Reservoir.

5.3 Columbia-Snake River Irrigators Association Voluntary Regional Agreement

The Columbia-Snake River Irrigators Association (CSRIA) has submitted a draft VRA to Ecology. The CSRIA proposes to undertake conservation and other measures to create new sources of conserved water that can be used for new uninterruptible water rights on the Columbia River and lower Snake River (see Section 2.6.3). The draft VRA does not include specific projects, but proposes a framework for transferring saved water to the Trust Water Rights Program and allocating new water rights to CSRIA members. Implementation of some conservation projects may require additional environmental review. The impacts associated with those projects are expected to be similar to the impacts described in Chapter 4. This section discusses the potential impacts to water rights that would occur if the VRA were approved by Ecology.

Implementation of the agreement could stimulate farmers' adoption of agricultural best management practices, reducing pollutants in farm runoff and expanding streamside vegetation. These changes could increase fish populations and the supply of other ecosystem goods and services associated with improved quality of water in streams and aquifers. Funding for conservation and concerted efforts to promote adoption of best management practices could reduce farmers' perceptions of the risks and uncertainties associated with the adoption of conservation technologies and practices. Adoption of conservation technologies and practices may increase net earnings of some farmers (Schaible 2000).

The objective of the VRA filed by the CSRIA is to obtain new water rights, referred to as "supplemental drought permits," for their members who have interruptible water rights. Under the VRA, CSRIA would use best management practices to improve efficiency and would transfer the saved water to Ecology. Members seeking supplemental drought permits would submit information to Ecology to enable Ecology to "recalibrate" the water rights, if necessary, to reflect actual beneficial use.

The VRA appears to address potential impacts to existing water rights by providing that "[m]itigation through water savings resulting from water efficiency practices, or other means, must accrue either before or at the same time that water use under the supplemental drought permit occurs." The VRA also acknowledges that Ecology is bound by the *Hillis* Rule, WAC 173-152-050, in processing water right applications and that applicants may speed up processing by entering into a cost reimbursement agreement with Ecology (RCW 90.03.265).

The VRA proposes to add a new meaning to "municipal supply purpose." On page 3, the VRA states: "A municipal supply purpose shall also mean any requirements to meet mitigation conditions in an existing municipal water right permit."[4] This suggested meaning must be read against the definition of "municipal supply purpose water right" in RCW 90.03.015. If an entity holds a municipal supply purpose water right, then:

[4] It is not clear what the CSRIA means by this statement. The definition of "municipal supply purpose" is written in terms of types of beneficial uses of water. Therefore, it makes sense to read the sentence in the VRA as meaning any beneficial use of water required to meet mitigation conditions in an existing municipal water right permit.

> . . . any other beneficial use of water under the right generally associated with the use of water within a municipality is also for "municipal water supply purposes," including, but not limited to, beneficial use for commercial, industrial, irrigation of parks and open spaces, institutional, landscaping, fire flow, water system maintenance and repair, or related purposes. If a governmental entity holds a water right that is for the purposes listed in (a), (b), or (c) of this subsection, its use of water or its delivery of water for any other beneficial use generally associated with the use of water within a municipality is also for "municipal water supply purposes," including, but not limited to, beneficial use for commercial, industrial, irrigation of parks and open spaces, institutional, landscaping, fire flow, water system maintenance and repair, or related purposes (RCW 90.03.015). (Emphasis added.)

The "including, but not limited to" language appears to allow for inclusion of additional purposes and it would be within Ecology's discretion to include the purpose identified by CSRIA.[5]

The CSRIA VRA would have the same potential impacts as those of any VRA under RCW 90.90.030. Consultation would occur only on the VRA in general, but not on specific water right applications. Impacts may result from the presumption in RCW 90.90.030(3) that protecting instream flows during July and August in the Columbia River and during April through August in the Snake River is adequate mitigation for new water rights under a VRA.

5.4 No Action Alternative

Under the No Action Alternative for the Lake Roosevelt drawdown, no additional drawdown of Lake Roosevelt would occur. Water for municipal/industrial supply and streamflow enhancement would continue to be limited during non-drought years. No surface water would be provided to the Odessa Subarea to reduce ground water withdrawals. During drought years, interruptible water rights would not be met and streamflows would not be augmented. Under the No Action Alternative for the Supplemental Feed Route, feed water would continue to be supplied through the East Low Canal and the delivery system and reliability would not be improved. Under the No Action Alternative for the CSRIA VRA, Ecology would not process the VRA. For each of the early actions, other programs could be implemented to address the water allocation problems.

[5] The law provides further that:

Beneficial uses of water under a municipal water right may include water withdrawn or diverted under such a right and used for: (1) Uses that benefit fish and wildlife, water quality, or other instream resources or related habitat values; or (2) Uses that are needed to implement environmental obligations called for by a watershed plan approved under Chapter 90.82 RCW, or a comprehensive watershed plan adopted under RCW 90.54.040(1) after September 9, 2003, a federally approved habitat conservation plan prepared in response to the listing of a species as being endangered or threatened under the federal endangered species act, 16 U.S.C. Sec. 1531 *et seq.*, a hydropower license of the federal energy regulatory commission, or a comprehensive irrigation district management plan (RCW 90.03.550).

5.4.1.1 Earth

Short-term impacts

The No Action Alternative will not impact earth and earth resources. The alternative implies no construction activities and thus no earth disturbances, no new roads for new canals or storage impoundments, and no consumption of earth resources (i.e., gravel, sand, concrete).

Long-term impacts

The No Action Alternative will cause minimal impacts to earth. No new storage projects will be required to impound the increased water for municipal or industrial end users and thus construction impacts are unlikely. The construction required for the Supplemental Feed Route project would not occur and thus would not impact earth.

Mitigation

No earth impact mitigation will be necessary under the No Action Alternative.

5.4.1.2 Air

Short-term impacts

Under the No Action Alternative, short-term air quality impacts from construction associated with the early actions would not occur. Communities would not receive new water supplies from the Lake Roosevelt drawdown; therefore, there would be fewer construction impacts to air associated with such development.

Long-term impacts

Localized dust generation may increase if extended drought conditions occur.

Mitigation

No mitigation would be required for the No Action Alternative because no impacts to air would occur.

5.4.1.3 Surface Water

Short-term impacts

No short-term impacts on water quantity would result from the No Action Alternative.

The No Action Alternative short-term impacts on surface water quality are likely to be similar to the long-term impacts on surface water quality.

Long-term impacts

The No Action Alternative will not impact the surface water quantity or quality at Lake Roosevelt. The contaminant concentrations will likely remain the same and continue to be affected by the quality of the inflow and rate of outflow.

Mitigation

No mitigation of surface water quantity or quality impacts would be required under the No Action Alternative.

5.4.1.4 Ground Water

Short-term impacts

Under the No Action Alternative, the ground water levels around Lake Roosevelt will continue to be affected by the drawdown for flood control.

Long-term impacts

Under the No Action Alternative, no construction of new storage or conveyance facilities would occur. Ground water levels would not be reduced by construction dewatering.

Ground water levels in the Odessa Subarea would likely continue to decrease at approximately the same rate that they do today if surface water sources are not brought to Odessa to replace some ground water withdrawals. Ground water direction will not be further affected by the Potholes Reservoir.

Mitigation

No mitigation of ground water impacts would be required under the No Action Alternative.

5.4.1.5 Water Rights

Short-term impacts

If no additional drawdown of Lake Roosevelt occurs, there would be less water available for instream flow, municipal/industrial users, and interruptible water rights. If the CSRIA VRA is not implemented, new water rights for the interruptible water right holders would be subject to case-by-case consultation. There would be no automatic decision protecting the Columbia and Snake Rivers from impacts to instream flow during months identified as fish-critical as adequate mitigation for new water rights.

Not implementing the VRA may result in the possible loss of conserved water, although conservation can occur outside of a VRA. Ecology would lose the opportunity to examine the extent and validity of the water rights of the irrigators unless they apply for a water right change. Interruptible water rights would remain, subject to independently finding new water and providing mitigation for use of the water right without interruption during times of low flow.

Long-term impacts

Long-term impacts to water rights of no additional drawdowns of Lake Roosevelt or of not implementing the VRA would be the same as short-term impacts.

Mitigation

Appropriate mitigation for any impacts to water rights would be determined through Ecology's existing water rights approval processes.

5.4.1.6 Fish, Wildlife, and Plants

Short-term impacts

Fish. Under the No Action Alternative, no short-term impacts to aquatic resources would occur.

Wildlife and Plants. If no Supplemental Feed Route were implemented, plants and wildlife along the W20 Canal and Crab Creek Routes would not be impacted by noise and construction.

Long-term impacts

Fish. If the Lake Roosevelt drawdown were not implemented, no additional water would be available to supplement instream flows in the mainstem Columbia River downstream of Grand Coulee Dam. No long-term impacts to aquatic resources are anticipated as a result of not implementing the Supplemental Feed Route project.

Wildlife and Plants. If there were no additional drawdown of Lake Roosevelt, no related additional risk to nesting waterfowl or breeding amphibians such as spotted frog would occur. Reservoir operation would continue under existing schedules, and impacts to plants and wildlife due to annual drawdowns would continue to occur as described in Section 5.1.1.6. No additional water would be supplied to Crab Creek that could alter the vegetation communities within the corridor.

Mitigation

No mitigation to aquatic resources is required for the No Action Alternative.

5.4.1.7 Socioeconomics

Short-term impacts

Implementation of the No Action Alternative may stimulate short-term market responses, as it would induce irrigators and others to reverse decisions based on anticipation that the early actions would be implemented. Anticipation that the early actions would enable farms in the Odessa Subarea to receive surface water and avoid the high costs of pumping ground water, for example, may have persuaded the farmers to continue farming even while experiencing financial losses. However, a decision not to increase surface water supplies may induce farmers to cease their operations. Anticipation that the Voluntary Regional Agreement proposed by the Columbia Snake River Irrigators Association would boost the demand for conservation technologies could raise the market value of firms that sell the technologies, but a decision not to implement the agreement may lower their value.

Offsetting impacts may also occur. Anticipation that new surface water supplies would sustain the production of potatoes and other irrigated crops in the Odessa Subarea may have caused farmers elsewhere to plan to curtail their future production, for example, but a decision not to provide new water supplies in the Subarea might persuade them that production in the Odessa Subarea will fall and induce farmers elsewhere to initiate plans to expand their production to fill the gap.

Long-term impacts

The specific responses of private parties and public agencies to a decision not to implement the early actions would determine the levels and distribution of costs and benefits, impacts on jobs and income, interactions with the socioeconomic structure, and levels of risk and uncertainty. Without any other activity to provide surface water to the area, farmers in the Odessa Subarea would continue to experience rising costs of pumping ground water, which would diminish the feasibility of irrigation, especially for water-intensive crops. As the costs of pumping ground water rise, or if supplies become exhausted, some irrigators would shift to crops that require less water or cease operations entirely. Bhattacharjee and Holland (2005) estimated that, if declining water supplies caused the entire annual production of potatoes in the Odessa Subarea to cease and the economy did not adjust, the surrounding counties would lose $179 million in sales, 1,136 jobs, and $54 million in income. They also found that, if the loss of potato production induced the potato-processing industry to close and the economy did not adjust, the total impacts would be more than three times as great. They observed, however, that these worst-case scenarios would not materialize if only some farmers in the Subarea stopped producing potatoes, if farmers in the Subarea shifted to less water-intensive crops instead of potatoes, or if farmers outside but near the Subarea increased their production of potatoes for processing by plants inside the Subarea. Any overall decline in the production of potatoes and other crops would likely result in higher prices throughout regional and statewide markets.

Future droughts, similar to recent ones, could trigger responses by private parties and public agencies similar to those implemented in recent years. Long-run shortages of water, however, could trigger different responses. Irrigators might shift from growing water-intensive crops to those that require less irrigation or even to dryland farming. Some land may become infeasible to farm and be retired from the agricultural base.

Continuation of current flow regimes below Lake Roosevelt would extend current risks and uncertainties regarding fish populations and other flow-related issues.

Mitigation

Future droughts would trigger demands for mitigation programs and practices such as those that have addressed economic concerns during past droughts. Long-term water shortages may stimulate demands for emergency assistance, such as subsidized loans to promote the adoption of water conserving technology by irrigators and municipal/industrial users. Long-term mitigation also might include increased efforts to expand the economic opportunities for residents and businesses in water-short areas. Such efforts might include, for example, improvements in transportation infrastructure to increase the access of businesses and workers in water-short areas to new economic opportunities in nearby areas.

Future concerns about salmon, steelhead, and other at-risk species would extend current demands for compensatory and corrective actions.

5.4.1.8 Land and Shoreline Use

Short-term impacts

Under the No Action Alternative, none of the minor short-term impacts to land use from construction of the Supplemental Feed Routes would occur. No other short-term impacts would be expected.

Long-term impacts

If additional water supplies are not provided in the Odessa Subarea, potato farming could cease on farms where the cost of pumping ground water becomes too high. This could result in conversion to less water-intensive crops, dryland farming, or even to retiring some land from agricultural production (see Section 5.4.1.7, Socioeconomics) Crop conversion on land zoned for agriculture would be consistent with goals for preserving agricultural land.

The effects of not implementing the early actions would be similar to those described in Section 4.2.1.8.

Mitigation

Mitigation for land use impacts under the No Action Alternative would be provided by compliance with local plans and regulations.

5.4.1.9 Cultural Resources

Short-term impacts

No additional short-term impacts to cultural resources are anticipated under the No Action Alternative.

Long-term impacts

No additional long-term or operational impacts to cultural resources are anticipated under the No Action Alternative.

Mitigation

Because no additional impacts to cultural resources are anticipated, no additional mitigation measures would be necessary under the No Action Alternative.

5.4.1.10 Transportation

Short-term impacts

No short-term impacts are expected if the early actions are not implemented, since none of the associated construction would occur.

Long-term impacts

If the drawdowns at Lake Roosevelt were not implemented, current trends in traffic and transportation demand would continue. Not implementing one or more of the Supplemental Feed Routes would have no effect on transportation systems over the long-term.

Mitigation

No mitigation would be required for this alternative.

5.4.1.11 Recreation and Scenic Resources and Aesthetics

Short-term impacts

None of the direct construction-related impacts associated with the early actions would occur.

Long-term impacts

Water supplies from the early actions would not be provided to the receiving areas, and water levels at Lake Roosevelt would remain at their current range during summer months.

Mitigation

There are no impacts expected to recreation and scenic resources that would need to be mitigated if the Lake Roosevelt drawdowns were not implemented. The Supplemental Feed Routes that are currently used to feed Potholes Reservoir would continue to be used, and as long as they remain reliable no mitigation would be required for recreation and scenic resources.

5.4.1.12 Public Services and Utilities

Short-term impacts

Costs associated with construction of infrastructure to deliver water from the Lake Roosevelt drawdowns and the Supplemental Feed Route would not be incurred.

Long-term impacts

Municipal water supplies would not receive the water from the Lake Roosevelt drawdowns, which could limit their ability to accommodate expected growth in demand for water and water treatment.

Under the No Action Alternative, current maintenance costs would continue, which could affect long-term costs to irrigation districts. Risks of flooding from the current operation would continue, which affects emergency service providers in the area downstream from Potholes Reservoir.

Mitigation

Municipal water suppliers would need to find new water supplies to accommodate growth in their service areas, and could be assisted by existing Ecology programs.

5.5 Cumulative Impacts

The cumulative impacts of the early actions proposed under the Management Program would be similar to those described for the Management Program in Section 4.3. Funding used for the early actions would not be available for other social needs or for other areas of the state or region.

Although the proposed Lake Roosevelt drawdown is considered to be within the normal operations of the reservoir, prolonged additional drawdowns could compound the impacts of drawdowns to fish and wildlife, cultural, recreation, and other resources. Potential cumulative impacts to fisheries are described in Section 5.1.1.6. Furthermore, increased release from Lake Roosevelt could potentially affect total dissolved gas levels. These should be considered along with the cumulative impacts to total dissolved gas levels resulting from Canadian operations.

Water diverted to the Odessa Subarea would reduce ground water withdrawals in that area, but would not be available for other downstream uses, including instream flows and hydropower generation. Improved water reliability may cause farmers to change cropping practices in the Odessa Subarea, but is not intended to expand irrigated acreage in the Odessa Subarea. Water rights holders with interruptible water rights who receive a more reliable water supply could also change cropping practices and could expand irrigation. This could have additional impacts on the remaining shrub-steppe habitat in the project area. Improved municipal/industrial water supplies could cause expanded residential or industrial development.

The Supplemental Feed Route may provide increased water reliability for irrigators in the South Columbia Basin Irrigation District. These farmers may also change crops. The increased flexibility will allow Reclamation to use the East Low Canal for additional uses, including possible deliveries to the Odessa Subarea.

If state funding were used for conservation or storage projects under the Columbia-Snake River Irrigators Association VRA, that state money would not be available for other public uses in the state.

Ecology would minimize potential cumulative impacts of the early actions by continuing to coordinate with tribes and local, state and federal agencies. Any development that occurs as a result of more reliable water supplies would comply with local planning and zoning regulations. Ecology has determined that the early actions will require future threshold determinations under SEPA Ecology has determined that a Supplemental EIS will be prepared on the Lake Roosevelt Drawdown Project. Reclamation is preparing a NEPA EA for the Supplemental Feed Route Project. Ecology will develop an Implementation Plan for the CSRIA VRA that will be subject to SEPA review. In addition, specific projects proposed to implement the CSRIA VRA may also require SEPA and/or NEPA review. The additional environmental review will be used to refine impacts analysis, avoid impacts, and identify appropriate mitigation.

CHAPTER 6.0 POLICY DISCUSSION

6.1 Description and Analysis of Policy Alternatives for Implementing the Management Program

The Columbia River Management Act includes new policies for managing water in the Columbia River Basin. It establishes a new mandate for Ecology to "aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses." The new directive requires Ecology to develop new policies and guidelines. Some of the policies established in the Columbia River Management Act need additional definition to facilitate implementation and to resolve potential conflicts with existing policies. Ecology is proposing the policy alternatives presented in this chapter to help define how it would implement the Management Program.

For all policy alternatives, the underlying statutory requirements for Ecology to approve a new water right or change of water right remain the same. Ecology may not approve a new water right or a change of water right if detriment or injury to existing water rights would result (RCW 90.03.290(3) and 90.03.380).

The policy alternatives are outlined in Section 2.2. This chapter contains additional description of the policy alternatives and a discussion of the implications of each of the policy alternatives.

The policy alternatives considered within the proposal are primarily alternatives for how Ecology will process and implement the components of the Management Program. Many of these alternatives would have a limited impact on the natural or built environment. The primary impacts would be related to how water rights would be processed and how funding would be distributed to proposals. Chapters 4 and 5 include discussion of the impacts on the elements of the environment from projects proposed under the Management Program. Therefore, the impacts of policy alternatives on each element of the environment are not being evaluated in this chapter of the programmatic EIS.

6.1.1 Definitions

Based on comments received on the Draft EIS, Ecology has developed the following definition of terms used in the Columbia River Water Management Act:

"**Conservation**" means a reduction in the volume and/or rate of water diversion required to accomplish a beneficial use.

"**No negative impacts**" means no reduction in the flow of the mainstem Columbia River on a weekly basis during a period when flows are inadequate to provide for existing water rights or the preservation of wildlife, fish, scenic, aesthetic, other environmental values, and navigational values.

"Pool" means a reach of the Columbia or Snake River mainstem inundated and under the downstream hydraulic control of one of the US Corps of Engineers, Bureau of Reclamation, or mid-Columbia Public Utility District (PUD) dams.

"**Voluntary Regional Agreement**" (VRA) means a contractual agreement between Ecology and a group of water users in a defined geographic area within the Columbia River basin.

6.1.2 Selecting Water Supply Projects

Ecology's role in state water management has traditionally been one of regulation and permitting. The Columbia River Water Management Act adds to this traditional role by requiring the agency to "aggressively pursue" water supply development. Ecology currently plays some role in water supply development for instream flows and out-of-stream uses, but the legislation has "ramped up" this role by requiring that Ecology take an aggressive role in water supply development. All of the policy alternatives addressing selection of water supply projects presented in this programmatic EIS relate to how aggressively Ecology will pursue projects. This first policy alternative frames the discussion by defining "aggressively." Two alternatives were proposed:

> **Review projects only as proposed by applicants**. Water supply projects would be reviewed only as proposed by applicants, and screened and ranked by criteria developed by Ecology, including cost effectiveness, fisheries benefits, and other criteria.
>
> **Aggressively pursue water supply options.** In addition to reviewing projects proposed by applicants, Ecology would aggressively pursue water supply options (e.g., use watershed plans to identify and pursue smaller storage options; purchase stored water in Idaho and/or Canada; consider buying or negotiating changes in operations of existing federal facilities; conduct studies for ASR or passive ground water recharge; and promote small scale projects that benefit small landowners), including water acquisition and conservation projects.

Under the first alternative, Ecology would review only projects proposed by applicants. Under the second alternative, in addition to receiving proposals, Ecology would "aggressively pursue" water supply projects. The first alternative would not fully meet the goal of "aggressively pursuing" water supply options. Ecology would maintain its existing role as a regulating and permitting agency and would manage the grants and/or loans necessary to distribute and manage the funding. Under the second alternative, Ecology would take a more proactive role in water management by pursuing projects independent of those proposed by applicants. The second alternative would better meet the goals of the Columbia River Water Management Act.

Preferred Alternative: Ecology will actively pursue the most cost-effective and beneficial methods to meet the future water supply needs of the Columbia River basin. Both large and small water supply projects will be evaluated and considered. First, Ecology will continue to fund studies designed to identify large off-channel storage projects that would serve multiple water supply purposes and benefit both public and environmental water needs. Second, Ecology will work to identify other, likely smaller, water supply opportunities that might substitute for, or

complement, new large off-channel storage. Opportunities include: using watershed plans to identify and pursue smaller storage projects; purchasing stored water in Idaho and/or Canada; buying or negotiating changes in operations of existing federal facilities to provide additional water when and where it is needed; aquifer storage and recharge; passive ground water recharge; and other water conservation and acquisition projects.

6.1.3 Calculating Net Water Savings from Conservation

The Columbia River Management Act provides that net water savings from conservation projects shall be placed in the Trust Water Rights Program (Trust Program): "net water savings achieved through conservation measures funded by the account shall be placed in trust in proportion to the state funding provided to implement the project" (RCW 90.90.010(4)). Integration of the Act with the existing Trust Program results in two central questions—1) what conservation projects can be considered and 2) how will conservation savings be calculated?

First, although the effective date of the Act is July 1, 2006, the Act directs Ecology to manage savings from conservation projects in the Trust Program. There are many ways that water rights can be managed in the Trust Program, including through donation and acquisition. Although statutory differences exist in RCW 90.42 on how trust water savings will be calculated, in general, such savings must be derived from a valid water right and in the case of donation, may be limited to the amount beneficially used within the last five years. In order to maximize conserved water under the Act and fully integrate the Act with the Trust Program, Ecology will consider any conservation project that meets the requirements of the Act and the Trust Program, including projects that were implemented prior to July 1, 2006, but are not currently managed within the Trust Program.

Second, neither the term "net water savings" nor the method for calculating it is defined in the Columbia River Management Act. Ecology considered two alternatives for calculating net water savings.

> **Use Guidance-1210 methodology**. Net water savings methodology would be defined by rule, primarily based on existing guidance in Guidance-1210[1] (Ecology 2005), which establishes Ecology's approach for determining irrigation efficiency and consumptive use of water.
>
> **Develop and use a methodology incorporating scientific evidence on the benefits of the net water savings to instream flows**. Net water savings methodology would be developed based on scientific evidence regarding the benefits to instream flows. The methodology could include any credible approach that addresses the fate, pathway, timing, and legality of the water transfer being proposed.

[1] The Guidance 1210 methodology can be obtained on Ecology's web site at: www.ecy.wa.gov/programs/wr/rules/images/pdf/pol1210r.pdf

The term "net water savings" is defined for purposes of the Trust Program:

> "Net water savings" means the amount of water that is determined to be conserved and usable within a specified stream reach or reaches for other purposes without impairment or detriment to water rights existing at the time that a water conservation project is undertaken, reducing the ability to deliver water, or reducing the supply of water that otherwise would have been available to other existing water uses (RCW 90.42.020(2)).

A trust water rights statute specific to the Yakima Basin defines the term similarly:

> "Net water savings" means the amount of water that through hydrological analysis is determined to be conserved and usable for other purposes without impairing existing water rights, reducing the ability to deliver water, or reducing the supply of water that otherwise would have been available to other water users RCW 90.38.010(2)).

The common factors in the definitions are that the saved water must be available for use for other purposes without impairment to existing water rights, without reducing the ability to deliver water, and without reducing the water supply that would have otherwise been available. These criteria can, under most circumstances, be met by considering as "net water savings" only the portion of the quantity saved that has been consumptively used.

Ecology's Guidance-1210 includes several alternative methods for quantifying the consumptive use portion of a water right using either project specific data or empirical data for similar irrigation situations. It may also be useful to analyze the fate (in addition to the quantity) of deep percolation and other non-consumptive elements of the farm water budget to fully understand the benefits to instream flows. The advantages of the first alternative (rulemaking) include certainty to applicants on how calculations of water savings will occur and parity amongst water users subject to individual project conditions. The advantage of the second alternative (any credible scientific approach) is flexibility in selection of methods for calculating saved water.

> Example #1. Adoption of Ecology guidance in rule would likely result in a standardized state methodology for calculating evapotranspiration (ET) consistent with USDA and NRCS standards. Calculation of ET is often the portion of beneficial use under the water right which can be protected instream in the Trust Water Rights Program. Selection of the second alternative would allow any one of more than 50 ET equations to be used to determine saved water.

> Example #2. Adoption of Ecology guidance in rule would identify a hierarchy of information that, if available, should be used in calculating water saved by multiple methods. These could include source metering data, power metering records, run-time information, aerial photography review, production records and other sources of information. Selection of the second alternative would allow any credible source of data to be used in calculating conserved water, but would not necessarily rank one methodology over another for any given project.

Preferred Alternative: Ecology will use GUID-1210 (a 2005 Ecology guidance document that establishes Ecology's approach for determining irrigation efficiency and consumptive use of water) for calculating net water savings. Ecology may, if required by RCW 34.05, propose a rule that adopts the GUID-1210 methodology as the basis for calculating consumptive use and net water savings.

6.1.4 Funding Criteria for Conservation Projects

The Columbia River Water Management Act directs Ecology to aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses. The Act specifies that two-thirds of the funding in the Columbia River Water Supply Development Account (Account) be spent on storage projects and establishes a specific standard for spending funds associated with storage projects funded from the Account. Two-thirds of the new water is allocated to out-of-stream use and one-third is allocated to instream flows. The Act does not provide similar policy direction for 1) funding of conservation projects or 2) the criteria by which conservation projects will be screened and ranked.

The Act provides that the remaining one-third of the funds from the Account be "used for other purposes in this section," which includes conservation. Net water savings from conservation are to be placed in the Trust Program, but the Act does not specify how the water in Trust Program is to be used (RCW 90.90.010(2)(b), (4)). Ecology is considering three alternatives for funding and allocating new water that results from conservation projects.

> **Funding projects to benefit only out-of-stream water allocation.** Any net water savings derived from funds that Ecology spends for conservation projects would be assigned to mitigate for permits authorizing out-of-stream beneficial use. Net water savings would not benefit instream flows in the Columbia River, but could benefit tributaries depending on the source of conserved water.
>
> **Funding projects to benefit only instream flows and water quality.** Under this allocation proposal, net water savings from funded conservation projects would be used to benefit instream flows and water quality in the Columbia River as well as tributaries, if applicable.
>
> **Funding projects to obtain one-third of the benefit to instream purposes and two-thirds to benefit out-of-stream water allocation.** Net water savings derived from funding conservation projects would be assigned to benefit both instream flows and out-of-stream uses on the Columbia River. One-third of the net water savings would be managed in the Trust Water Rights Program to benefit Columbia River instream flows and two-thirds would be assigned to mitigate for out-of-stream beneficial uses authorized by permits that would be issued under the program.

The Act provides that net water savings achieved through conservation funded by the account will be placed into the Trust Program in proportion to the state funding provided for the project. The Act does not say for what purposes the water placed in the Trust Program may be used. Under the first alternative, the benefit (net water savings) assigned to the Trust Program would be for out-of-stream water allocation, not instream flow. The second alternative would do the

opposite, i.e., all water transferred to the Trust Program from conservation savings would be allocated to achieve instream flow and water quality benefits. Neither alternative appears to be consistent with the findings of the legislature in enacting the Columbia River Water Management Act. The legislature found "a key priority of water resource management in the Columbia River basin is the development of new water supplies that includes storage *and* conservation in order to meet the economic and community development needs of people *and* the instream flow needs of fish" (RCW 90.90.005(1)) (Emphasis added).

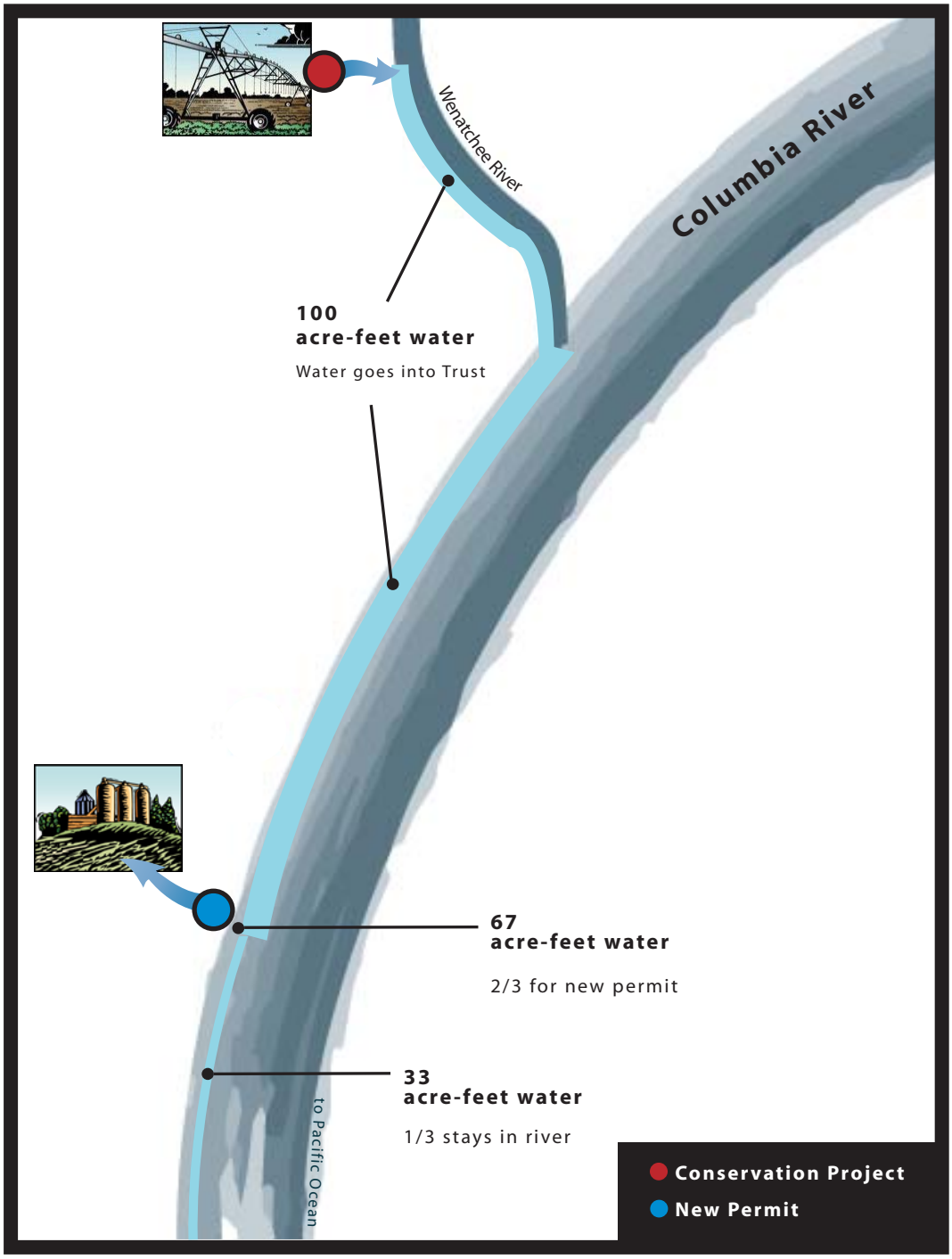
Under the third alternative, money would be spent and resulting benefit assigned on a basis other than 1:1 for out-of-stream and instream uses. Assigning two-thirds of the saved water for out-of-stream uses and one-third for instream flow would be consistent with the ratio for storage projects (RCW 90.90.020(1)(a)). However, since the legislature did not expressly provide such a ratio as it did for storage, this decision appears to be within Ecology's discretion.

> Example #1. Ecology funds a conservation project in the Wenatchee River Basin that results in 100 acre-feet of water being managed in the Trust Program. Under the first alternative, trust water benefit would only occur in the Wenatchee River and the full 100 acre-feet would be used to offset a future appropriation of water from the Columbia River. Under the second alternative, the full 100 acre-feet would benefit both the Wenatchee River and the Columbia River. Under the third alternative, the full 100 acre-feet would benefit the Wenatchee River, 33 acre-feet would benefit the Columbia River and 67 acre-feet would be used to offset a future appropriation of water from the Columbia River (see Figure 6-1).

The Act also does not describe how conservation projects will be screened and ranked for funding. Even before the Act became effective, Ecology began receiving inquiries on whether different projects would be eligible for funding under the program. Through this Programmatic EIS process and with input from Ecology's Columbia River Policy Advisory Group[2] (PAG), Ecology will develop funding criteria and a screening and ranking process. Ecology will also decide whether to include funding criteria in future rule-making efforts or whether guidance will be developed on the funding program. The flowchart in Figure 6-2 illustrates how such a funding program could work.

Preferred Alternative: Net water savings derived from funding conservation projects will be assigned to benefit both instream flows and out-of-stream uses on the Columbia River. Projects would be qualified and then ranked by the magnitude and significance of the instream and out-of-stream benefits expected. In-kind contributions and cost-sharing by applicants will be among the criteria to be developed by Ecology.

[2] For information on the Columbia River Policy Advisory Group, see Ecology's web page at: http://www.ecy.wa.gov/programs/wr/cwp/crwmp_info.html



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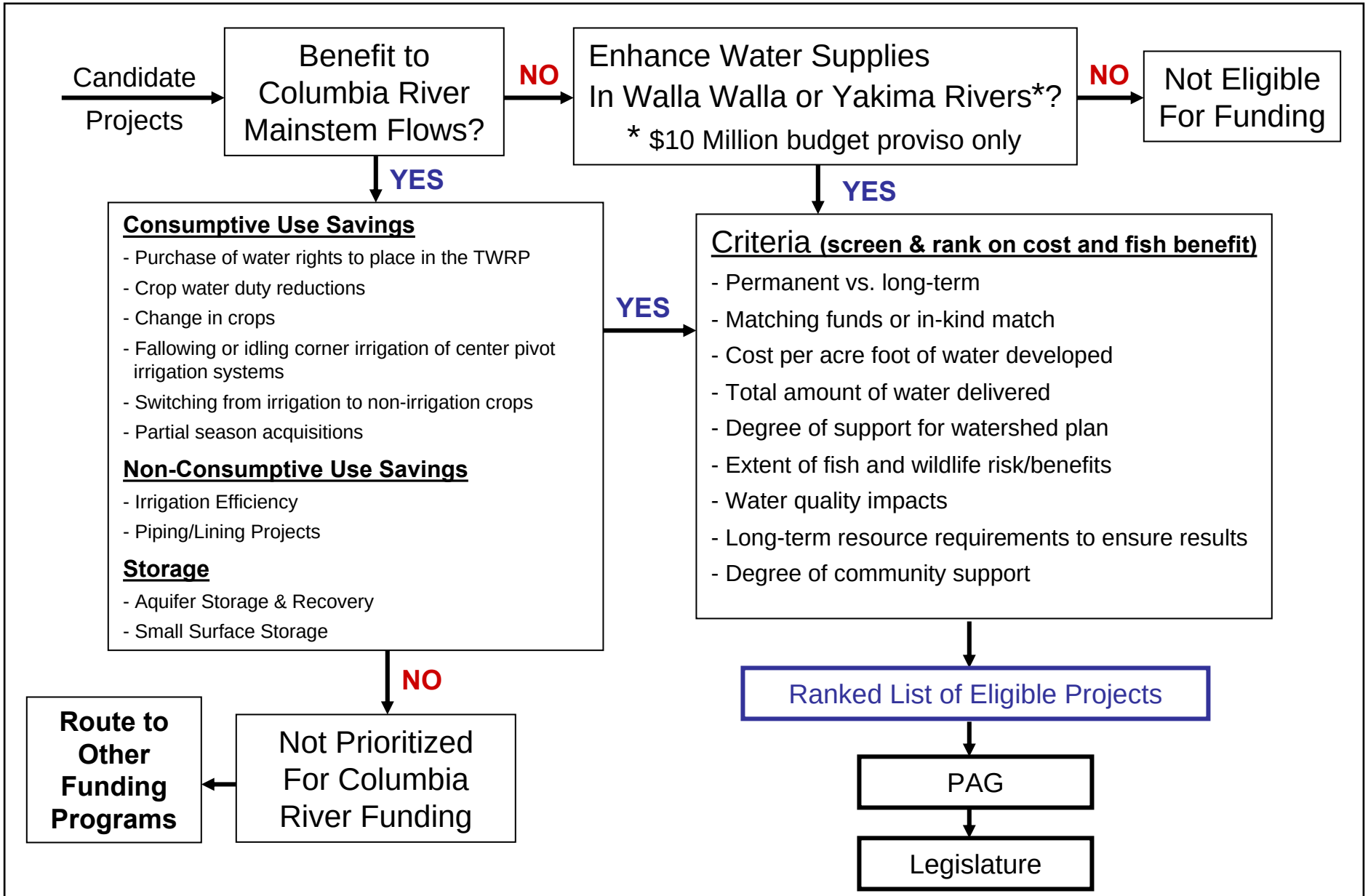
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SOURCE:

FIGURE 6-1

EXAMPLES OF FUNDING CRITERIA APPLICATIONS

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON



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FIGURE 6-2

DRAFT COLUMBIA RIVER PROJECT EVALUATION

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Ecology will ensure the expected project benefits are realized in two ways. First, if conservation projects are funded on tributaries, water savings will be assigned solely to instream flow benefit within the tributary stream down to the confluence with the Columbia River. Second, during initial program implementation, Ecology may reserve a portion of the water rights acquired with Account funds for instream purposes on the mainstem Columbia River. Ecology may subsequently alter the initial reservation once measuring and accounting systems are fully implemented and any uncertainties associated with management of the new trust water rights and new permits are defined and addressed.

To ensure that anticipated out-of-stream benefits are achieved, Ecology will allocate water rights not reserved exclusively for mainstem flow improvement to provide mitigation for new water rights from the Columbia mainstem. Ecology will provide mitigation water for each permit it approves; however, the state-funded portion of the mitigation package will be determined by the project funding criteria and anticipated public benefits associated with the proposed use of water.

6.1.5 Defining Acquisition and Transfer

The Columbia River Water Management Act prohibits Ecology from expending money from the Columbia River Account on conservation projects that will result in "water acquisition or transfers from one water resource inventory area to another" without specific legislative authorization. The bill does not define either acquisition or transfer. Ecology considered two alternative definitions that describe the degree of flexibility that Ecology will have in issuing new water permits from the Columbia River based on projects funded under the program:

> **Acquisition and transfer means any non-storage project.** Ecology will interpret "acquisition or transfer" to mean any non-storage project funded in part by conservation monies from the Columbia River Account that results in water put into the Trust Program. Ecology will manage new permits so conserved water from a WRIA is used, where possible, to offset new permits from the Columbia for beneficial uses within that WRIA[3].
>
> **Acquisition and transfer means direct purchase of water rights**. Ecology will interpret "acquisition or transfer" to mean the direct purchase of water rights, not infrastructure or conservation improvements that may yield conserved water. Ecology will manage new permits so water rights purchased within a WRIA stay within a WRIA.
>
> > Example #1. Ecology buys a water right in the Wenatchee River basin. Under both alternatives, this conserved water could only result in a new permit from the Columbia River for beneficial use within that WRIA without specific legislative authorization.
> >
> > Example #2. Ecology funds a conservation infrastructure project that results in 100 acre-feet of saved water being managed in Ecology's Trust Program. Under the first

[3] Note, some WRIAs within the Columbia River Basin do not have Columbia River "riverfront" and will not likely receive any new appropriations from the Columbia River itself.

alternative, the 100 acre-feet could only result in a new permit from the Columbia River for beneficial use within that WRIA unless Ecology received specific legislative authorization. Under the second alternative, the 100 acre-feet could result in a new permit from the Columbia River for beneficial uses within other WRIAs with no need for specific legislative authorization.

The second alternative provides the greatest flexibility to Ecology in matching supply generated through non-storage projects with future Columbia River demands. However, the second alternative is inconsistent with the ordinary meaning of the term and with the Trust Water Rights statute. The dictionary defines "acquisition" as "the act of acquiring or gaining possession" (Dictionary.com 2006). The Trust Program provides that "[t]he state may acquire all or portions of existing water rights, by purchase, gift, or other appropriate means other than by condemnation, from any person or entity or combination of persons or entities" (RCW 90.42.080). Such acquisitions can be made through "leases, contracts, or such other arrangements with other persons or entities as appropriate, to ensure that trust water rights acquired in accordance with this chapter may be exercised to the fullest possible extent" (RCW 90.42.080). Trust water rights may be acquired by the state on a temporary or permanent basis (RCW 90.42.080.). Once a water right is permanently transferred to the Trust Program, it becomes the state's water right and a certificate to the water is issued in the name of the state (RCW 90.42.040(2)).

If the term "acquisition" is restricted to direct purchase, it eliminates other types of transactions that may result in the state acquiring water, e.g., saved water from conservation projects in the proportion funded by the state. Likewise the term "transfer" as applied to a water right means to change ownership from one person to another or one place to another, i.e., from out-of stream use to instream flow. This can happen through lease, donation, bequest and other means besides direct purchase.

Preferred Alternative: For purposes of determining where Account funds may be spent, Ecology will define the terms "acquisition" and "transfer" as follows:

"Acquisition" means funding projects using the Columbia River account for the purpose of effectuating the following forms of consumptive water use reduction:

- Purchase of water rights to place in the Trust Program;
- Crop water duty reductions (e.g., deficit irrigation without crop change);
- Change in crops (e.g., permanent change of orchard to vineyard);
- Fallowing or idling corner irrigation of center-pivot irrigation systems;
- Switching from irrigated to non-irrigated crops; or
- Partial season acquisitions (e.g., foregoing irrigation after first cutting of hay).

"Transfer" means the change of a water right from one place and person to another place and person, or the issuance of a new permit where the consumptive demand associated with the new permit is mitigated by a water right "acquired" using Account funds and held in the Trust Program.

Pumps and pipes infrastructure projects are not considered to be "acquisition" or "transfer."

6.1.6 Conditioning Water Rights on Instream Flows

The Columbia River Water Management Act states that "Water developed under the provisions of this section to offset out-of-stream uses and for instream flows shall be deemed adequate mitigation for the issuance of new water rights" (RCW 90.90.020(2). Currently, Ecology conditions new water rights and water right changes to protect instream flows (Chapter 173-563 WAC and Chapter 173-564 WAC). Information on the Instream Flow Rule and the Biological Opinion flows that pertain to the Columbia and Snake Rivers is located in Section 3.3.1 of the Columbia River Water Supply Inventory and Long-Term Water Supply and Demand Forecast, which can be accessed at: http://www.ecy.wa.gov/programs/wr/cwp/wsi_ltsdf.html. The inventory includes tables listing the flows.

The requirement to protect instream flows has discouraged some water right changes that could provide a "new source of water" for municipal users. Ecology considered two alternatives for processing water rights changes:

> **Apply instream flow water right created by the June 24, 1980 Columbia River Instream Flow Rule to new permits or changes of season of use that authorize use outside the season where the conserved water or acquired water right was beneficially used.** All changes of seasonal to year-round rights would continue to be subject to the adopted instream flows. Also, new permits that rely on a seasonal water right for mitigation, but which authorize a new use outside the season of use of the water right acquired for mitigation, would be subject to the adopted instream flow during the period outside the time when the mitigation water right was historically exercised.
>
> **Waive instream flow water right created by the June 24, 1980 Columbia River Instream Flow Rule where new permits or transfers shift consumptive demand away from critical periods and benefit aquatic species.** Under this alternative, Ecology would develop an approach that would recognize the benefit to aquatic species of shifting the demand from the critical July and August period to the period from October through March. This approach would include an evaluation of the public benefits and costs and whether the overriding considerations of the public interest (OCPI) would be served by shifting the out-of-stream uses away from a critical period for fish. An example of this approach would be the conversion of a seasonal irrigation use to a year-round municipal use that would reduce actual water use during July and August for the mainstem Columbia River or the April to August period for the Snake River. If the municipal use would be less during July and August than the amount currently used for irrigation during that period, it would benefit instream flow in the same manner as a scheduled release of water from a storage facility. This determination could either be implemented on a case-by-case basis when rights are proposed for change (or mitigation is evaluated for adequacy to issue a new permit) or it could be addressed through rulemaking.

The first alternative relies on conditioning applications for change and new applications to protect the June 24, 1980 adopted instream flow, which is a water right, entitled to protection from impairment (see RCW 90.03.345). Only water right changes that expand the season of use or new permits authorizing a season of use that is not mitigated by the net water savings acquired through mitigation would be subject to the adopted flows. Also, only that portion of the season for which the historic beneficial use did not provide "in-time" mitigation would be subject to the adopted instream flow.

WAC 173-563-080 allows the Director of Ecology to authorize the "use of water which would conflict with the adopted instream flows when it is clear that overriding considerations of the public interest (OCPI) will be served." Withdrawals of water which would conflict with needed base flows are permitted only "where it is clear that overriding considerations of the public interest will be served" (RCW 90.54.020(3)(a)). Thus, under the existing 1998 Instream Flow Rule, a change of water right from seasonal to year-round, or a new permit with associated mitigation that did not perfectly match the season of use authorized by the new permit, could be approved without subjecting the change to instream flows in the rule. Such a decision could be made on a case-by-case basis, require evaluation in consultation with state and federal agencies and tribes, or could be made by a determination of OCPI by the Director of Ecology in consultation with other state agency directors and the Commissioner of Public Lands.

The real difference between the second alternative and case-by-case consideration is that Ecology would establish through rulemaking that seasonal water rights may be changed to year-round water rights without being subjected to the instream flows set by rule. Currently the Director may make case-by-case determinations of OCPI. Under the second alternative, the determination of OCPI would be made one time during rulemaking and that decision would apply to a class of applications that meet the criteria identified in the rule.

Currently, transfers of season of use (e.g., from irrigation to municipal) are problematic because the resulting seasonal interruptibility makes it difficult for municipalities to provide reliable service for a public water system. In some cases this has led to a proliferation of exempt uses under RCW 90.44.050, rather than transfer of existing rights. The advantage of the second alternative is that it would encourage regional water systems and will help adjust the hydrograph to avoid or lessen impacts during initial demand periods.

No matter which alternative is adopted, the underlying statutory requirements for Ecology to approve a change of water right remain. Ecology may not approve such a change if there are any adverse impacts to existing water rights (RCW 90.03.380).

Preferred Alternative: Ecology will continue to apply the instream flow water right created by the 1980 Columbia River Instream Flow Rule to new permits and to season of use changes that authorize a beneficial use during a different season than the mitigation water right. In situations where demand shifting from critical summer months to less critical winter months would result in a benefit to aquatic species, Ecology will consider case-specific waivers of the 1980 instream flow after consulting with the Directors of the Department of Fish and Wildlife and the Department of Agriculture and the Commissioner of Public Lands.

6.1.7 Initiating Voluntary Regional Agreements

The alternatives considered here relate to how aggressively Ecology will pursue VRAs. Two alternatives were proposed:

> **Process VRAs as proposed.** Ecology would be review VRAs only as proposed by applicants.
>
> **Aggressively pursue VRAs.** In addition to reviewing VRAs proposed by applicants, Ecology would aggressively pursue new water and actively seek groups who wish to develop VRAs through such strategies such as water marketing and reverse auctions (a reverse auction occurs when Ecology notifies water rights holders that it is looking for water to buy or lease and asks those interested to respond to Ecology and let the agency know how much water they are willing to sell or lease and at what price).

The second alternative would better meet the goal of the Columbia River Water Management Act of "aggressively pursuing" the development of water supplies. Processing VRAs as proposed would maintain Ecology's traditional role of regulating and permitting.

Preferred Alternative: Ecology will support water users with common interests to consider a VRA where it benefits the Columbia River Management Program and is in the public interest. Ecology will respond to and work with proponents to execute new VRA proposals that are consistent with RCW 90.90.030. However, this will not be a major focus of Ecology's activities.

6.1.8 Processing Voluntary Regional Agreements

Ecology currently processes water right applications according to the "Hillis Rule" (Chapter 173-152-050 WAC). Generally, Ecology will process new water right applications and water right change applications in two separate tracks in the order they are received within a region. Ecology may make decisions from multiple water sources within a region based on the oldest priority date in each source. Ecology generally prioritizes its work by source (WRIA) for efficiency in investigation and permitting. The oldest priority date is based on the date the application is filed with Ecology (WAC 173-152-030).

The Hillis Rule provides that certain applications may be processed ahead of competing applications, which the rule defines as "all existing applications for water right from the same water source, whether for a new water right or for a change or transfer of an existing water right" (WAC 173-152-020(4)).

> "Same water source" or "source of water" means an aquifer or surface water body, including a stream, stream system, lake, or reservoir and any spring water or underground water that is part of or tributary to the surface water body or aquifer, that the department determines to be an independent water body for the purposes of water right administration (WAC 173-152-020(5)).

The legislature established two tracks or lines for processing water right applications, one for applications for new water rights and a second for applications to change an existing water right

(RCW 90.03.380(5)). Thus, applications for new water only "compete" with other applications for new water, not with applications to change an existing right. The same is true for change applications—they are in competition only with other change applications.

Under the Hillis Rule, an application for a new water right or a water right change "may be processed prior to competing applications if the application resolves or alleviates a public health or safety emergency caused by a failing public water supply system currently providing potable water to existing users" (WAC 173-152-050(1)).

An application for a new water right may also be processed out of order if Ecology determines that "immediate action is necessary for preservation of public health or safety; or …the proposed water use is nonconsumptive[4] and if approved would substantially enhance or protect the quality of the natural environment" (WAC 173-152-050(2)).

An application to change an existing water right may also be processed prior to competing applications if one or more of the following criteria are met: "[t]he change or transfer if approved would substantially enhance the quality of the natural environment; or …[t]he change or transfer if approved would result in providing public water supplies to meet general needs of the public for regional areas;" and/or "[t]he change or transfer was filed by water right holders participating in an adjudication" (WAC 173-152-050(3)).

The Hillis Rule also provides that each regional office of Ecology shall process applications satisfying the criteria in the rule in the following order:

a. Health and safety emergencies as defined in WAC 173-152-050(1)
b. Immediate action is necessary for preservation of public health or safety (WAC 173-152-050 (2)(a)),
c. Transfers or changes that would substantially enhance the quality of the natural environment (WAC 173-152-050)(3)(a),
d. Transfers or changes that would result in providing public water supplies to meet general needs of the public for regional areas (WAC 173-152-050(3)(b)),
e. Transfers or changes filed by water right holders participating in an adjudication and a decision is needed expeditiously to ensure that orders or decrees of the superior court will be representative of the current water use situation (WAC 173-152-050)(3)(c)), and

[4] Ecology has adopted a policy (POL 1021) interpreting priority processing of nonconsumptive projects under the Hillis Rule to include those that are "water budget neutral" when considering the withdrawals and mitigation (http://www.ecy.wa.gov/programs/wr/rules/images/pdf/pol1021.pdf).

f. Nonconsumptive uses that would substantially enhance or protect the quality of the natural environment (WAC 173-152-050(4)).

RCW 90.90.030 authorizes Ecology to "enter into voluntary regional agreements for the purposes of providing new water for out-of-stream use, streamlining the application process, and protecting instream flow." New water can be obtained from a new water right or the change of an existing right. Ecology has identified three alternatives for processing applications for new water rights and water right changes associated with VRAs.

Process applications according to the Hillis Rule. Ecology would continue to process new water rights applications according to the Hillis Rule. In order for an application associated with a VRA to be processed ahead of prior competing applications, it would have to meet one of the exceptions in the Hillis Rule.

Example #1. An applicant has proposed a new 1—acre-foot irrigation project and is currently fifth oldest in line in priority relative to other competing Columbia River applications. The application is associated with a VRA. Fifty acre-feet of this withdrawal will occur in July and August. Under the first alternative, the applicant under a VRA would have to wait until the four senior applications were processed and then would be required to mitigate for July and August instream flow impacts. Alternatively, the applicant could seek priority processing under the Hillis Rule by also mitigating for instream flow impacts outside the July and August period (e.g., water budget neutral) provided such mitigation also provided substantial environmental benefit. Because the mitigation standard for priority processing is a much higher standard under current regulations than for normal processing, this alternative gives weight to the existing priority system and senior applicants. Cost reimbursement under RCW 90.03.265 may also be an option for some applicants. Priority processing under the Hillis Rule and cost reimbursements are also available to applicants not part of a VRA.

Amend the Hillis Rule for VRAs that convert interruptible rights. The Hillis Rule would be amended to add a new processing line for water right applications submitted under VRAs that are solely for the conversion of interruptible rights to non-interruptible rights.

Amend the Hillis Rule for new water rights from VRAs. The Hillis Rule would be amended to add a new processing line for issuing new water rights resulting from VRAs.

Any alternative must be consistent with RCW 90.90.030(7) and (8).

(7) Nothing in this section may be interpreted or administered in a manner that precludes the processing of water right applications under chapter 90.03 or 90.44 RCW that are not included in a voluntary regional agreement.

(8) Nothing in this section may be interpreted or administered in a manner that impairs or diminishes a valid water right.

For non-VRA applicants, RCW 90.90.030(7) makes it clear that the current consultation pathway for the Columbia River that Ecology adopted in rule still exists. Absent priority processing, Ecology would apply the appropriate standard (e.g., either consultation or VRA) to each applicant in turn according to priority.

If the first alternative is selected as the preferred alternative, processing of such applications may be delayed and may affect the decision on the applications. The question is whether any of the alternatives would impair or diminish a "valid water right or a habitat conservation plan approved for purposes of compliance with the federal endangered species act" (RCW 90.90.030(8)). Ecology may not grant a new water right if it would impair an existing right. For purposes of new water rights, pending water right applications are considered in such an impairment analysis. If a new water right under a VRA was processed and issued prior to another pending application, it could result in an impairment. However, if the project were "water budget neutral," then it is unlikely such impairment would occur. Further, if the mitigation water for a new water right is created through a VRA prior to the application for a new water right being filed and processed, there should be no impact from the third alternative. In contrast to new water right applications, in making decisions on change applications, Ecology is not required to consider pending water right applications in its impairment analysis. Therefore, if a change application to convert an interruptible water right to a non-interruptible right is processed prior to non-VRA change applications, it should not result in an impairment of other water rights simply because it is processed first.

Preferred Alternative: Ecology currently processes water rights applications according to the "Hillis Rule" (Chapter 173-152-050 WAC). Ecology will continue this practice for new Columbia River applications, including those associated with a VRA. This means that, generally, Ecology will process new water right applications and water right change applications in two separate lines in the order they are received within an Ecology region. Ecology may make decisions from multiple water sources within a Region, beginning with the application with oldest priority date from each source. Ecology generally prioritizes its work by source (WRIA) for efficiency in investigation and permitting. The priority date is based on the date an application is filed with Ecology (WAC 173-152-030).

6.1.9 Defining "No Negative Impact" to Instream Flows of the Columbia and Snake Rivers

The Columbia River Water Management Act sets forth that there shall be no negative impact to stream flow allowed in July and August on the Columbia River and from April through August on the Snake River as a result of a VRA. VRAs could propose withdrawals of water in one part of the basin, based on net water savings through conservation in another part of the basin. There is no existing policy on how or where to measure whether a withdrawal of water pursuant to a VRA would result in a net reduction in stream flow. (The Management Program could include any project that would benefit instream flows in the Columbia and Snake Rivers, which would include some projects on tributaries of these rivers. The location where net water savings from a tributary project would be measured would be at the mouth of the tributary.)

Ecology considered four alternative policies to address measuring a net reduction in instream flow. For each of these alternatives, if a VRA includes a conservation project funded by Ecology, there may be an additional restriction that the mitigation must be in the same WRIA as the new withdrawal (for example see RCW 90.90.010(2)(a) and Section 6.1.3).

Same pool and downstream. Withdrawals can occur anywhere downstream of, or anywhere in, the same pool where net water savings through conservation occur, including in tributaries (Figure 6-3a).

Same major reach. Withdrawals can occur anywhere within the same major reach, but not downstream of the major reach in which the net water savings through conservation occur (Figure 6-3a).

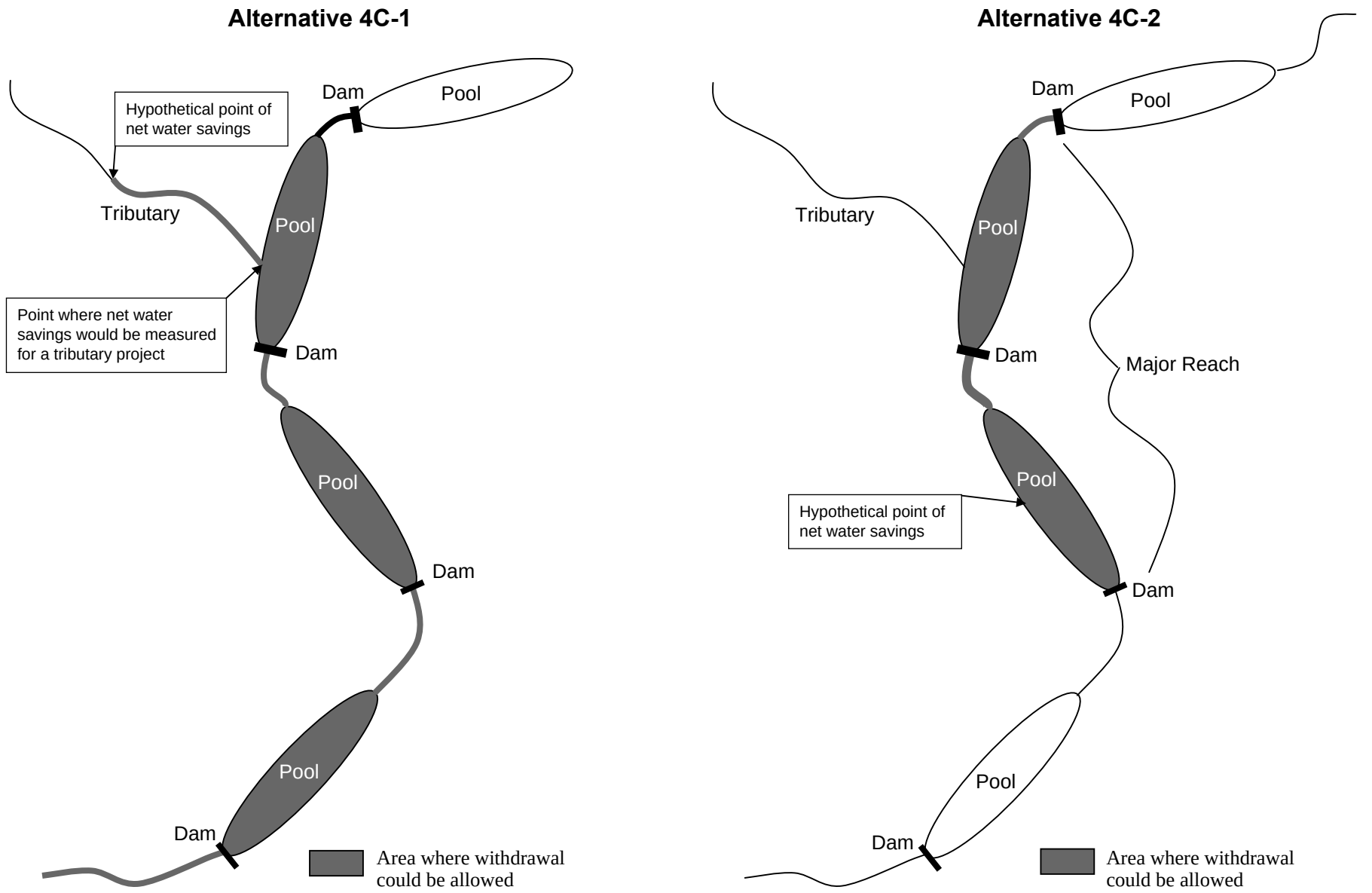
Same pool, but not downstream. Withdrawals can occur anywhere within the same pool where net water savings through conservation occur, but not downstream of the pool (Figure 6-3b).

Same pool, but only downstream of point of net water savings. Withdrawals can occur within the same pool where net water savings through conservation occur, but only downstream of the point where net water savings through conservation occur, and not downstream of the pool (Figure 6-3b).

The basis of the four alternatives for defining no net impact to instream flow is the relative location of the net water savings and the point of withdrawal under the new water right. Logically, the area of consideration for impact should be aligned with the management units for instream flow in WAC 173-563-040(1)--John Day Dam downstream to Bonneville Dam; measured at The Dalles Dam; John Day Dam upstream to McNary Dam measured at John Day Dam; McNary Dam upstream to Priest Rapids Dam measured at McNary Dam; and Priest Rapids Dam upstream to the Canadian Border measured at Priest Rapids Dam and upstream at Wanapum, Rock Island, Rocky Reach, Wells, Chief Joseph, and Grand Coulee Dams.

The second and third alternatives are most consistent with the management units established in WAC 173-563. Following the scheme laid out in the rule, as long as any impact from the withdrawal no longer existed at the control point for a management unit, there should be by definition "no net impact" to the river.

Definition of the "major reach" for use in determinations of "no net impact" will affect the "portability" of any credit associated with net water savings (mitigation credits) that can be used to offset the stream flow impacts of new permits. Limiting the use of mitigation credits to a single pool as opposed to within one of four stream reaches would generally lessen the number of prospective water users who could benefit from a credit. It would also reduce the distance that a mitigation credit could be assigned to a new permit to divert water upstream of the site of the mitigation credit. As a result, there would be fewer river reaches created that would have reduced stream flow that might negatively impact fisheries or other elements of the built or natural environment. Restricting the assignment of mitigation credit to new withdrawals at downstream locations only would eliminate the potential for reaches with reduced flow and associated environmental impacts. By limiting the potential location of water conservation and water right acquisitions for mitigating new permits, the costs to the public and prospective water users can reasonably be expected to be higher because the universe of potentially mitigating rights or conservation projects would be smaller.



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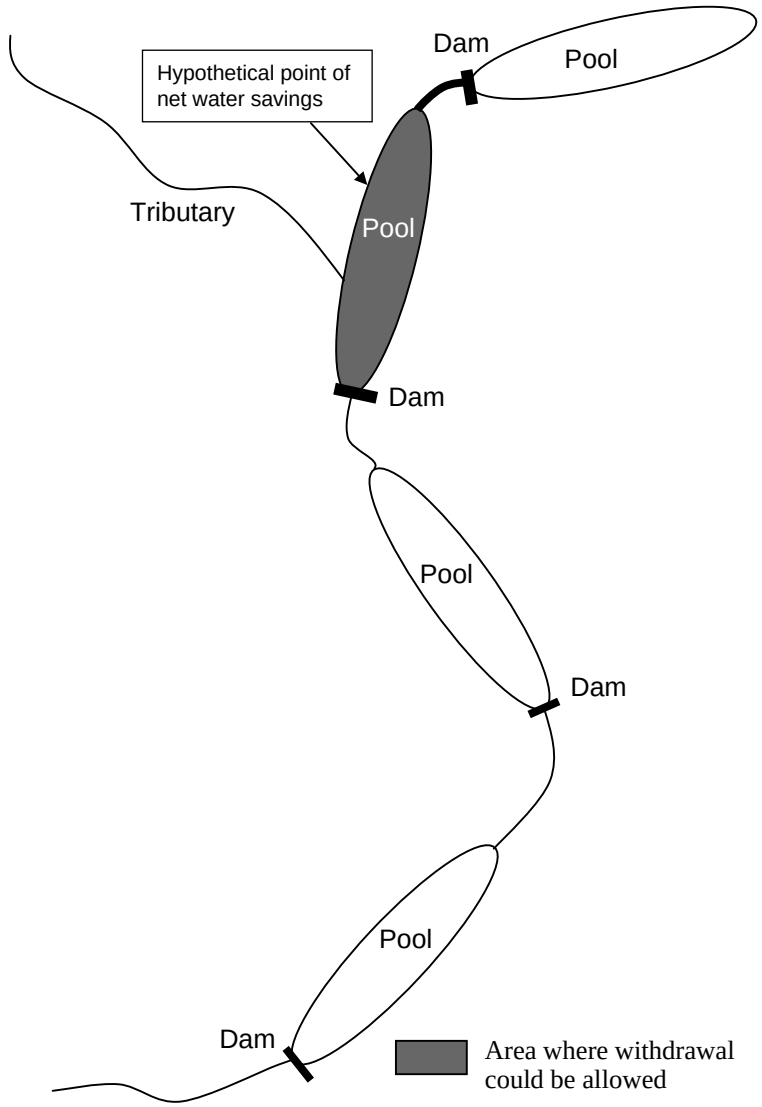
FIGURE 6-3A

ALTERNATIVES FOR MEASURING A NET REDUCTION IN STREAM FLOW

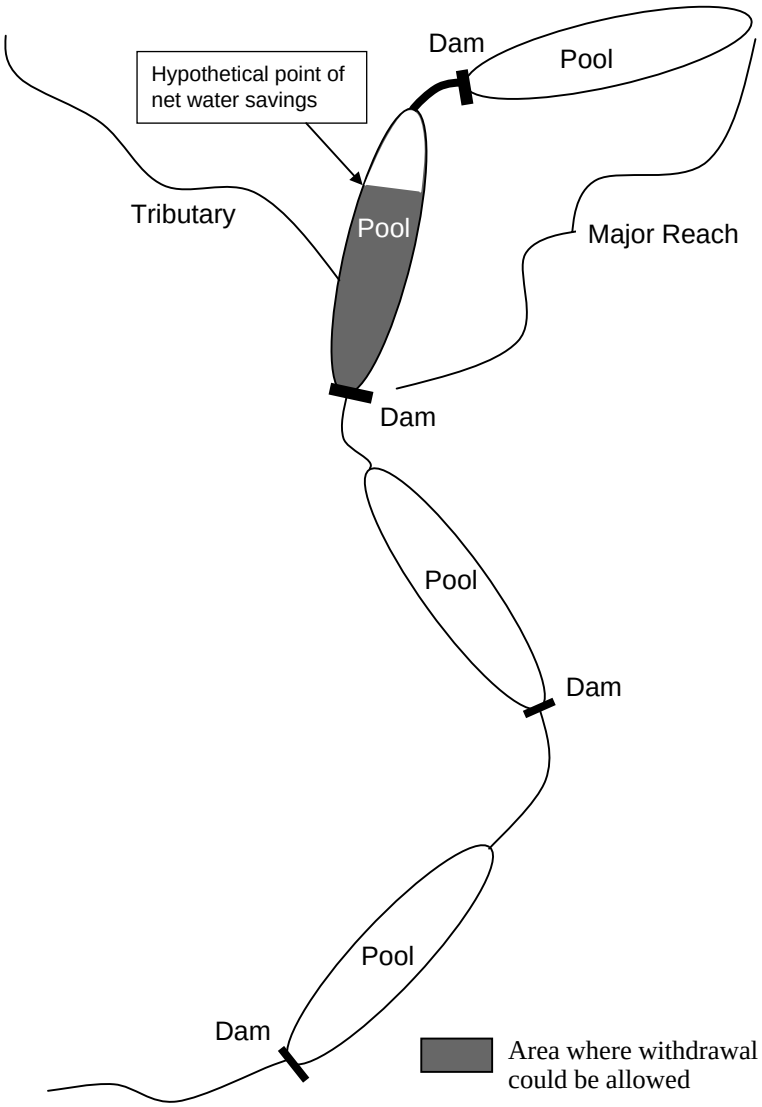
COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Alternative 4C-3



Alternative 4C-4



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FIGURE 6-3B

ALTERNATIVES FOR MEASURING A NET REDUCTION IN STREAM FLOW

COLUMBIA RIVER WATER MANAGEMENT PROGRAM EIS

WASHINGTON

Preferred Alternative: The Columbia River Water Management Act sets forth that there shall be no negative impact to stream flow allowed in July and August on the Columbia River and from April through August on the Snake River as a result of a VRA. Ecology will use metering, monitoring, stream gaging, and water masters to account for trust water rights derived from conservation and acquisitions together with all mitigated permits. Ecology will authorize new out-of-stream uses only within the first mainstem pool that benefits from a trust water right and any downstream pools, subject to the limitations of RCW 90.90.010(2)(a) on acquisitions and transfers. Net water savings from a tributary project would be measured at the mouth of the tributary.

6.1.10 Defining the Main Channel and One-Mile Zone

The legislation defines the mainstems of the Columbia and Snake Rivers to include "all water . . . within the ordinary high water mark [OHWM] of the main channel…" and "all ground water within one mile of the ordinary high water mark." Ecology interprets "all water" in these definitions to refer to diversions within the one-mile corridor, whereas the place of use could be outside of the one-mile corridor. Significantly, this definition applies only to RCW 90.90.030 and RCW 90.90.050, which address VRAs and the water resource inventories.

The definition applies to:

a. Water rights issued from the mainstem;

b. No negative impact on instream flows of the mainstem; and

c. Water resource inventory for "effective mainstem water resource planning and management."

Ecology considered how to define the OHWM of the main channel and how to measures the one-mile zone. If a narrow definition were used, the program would focus on a smaller number of users. Many water users with interruptible water rights would not be included because they divert water outside of the one-mile corridor and thus might not be eligible to benefit from VRAs or storage projects. Further, there are springs and creeks tributary to the mainstems within the one-mile corridor that could be considered "all water". Ecology considered two alternatives for defining the main channel OHWM and one-mile zone.

> **No backwater areas included.** The definition of the main channel OHWM would not include any of the backwater areas on tributaries. A straight line would be drawn across the mouth of each tributary to delineate the mainstem channel. The main channel also would not include any tributary surface water rights within the one-mile corridor.
>
> **Backwater areas included.** The definition of the main channel OHWM would include backwater areas on tributaries and tributary surface water and thus the one-mile zone would extend one mile from the OHWM of any of the backwater areas as well as from the mainstem proper.

The second alternative would include the backwater areas and the one-mile zone for ground water would be larger. This alternative is more consistent with the definition Ecology has used

in making water right decisions under WAC 173-563. WAC 173-563-020(1) applies to the following:

> … public surface waters of the main stem Columbia River in Washington State and to any ground water the withdrawal of which is determined by the department of ecology to have a significant and direct impact on the surface waters of the main stem Columbia River. The extent of the "main stem" Columbia River shall be the Columbia River from the upstream extent of tidal influence (Bonneville Dam River Mile 146.1) upstream to the United States-Canadian border (River Mile 745) and *including those areas inundated by impounded waters at full pool elevations*. (Emphasis added).

The Snake River rule "applies to public waters of the main stem of the Snake River in Washington and to any ground water where the ground water is determined by the department of ecology to be part of or tributary to the surface waters of the main stem of the Snake River" (WAC 173-564-030(1)).

The first alternative would exclude a portion of this water, namely that backed up into tributary areas. In doing so, it would exclude certain water rights issued since 1980 and subject to WAC 173-563 minimum flows from participation in this program. The second alternative is more consistent with Ecology's practice under the existing rule. Finally, the second alternative provides a larger inventory of water rights, and could improve Ecology's ability to plan for and manage the Columbia River water resources.

Preferred Alternative: The Columbia River Water Management Act defines the mainstems of the Columbia and Snake Rivers to include "all water ... within the ordinary high water mark (OHWM) of the main channel…" and "all ground water within one mile of the ordinary high water mark." Ecology interprets "all water" in these definitions to refer to diversions within the one-mile corridor, even where the place of use of the diverted water is outside of the one-mile corridor. The definition of the main channel and one-mile zone applies to:

a. Water right permits issued from the mainstem;

b. The mitigation standard for VRAs (no negative impact on instream flows of the mainstems); and

c. The water resource inventory prepared for "effective mainstem water resource planning and management."

A straight line will be drawn across the mouth of each tributary to delineate the mainstem channel. The main channel OHWM does not include any of the backwater areas on tributaries nor does it include tributary surface water rights within the one-mile corridor.

6.1.11 Coordinating VRA Mitigation and Processing New Water Rights

Processing new water rights from the Columbia River will require mitigation for any impacts to instream flows. The mitigation will be provided either through a VRA or through the consultation process (WAC 173-563-020, see Section 1.3 for additional information). A VRA

requires no negative impact on instream flows in July and August (April through August for the Snake River). Mitigation under a VRA means avoidance of impacts on flows and is in kind, in time, and in place.

Ecology plans to aggressively pursue funding of storage and conservation projects to make mitigation water available for such permits. However, adequate mitigation water may not be available for new water rights associated with a VRA. RCW 90.03.380(5)(c) allows Ecology to skip over a water rights change application to the next person in line if information is lacking to make a decision on the request. There has been some concern that Ecology does not have similar statutory discretion for processing new water rights and must process them in the order they are received. However, it now seems clear that Ecology may request permission from the applicant to be skipped over if the senior applicant has not provided enough information on the application.

Ecology considered two alternatives for processing applications if adequate mitigation water has not been acquired in the area needed to make a permit decision.

> **Deny the application.** If mitigation water is not available to meet the requirements in the legislation, Ecology should deny the decision or otherwise require the applicant to provide adequate mitigation in a timely manner (to meet the VRA standard or that imposed by Ecology following consultation). If the application is denied and mitigation later becomes available in that area, the applicant would have to refile an application and the mitigation water would be used for the oldest application in line in that area.
>
> **Seek legislative authority to skip applications.** Ecology should seek legislative authority similar to that provided in the change statute (RCW 90.03.380(5)(c)) so it can skip over VRA applications upon request of the applicant where mitigation is not available. If mitigation later becomes available, the senior-most applicant in that area would be able to use the mitigation for their project subject to the terms and conditions of Ecology's acquisition of the mitigation.

In large part, the effect of these alternatives on any pending application depends on whether the Hillis Rule (WAC 173-152) is amended by Ecology to create a separate line for new water right applications associated with a VRA (see Section 6.1.8). If VRA applications are in a separate line, it seems logical that Ecology would not process the applications until the mitigation water is in place. In the alternative, Ecology could process applications and issue permits subject to instream flow conditions that would be removed as mitigation meeting the mitigation standard is accepted. A phased authorization, like the 1993 Quad-Cities permit, may provide a reasonable model for balancing infrastructure planning, financing, and acquisition of mitigation water.

Conflicts would likely arise over Ecology's schedule for acting on pending applications when a pool of mitigation water is not available to mitigate for all of the pending applicants' needs. If a non-VRA applicant deep in the line of applications acquired its own mitigation and Ecology agreed to process its application, but the VRA applicant earlier in line did not have mitigation available, then the VRA application would be denied unless the senior applicant agreed to allow the junior application to be processed first. The reverse situation may be as likely to occur. Absent a decision to deny applications without acceptable mitigation, any other application that

provided its own mitigation water would be delayed significantly while the consultation process under WAC 173-563-020(4) was performed. Alternatively, Ecology could choose not to process any applications in that area until mitigation water is available for all applicants in the entire area.

Preferred Alternative: Processing new water rights from the Columbia River will require mitigation for any impacts to instream flows. The mitigation will be provided either through a VRA or through the consultation process (WAC 173-563-020, see Section 1.3 for additional information). The mitigation standard for Columbia River water rights covered by a VRA is no negative impact on instream flows during July and August. For the Snake River, it is no negative impact for the months of April through August. Mitigation under a VRA means avoidance of negative impacts on flows and must be in-kind, in-time, and in-place.

Ecology will aggressively pursue funding of water supply projects to make mitigation water available for new mainstem permits, whether covered by a VRA or not. However, in some cases, adequate (in-kind, in-time, in-place) mitigation water may not be available. RCW 90.03.380(5)(c) allows Ecology to skip over a water right change application to the next person in line if information is lacking to make a decision on the request. There has been some concern that Ecology does not have similar statutory discretion for processing new water rights and must process them in the order they are received. However it now seems clear that Ecology may request permission from the senior applicant to be skipped over if the senior applicant has not provided enough information on the application.

If state-funded mitigation is unavailable and those earlier in line that require mitigation cannot provide their own, Ecology would allow those earlier in line to voluntarily step aside for up a set period of time. After that period of time, the application would be processed, even if adequate mitigation water has not been found. This may result in a denial of an application to the extent that mitigation was inadequate. If an earlier applicant declines to step aside, Ecology will process the application and would deny an application that fails to meet the four-part test under RCW 90.03.290. Ecology will address this process through policy development or, if required by RCW 34.05, rulemaking and will consider reasonable timeframes (e.g., two years) necessary to coordinate acquisition of adequate mitigation under the program (in-kind, in-place, in-time) with new application requests. .

6.1.12 Coordinating VRA and Non-VRA Processing

WAC 173-152-030 states that Ecology will process new water right applications in the order they are received within a region. It also allows Ecology to make decisions from multiple water sources within a region, based on the oldest priority date in each source (Ecology defines "source" as the same body of public water that is not hydraulically connected). The oldest priority date is based on the date of the application filed with Ecology. Generally, Ecology processes water rights applications on a WRIA by WRIA basis within the region to maximize permitting efficiency, which may include Columbia River applicants and non-Columbia River applicants. The Columbia River spans multiple WRIAs and three Ecology regions (Southwest, Central and Eastern). How Ecology chooses to prioritize its work will affect the seniority of applicants who will be processed under the Management Program, where Ecology should

prioritize its conservation efforts to generate mitigation water through acquisitions and conservation project funding, and where applications will be eligible to receive mitigation water from projects funded with Columbia River dollars. Ecology considered three alternatives for processing VRA and non-VRA applications:

> **Grouped within the Columbia River one-mile corridor.** Ecology would group all applicants in the Columbia River one-mile corridor together, giving maximum weight to the existing priority system.
>
> **Grouped within the Columbia River one-mile corridor by region.** Ecology would group all applicants in the Columbia River one-mile corridor by region and direct staff to work on the first applicant in each region at the same time. This would provide regional parity by processing water rights in each region. Water rights in one region would not be processed to the exclusion of another region.
>
> **Grouped within the Columbia River one-mile corridor with WRIA permitting.** Ecology would group all applicants in the Columbia River one-mile corridor with tributary WRIA permitting, which integrates permitting at the WRIA level. Ecology would choose which WRIA to work in based on the existence of mitigation water available to offset Columbia River impacts.

In assessing these alternatives it is important to consider another section of the Hillis Rule that establishes how Ecology is to organize and manage its water rights workload. WAC 173-152-030 provides in part as follows:

> The department will make decisions on new water right applications and applications for change or transfer of an existing water right within a region or within a regional or field office's geographic area in the order the application was received except as provided for in subsection (3) of this section and WAC 173-152-050.

The second and third alternatives appear to be most consistent with this rule.

> The department may, based on the criteria identified in subsection (4) of this section, conduct an investigation and make decisions on one or more water right applications for the use of water from the same water source. Within a regional office, more than one water source may be investigated at a time. When numerous applications for water from the same water source are being investigated, the decisions will be made in the order in which the applications were received. Each application will be considered individually under the requirements of Chapters 90.03 and 90.44 RCW.
>
> Criteria for selecting a water source include, but are not limited to:
>
> a. The number and age of pending applications, and the quantities of water requested;

b. The ability to efficiently investigate applications because of the availability of data related to water supply and future needs, streamflow needs for instream values, and hydrogeology of the basin;

c. The ability of the department to support implementation of local land use plans or implementation of water resource plans;

d. The projected population and economic growth in the area; and/or

e. The completion of an initial basin assessment as provided for in WAC 173-152-040(5).

The first alternative appears most consistent with the definition of same source and processing applications from the same source at the same time.

> "Same water source" or "source of water" means an aquifer or surface water body, including a stream, stream system, lake, or reservoir and any spring water or underground water that is part of or tributary to the surface water body or aquifer, that the department determines to be an independent water body for the purposes of water right administration (WAC 173-152-020(5).

When considering whether a new water right would impair existing water rights, Ecology must consider pending water right applications. To the extent that grouping applications within one mile of the Columbia River would allow decisions to be made without consideration of applications outside the one-mile corridor that may be in hydraulic continuity with the river, the potential for impairment exists.

Preferred Alternative: WAC 173-152-030 states that Ecology will process new water right applications in the order they are received within a region. It also allows Ecology to make decisions from multiple water sources within a region, beginning with the oldest priority date in each source. The priority date is based on the date an application is filed with Ecology. Ecology defines a "source of water" as surface waters and/or ground water in hydraulic connection, meeting the following four conditions:

a. They share a common recharge area;

b. They are part of a common flow regime;

c. They are separable from other water sources by effective barriers to hydraulic flow; and

d. They are an independent water body for the purpose of water right administration, as determined by Ecology.

Generally, Ecology processes water rights applications on a WRIA-by-WRIA basis within a Region to maximize permitting efficiency. WRIAs may include Columbia River applicants and non-Columbia River applicants.

Ecology will use a hybrid of two choices presented in the Draft EIS to coordinate VRA and non-VRA application processing based on: 1) the source of mitigation water acquired and placed into the Trust Program (e.g., mainstem savings versus tributary savings); and 2) whether saved water

must stay within the WRIA by statute (e.g., RCW 90.90.010(2)(a) without specific legislative authorization, as follows:

Grouped within the Columbia River one-mile corridor. If the source of mitigation water is a mainstem conservation, acquisition, or storage project, Ecology will group all applicants in the Columbia River one-mile corridor together. Ecology will process applications from the mainstem independent of WRIA boundaries when the source of water from a water supply project is from the mainstem Columbia, for example, the proposed Lake Roosevelt drawdown.

Grouped within the Columbia River one-mile corridor with WRIA permitting. If the source of mitigation water is a conservation or acquisition project within a tributary stream, Ecology will group applicants within the Columbia River one-mile corridor together with tributary WRIA permitting. Ecology will choose which WRIA to work in based on the availability of water rights within the Trust Program to match up with new permits from the Columbia River requiring mitigation to satisfy the no negative impact policy described in section 6.1.9. The senior-most applicant *within the WRIA* will be processed ahead of older mainstem applicants downstream if those older applicants cannot benefit from mitigation water that must stay within the WRIA.

Example: Consider two applicants. Applicant 1 has a priority date of 1992 and is located in WRIA 40. Applicant 2 has a priority date of 1994 and is located upstream in WRIA 45. As the senior applicant, Applicant 1 would normally be processed first. If mitigation water were obtained from the mainstem Columbia River, it would be assigned to mitigate the impacts of a permit that would be issued to Applicant 1. Applicant 2 would then be the next in line for processing.

However, if mitigation water is obtained within WRIA 45 through acquisition or transfer and is protected to the Columbia River, this mitigation water could not be used to mitigate a new permit within WRIA 40 unless Ecology first receives specific legislative authorization. Therefore, absent specific legislative authorization, Applicant 2 would be the senior-most water right applicant eligible to receive the benefit of the mitigation water. In this way, water supply will be matched with demand so that mitigation benefit is assigned to the senior-most applicant capable of benefiting from the source of the mitigation. See Figure 6-4 below.

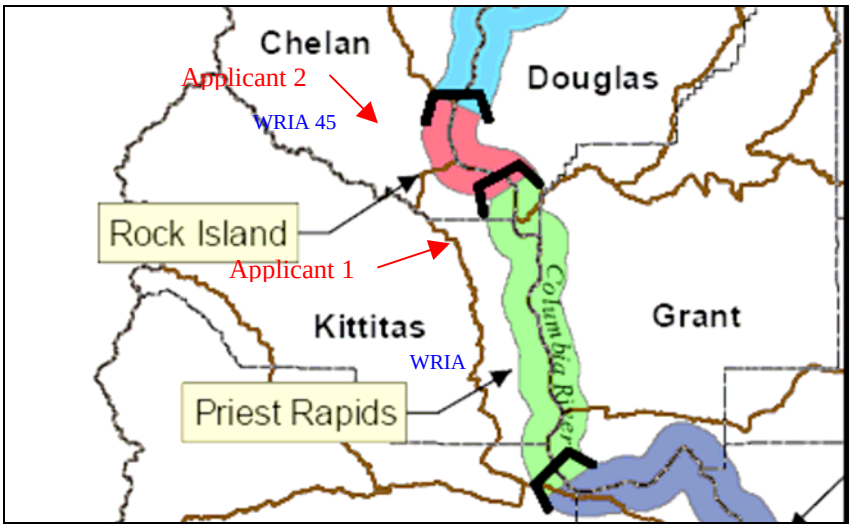


Figure 6-4. Example of applications grouped with the Columbia River one-mile corridor with WRIA permitting

6.1.13 Funding Projects Associated with a VRA

The Columbia River Management Act does not directly require Ecology to use conservation or storage funding to assist in providing mitigation water for VRAs. Ecology considered three alternatives for funding projects associated with VRAs.

> **Mitigation for all applicants.** Ecology would spend conservation project money on projects that will provide mitigation for all applicants subject to their priority date in line regardless of whether they participate in a VRA or not.
>
> **Mitigation only for applicants in VRAs.** Ecology would only spend conservation project money on projects that will provide mitigation for applicants in VRAs. Applicants not in VRAs that participate in the consultation process would provide their own mitigation.
>
> **No mitigation for applicants in VRAs.** Ecology would not spend conservation project money for mitigation associated with VRAs. VRA participants would provide their own mitigation.

RCW 90.90.010 provides that one-third of the money in the Columbia River Basin Water Supply Account is to be used for projects other than new storage, including conservation projects. The net water savings achieved through conservation funded by the state are to be transferred to the state Trust Program in the proportion funded by the state (RCW 90.90.030). The Columbia River Water Management Act directs Ecology to begin to implement the Management Program with a $10 million authorization and include funding projects that improve water use efficiency. Finally, nothing in RCW 90.90.030 regarding VRAs may be "interpreted or administered in a manner that precludes the processing of water right applications … that are not included in a voluntary regional agreement."

One of the objectives of VRAs is to develop new water supplies for out-of-stream uses (RCW 90.90.030). This in turn depends on development of mitigation for these new water rights, primarily through conservation. The second alternative is inconsistent with the objective of the law. Although limiting state funding to conservation projects associated with VRAs would not "preclude" the processing of non-VRA applications in the strictest sense (i.e., prevent the occurrence of or make impossible), it would in reality make it much more difficult for a non-VRA application to be approved. The first alternative under which Ecology would fund conservation projects that would provide mitigation to all applicants appears to be most consistent with the intent of the Columbia River Water Management Act and would avoid potential impairment of existing water rights/pending water right applications.

Preferred Alternative: The Columbia River Management Act does not directly require Ecology to use conservation or storage funding to assist in providing mitigation water for VRAs. However, Ecology will expend Account funds on projects that will provide mitigation for mainstem water right applicants, including those who participate in VRAs. Funding criteria for water supply projects will include incentives for federal, local, or private participation as a method of sharing responsibility for the costs of water supply development and to support long-term financial sustainability for the program.

6.1.14 Inclusion of Exempt Wells in Water Use Inventory

The Columbia River Management Act directs Ecology to develop a Columbia River mainstem water resources information system that includes "the total aggregate quantity of water rights issued under state permits and certificates and filed under state claims on the Columbia River mainstem and for ground water within one mile of the mainstem" (RCW 90.90.050(2)(a)). Exempt wells are not issued permits or certificates, and yet are allowed to withdraw water, and are subject to interruption in order to protect instream flows. Exempt wells are an important part of the water balance for the defined area and yet are not technically within the definition of what the information system is expected to include. Ecology considered two alternatives for including exempt wells in the inventory system.

Do not include exempt wells in the information system.

Include exempt wells in the information system.

The first alternative would adopt the most literal reading of the law: the inventory shall include water right permits, certificates and claims. However, this alternative also inserts an extra word into the law—"only." While the law requires Ecology to include the listed water rights, it does not preclude Ecology from including additional water rights information, i.e., exempt wells. RCW 90.44.050 provides that:

> "…to the extent that it is regularly used beneficially, shall be entitled to a right equal to that established by a permit issued under the provisions of this chapter: PROVIDED, HOWEVER, That the department from time to time may require the person or agency making any such small withdrawal to furnish information as to the means for and the quantity of that withdrawal: PROVIDED, FURTHER, That at the option of the party making withdrawals of ground waters of the state not exceeding five thousand gallons per day, applications under this section or

> declarations under RCW 90.44.090 may be filed and permits and certificates obtained in the same manner and under the same requirements as is in this chapter provided in the case of withdrawals in excess of five thousand gallons a day."

Thus, RCW 90.44.050 provides that beneficial use of exempt ground water withdrawals equate to a water right obtained by permit.[5]

The second alternative is a more complete accounting or estimation of water beneficially used under all water rights. This alternative is also consistent with the objective of the water resource inventory, which is to provide "the information necessary for effective mainstem [including groundwater within one-mile] water resources planning and management" (RCW 90.90.050(1)).

Preferred Alternative: Ecology will include uses of ground water exempt from permitting in the water use inventory. However, the first inventories will address only uses that rely on wells for which electronic information is available. Over time, as resources and opportunities allow, Ecology will expand the inventories to include additional exempt uses. Ecology will provide access on its website to the aggregate inventory data by 2009.

[5] A significant difference between permits, certificates, and claims is that water beneficially used under them can be changed pursuant to RCW 90.03.380 and RCW 90.44.100, whereas the Pollution Control Hearings Board has held that a water right based upon the ground water exemption cannot be changed under RCW 90.03.380:

> "An exempt use under RCW 90.44.050 is illusory for the purposes of the change statute. Transferring an exempt right would not eliminate the ability of future owners of the property to claim an exempt use in the future. In essence, granting the change in place of use would accomplish nothing more than transferring a use without affecting the water rights appurtenant to the existing place of use. Any certificate of change issued for a transfer of the exempt use would constitute a grant of a new water right beyond the scope of a change application." Knight, et al. v. Ecology, PCHB Nos. 94-61, 94-77, & 94-80 (1995).

CHAPTER 7.0 REFERENCES

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Appendix A.
Engrossed Second Substitute House Bill 2860, Columbia River Water Management Act

Chapter 90.90 RCW
Columbia river basin water supply
Chapter Listing

RCW Sections

90.90.005 Finding.

90.90.010 Columbia river basin water supply development account -- Use for storage facilities and access to water supplies -- Evaluation -- Public comment -- Use of net water savings.

90.90.020 Allocation and development of water supplies.

90.90.030 Voluntary regional agreements -- Scope and application -- Reports to legislature -- Definitions.

90.90.040 Columbia river water supply inventory -- Long-term water supply and demand forecast.

90.90.050 Columbia river mainstem water resources information system.

90.90.900 Effective date -- 2006 c 6.

90.90.005
Finding.

(1) The legislature finds that a key priority of water resource management in the Columbia river basin is the development of new water supplies that includes storage and conservation in order to meet the economic and community development needs of people and the instream flow needs of fish.

(2) The legislature therefore declares that a Columbia river basin water supply development program is needed, and directs the department of ecology to aggressively pursue the development of water supplies to benefit both instream and out-of-stream uses. [2006 c 6 § 1.]

90.90.010
Columbia river basin water supply development account — Use for storage facilities and access to water supplies — Evaluation — Public comment — Use of net water savings.

(1) The Columbia river basin water supply development account is created in the state treasury. The account may receive direct appropriations from the legislature, receipts of any funds pursuant to RCW 90.90.020 and 90.90.030, or funds from any other sources.

(2)(a) Expenditures from the Columbia river basin water supply development account may be used to assess, plan, and develop new storage, improve or alter operations of existing storage facilities, implement conservation projects, or any other actions designed to provide access to new water supplies within the Columbia river basin for both instream and out-of-stream uses. Except for the development of new storage projects, there shall be no expenditures from this account for water acquisition or transfers from one water resource inventory area to another without specific legislative authority.

(b) Two-thirds of the funds placed in the account shall be used to support the development of new storage facilities; the remaining one-third shall be used for the other purposes listed in this section.

(3)(a) Funds may not be expended from this account for the construction of a new storage facility until the department of ecology evaluates the following:

(i) Water uses to be served by the facility;

(ii) The quantity of water necessary to meet those uses;

(iii) The benefits and costs to the state of meeting those uses, including short-term and long-term economic, cultural, and environmental effects; and

(iv) Alternative means of supplying water to meet those uses, including the costs of those alternatives and an analysis of the extent to which long-term water supply needs can be met using these alternatives.

(b) The department of ecology may rely on studies and information developed through compliance with other state and federal permit requirements and other sources. The department shall compile its findings and conclusions, and provide a summary of the information it reviewed.

(c) Before finalizing its evaluation under the provisions of this section, the department of ecology shall make the preliminary evaluation available to the public. Public comment may be made to the department within thirty days of the date the preliminary evaluation is made public.

(4) Net water savings achieved through conservation measures funded by the account shall be placed in trust in proportion to the state funding provided to implement a project.

(5) Net water savings achieved through conservation measures funded by the account developed within the boundaries of the federal Columbia river reclamation project and directed to the Odessa subarea to reduce the use of ground water for existing irrigation is exempt from the provisions of subsection (4) of this section.

(6) Moneys in the Columbia river basin water supply development account created in this section may be spent only after appropriation.

(7) Interest earned by deposits in the account will be retained in the account.
[2006 c 6 § 2.]

90.90.020

Allocation and development of water supplies.

(1)(a) Water supplies secured through the development of new storage facilities made possible with funding from the Columbia river basin water supply development account shall be allocated as follows:

(i) Two-thirds of active storage shall be available for appropriation for out-of-stream uses; and

(ii) One-third of active storage shall be available to augment instream flows and shall be managed by the department of ecology. The timing of releases of this water shall be determined by the department of ecology, in cooperation with the department of fish and wildlife and fisheries comanagers, to maximize benefits to salmon and steelhead populations.

(b) Water available for appropriation under (a)(i) of this subsection but not yet appropriated shall be temporarily available to augment instream flows to the extent that it does not impair existing water rights.

(2) Water developed under the provisions of this section to offset out-of-stream uses and for instream flows is deemed adequate mitigation for the issuance of new water rights provided for in subsection (1)(a) of this section and satisfies all consultation requirements under state law related to the issuance of new water rights.

(3) The department of ecology shall focus its efforts to develop water supplies for the Columbia river basin on the following needs:

(a) Alternatives to ground water for agricultural users in the Odessa subarea aquifer;

(b) Sources of water supply for pending water right applications;

(c) A new uninterruptible supply of water for the holders of interruptible water rights on the Columbia river mainstem that are subject to instream flows or other mitigation conditions to protect stream flows; and

(d) New municipal, domestic, industrial, and irrigation water needs within the Columbia river basin.

(4) The one-third/two-thirds allocation of water resources between instream and out-of-stream uses established in this section does not apply to applications for changes or transfers of existing water rights in the Columbia river basin.
[2006 c 6 § 3.]

90.90.030

Voluntary regional agreements — Scope and application — Reports to legislature — Definitions. (Expires June 30, 2012.)

(1) The department of ecology may enter into voluntary regional agreements for the purpose of providing new water for out-of-stream use, streamlining the application process, and protecting instream flow.

(2) Such agreements shall ensure that:

(a) For water rights issued from the Columbia river mainstem, there is no negative impact on Columbia river mainstem instream flows in the months of July and August as a result of the new appropriations issued under the agreement;

(b) For water rights issued from the lower Snake river mainstem, there is no negative impact on Snake river mainstem instream flows from April through August as a result of the new appropriations issued under the agreement; and

(c) Efforts are made to harmonize such agreements with watershed plans adopted under the authority of chapter 90.82 RCW that are applicable to the area covered by the agreement.

(3) The protection of instream flow as set forth in subsection (2) of this section is adequate for purposes of mitigating instream flow impacts resulting from any appropriations for out-of-stream use made under a voluntary regional agreement, and the only applicable consultation provisions under state law regarding instream flow impacts shall be those set forth in subsection (4) of this section.

(4) Before executing a voluntary agreement under this section, the department of ecology shall:

(a) Provide a sixty-day period for consultation with county legislative authorities and watershed planning groups with jurisdiction over the area where the water rights included in the agreement are located, the department of fish and wildlife, and affected tribal governments, and federal agencies. The department of fish and wildlife shall provide written comments within that time period. The consultation process for voluntary regional agreements developed under the provisions of this section is deemed adequate for the issuance of new water rights provided for in this section and satisfies all consultation requirements under state law related to the issuance of new water rights; and

(b) Provide a thirty-day public review and comment period for a draft agreement, and publish a summary of any public comments received. The thirty-day review period shall not begin until after the department of ecology has concluded its consultation under (a) of this subsection and the comments that have been received by the department are made available to the public.

(5) The provisions of subsection (4) of this section satisfy all applicable consultation requirements under state law.

(6) The provisions of this section and any voluntary regional agreements developed under such provisions may not be relied upon by the department of ecology as a precedent, standard, or model that must be followed in any other voluntary regional agreements.

(7) Nothing in this section may be interpreted or administered in a manner that precludes the processing of water right applications under chapter 90.03 or 90.44 RCW that are not included in a voluntary regional agreement.

(8) Nothing in this section may be interpreted or administered in a manner that impairs or diminishes a valid water right or a habitat conservation plan approved for purposes of compliance with the federal endangered species act.

(9) The department of ecology shall monitor and evaluate the water allocated to instream and out-of-stream uses under this section, evaluate the program, and provide an interim report to the appropriate committees of the legislature by June 30, 2008. A final report shall be provided to the appropriate committees of the legislature by June 30, 2011.

(10) If the department of ecology executes a voluntary agreement under this section that includes water rights appropriated from the lower Snake river mainstem, the department shall develop aggregate data in accordance with the provisions of RCW 90.90.050 for the lower Snake river mainstem.

(11) Any agreement entered into under this section shall remain in full force and effect through the term of the agreement regardless of the expiration of this section.

(12) The definitions in this subsection apply to this section and RCW 90.90.050, and may only be used for purposes of implementing these sections.

(a) "Columbia river mainstem" means all water in the Columbia river within the ordinary high water mark of the main channel of the Columbia river between the border of the United States and Canada and the Bonneville dam, and all ground water within one mile of the high water mark.

(b) "Lower Snake river mainstem" means all water in the lower Snake river within the ordinary high water mark of the main channel of the lower Snake river from the head of Ice Harbor pool to the confluence of the Snake and Columbia rivers, and all ground water within one mile of the high water mark.

(13) This section expires June 30, 2012.
[2006 c 6 § 4.]

90.90.040

Columbia river water supply inventory — Long-term water supply and demand forecast.

(1) To support the development of new water supplies in the Columbia river and to protect instream flow, the department of ecology shall work with all interested parties, including interested county legislative authorities and watershed planning groups, adjacent to the Columbia river, and affected tribal governments, to develop a Columbia river water supply inventory and a long-term water supply and demand forecast. The inventory must include:

(a) A list of conservation projects that have been implemented under this chapter and the amount of water conservation they have achieved; and

(b) A list of potential water supply and storage projects in the Columbia river basin, including estimates of:

(i) Cost per acre-foot;

(ii) Benefit to fish and other instream needs;

(iii) Benefit to out-of-stream needs; and

(iv) Environmental and cultural impacts.

(2) The department of ecology shall complete the first Columbia river water supply inventory by November 15, 2006, and shall update the inventory annually thereafter.

(3) The department of ecology shall complete the first Columbia river long-term water supply and demand forecast by November 15, 2006, and shall update the report every five years thereafter.
[2006 c 6 § 5.]

90.90.050

Columbia river mainstem water resources information system.

(1) In order to better understand current water use and instream flows in the Columbia river mainstem, the department of ecology shall establish and maintain a Columbia river mainstem water resources information system that provides the information necessary for effective mainstem water resource planning and management.

(2) To accomplish the objective in subsection (1) of this section, the department of ecology shall use information compiled by existing local watershed planning groups, federal agencies, the Bonneville power administration, irrigation districts, conservation districts in the basin, and other available sources. The information shall include:

(a) The total aggregate quantity of water rights issued under state permits and certificates and filed under state claims on the Columbia river mainstem and for ground water within one mile of the mainstem; and

(b) The total aggregate volume of current water use under these rights as metered and reported by water users under current law.

(3) The department of ecology shall publish the aggregate data on the department's web site no later than June 30, 2009, and shall periodically update the data.

(4) For purposes of this section, the definition of Columbia river mainstem in RCW 90.90.030(12) shall apply and the use of the definition is solely limited to the purpose of collecting data to meet the information requirements of this section.
[2006 c 6 § 6.]

90.90.900
Effective date — 2006 c 6.

This act takes effect July 1, 2006.
[2006 c 6 § 10.]

Appendix B.
Summary Scoping Comments

Summary of Scoping Comments

Comments	Discussion/EIS Section Reference
SEPA Issues	
The EIS should be a supplement to the 2004 EIS on the Columbia River Mainstem Water Management Program.	Refer to Sections 1.4, 1.6 of the EIS
The Programmatic EIS will be inadequate for addressing specific large-scale projects, which will have their own separate SEPA review, and thus these should not be included in the programmatic EIS.	Refer to Sections 1.2 and 1.4 of the EIS
SEPA review is currently conducted for all new water rights issuances, and usually results in a Determination of Nonsignificance.	The Columbia River Management Program will involve a significant number of actions, of which some, but not all, would create probable significant environmental impacts. While it is acknowledged that issuance of individual water rights or transfers would generally involve a Determination of Nonsignificance under SEPA, many of the storage and conveyance projects envisioned by the Management Program would likely result in probable significant adverse environmental impacts. The SEPA Rules clearly state that: A threshold determination shall not balance whether the beneficial aspects of a proposal outweigh its adverse impacts, but rather, shall consider whether a proposal has any probable significant adverse environmental impacts under the rules stated in this section. For example, proposals designed to improve the environment, such as sewage treatment plants or pollution control requirements, may also have significant adverse environmental impacts (WAC 197-11-330
Since full mitigation is required by the legislation, it is inappropriate to assume that issuance of new water rights would have a significant environmental impact.	The Columbia River Management Program will involve a significant number of actions, of which some, but not all, would create probable significant environmental impacts. While it is acknowledged that issuance of individual water rights or transfers would generally involve a Determination of Nonsignificance under SEPA, many of the storage and conveyance projects envisioned by the Management Program would likely result in probable significant adverse environmental impacts. The SEPA Rules clearly state that: A threshold determination shall not balance whether the beneficial aspects of a proposal outweigh its adverse impacts, but rather, shall consider whether a proposal has any probable significant adverse environmental impacts under the rules stated in this section. For example, proposals designed to improve the environment, such as sewage treatment plants or pollution control requirements, may also have significant adverse environmental impacts (WAC 197-11-330).
It is unnecessary to complete SEPA review on issues already allowed for and administered under RCW and WAC.	Through passage of Columbia River Management Act, the legislature directed the Ecology to develop the Columbia River Management Program and authorized expenditures from the Columbia River Account for that purpose. The definition of an "action" under the SEPA Rules includes the following:

Comments	Discussion/EIS Section Reference
SEPA Issues (continued)	
	(a) New and continuing activities (including projects and programs) entirely or partly financed, assisted, conducted, regulated, licensed, or approved by agencies; [or] (b) New or revised agency rules, regulations, plans, policies, or procedures (WAC 197-11-704(1)). The Management Program currently being created under authority of the legislation fits within the definitions provided above and is subject to environmental review under SEPA. This Programmatic EIS is not intended to address existing administrative procedures and processes, only new processes and projects that were created or enabled by the legislation.
A piecemeal approach to SEPA analysis could result unless all projects occurring in the region are identified (e.g., the ECBID transfers of water to Odessa are already occurring and therefore may not be included in this analysis).	One of the principal purposes of this Programmatic EIS is to ensure that all foreseeable actions that and activities that may be undertaken as part of the Columbia River Management Program are identified and associated impacts evaluated to the extent that they are known. The East Columbia Basin Irrigation District transfers alluded to in the comment are not being undertaken as part of the Management Program.
The CSRIA VRA should not be analyzed until the EIS is complete and policies have been established. SEPA review of a VRA proposal is premature at this time.	Voluntary Regional Agreements are being analyzed at a broad, programmatic level within this document to support evaluation of associated policy and rule making options. That does not preclude the subsequent evaluation of the more narrowly focus Columbia Snake River Irrigators' VRA proposal within the same document. The SEPA Rules state that: "The SEPA process shall be integrated with agency activities at the earliest possible time to ensure that planning and decisions reflect environmental values, to avoid delays later in the process, and to seek to resolve potential problems (WAC 197-11-055).
The implementation of VRAs should use rulemaking procedures.	Rule making is being considered by Ecology for resolution of various policy issues associated with implementation of the Columbia River Management Program. Refer to Chapter 6 for additional discussion of rulemaking.
SEPA analysis now would be incomplete for projects that will require further NEPA and ESA analysis at a later time. The SEPA analysis would need to incorporate the results of the NEPA and ESA analyses.	WAC 197-11-055 states that: The lead agency shall prepare its threshold determination and environmental impact statement (EIS), if required, at the earliest possible point in the planning and decision-making process, when the principal features of a proposal and its environmental impacts can be reasonably identified. The fact that proposals may require future agency approvals or environmental review shall not preclude current consideration, as long as proposed future activities are specific enough to allow some evaluation of their probable environmental impacts.

Comments	Discussion/EIS Section Reference
SEPA Issues (continued)	
	Thus, initial programmatic review of projects that will require additional SEPA and NEPA analysis would appear to be consistent with the SEPA rules. See also Sections 1.2, 1.4 of the EIS.
Alternatives	
Alternatives should include other potential future water scenarios based on different actions by neighboring jurisdictions, including Canada, tribal lands, and surrounding states.	The state of Washington regularly participates with representatives of the states of Idaho, Montana, and Oregon in discussions over governance of the Columbia River. The Columbia River Management Program was developed in consultation with that group, and it is anticipated that discussions will be ongoing in regard to achievement of regional consensus over management of the river system. It is the intent of the state of Washington to engage the governments of Canada and British Columbia in discussions over Columbia River management; however, in recognition of the federal government's role in addressing transboundary issues, those discussions will not be formally initiated until consultation with appropriate federal agencies.
When project and non-project actions are intertwined, SEPA requires examination of reasonable alternatives to the non-project action.	SEPA requires evaluation of "reasonable alternatives" regardless of whether the action is project or nonproject. In the case of the Columbia River Management Program development, the limitations placed by the legislative enabling act preclude development of full stand-alone alternatives to the program with the exception of the no action alternative. Where appropriate, policy and procedural options within the scope of the enabling act are considered. In addition, alternatives for projects envisioned under the act are evaluated to the extent currently possible.
"Alternative levels of precaution" should be analyzed when dealing with uncertainties in supply and demand.	The state of Washington regularly participates with representatives of the states of Idaho, Montana, and Oregon in discussions over governance of the Columbia River. The Columbia River Management Program was developed in consultation with that group, and it is anticipated that discussions will be ongoing in regard to achievement of regional consensus over management of the river system. It is the intent of the state of Washington to engage the governments of Canada and British Columbia in discussions over Columbia River management; however, in recognition of the federal government's role in addressing transboundary issues, those discussions will not be formally initiated until consultation with appropriate federal agencies.
Analyze alternative of buying water rights, or existing farms.	Refer to Section 2.4.3 of the EIS.
Analyze different methods of defining "consumptive use".	Refer to Section 2.2 of the EIS.
Analyze the use of reclaimed municipal water as an alternative.	Reclaimed water is included as a component of municipal conservation, as described in Section 2.1.2 of the EIS.
The forecast of demand should be quantified based on actual current use and should take into consideration actual demand and potential climate change.	Refer to Section 2.1.2.4 of the EIS.
A range of water supply alternatives for meeting projected consumptive use demand and instream flow protection should be assessed. Alternatives should be based on economic and demographic trends	Refer to Section 2.1.2.4 regarding demand forecasting, and Section 2.2.5 and Chapter 6 for discussions on how instream flows affects water rights.
Assess other alternatives for assisting Odessa Subarea irrigators (in addition to delivering CBP water to the Subarea).	See Section 2.1.2.1.

Comments	Discussion/EIS Section Reference
Storage	
Consider raising the height of Banks Lake by one foot in the analysis.	As part of the Odessa Special Study, several different proposals affecting the height and amount of draw down of Banks Lake will be analyzed. At least one proposal will be to store additional water (raise the level) in Banks Lake, while other proposals will evaluate drawing down Banks Lake to lower levels than current practices.
The study should include raising Lake Roosevelt by increasing the height of Grand Coulee Dam.	According to the U.S. Bureau of Reclamation, raising Grand Coulee Dam is not feasible. The dam's design would not safely accommodate construction of a lift above the current in-place structure.
Examine aquifer storage (ASR) and surface storage options that include water from the Columbia and Spokane Rivers. Also, examine reclaimed water as mitigation for surface and subsurface flows in the Crab Creek drainage.	Aquifer storage projects are a subset of storage projects that would be potentially eligible for funding under the Columbia River Management Program. Ecology is currently considering several aquifer storage proposals that are at a conceptual stage, including a proposal by the city of Kennewick to augment its public water. See Section 2.1.2.1.
Analyze the feasibility of transporting a portion of the water from the proposed Hawk Creek reservoir to the headwaters of Crab Creek.	Hawk Creek is one of the potential reservoir sites being evaluated as part of the Columbia River Mainstem Off-Channel Storage Appraisal Study. This study is being conducted by the Bureau of Reclamation as part of the Columbia River Management Program. The current appraisal study is evaluating the general suitability of the Hawk Creek site as a potential reservoir. Options concerning how and to where water would be discharge from the Hawk Creek site will be evaluated in a future feasibility study if that site advances beyond the appraisal level.
The EIS should include an examination of ASR and surface discharge options for Sinking Creek.	Such a proposal is not currently under consideration by Ecology. However, consistent with Section 16 of the 2004 Memorandum of Understanding between Bureau of Reclamation, the state of Washington, and the Columbia Basin Irrigation Districts, Ecology has indicated a willingness to explore the potential for an aquifer recharge project for the Odessa area once the current ground water replacement projects have been initiated.
The analysis should include consideration of small-scale storage projects along the Columbia River Mainstem and its tributaries.	Ecology is open to considering all proposals that meet the objectives of the Columbia River Management Act. Projects will be evaluated for funding eligibility using criteria developed under the program implementation process (see Chapter 6).
Consider operating Lake Roosevelt for the benefit of instream resources in the EIS.	The Bureau of Reclamation has filed two water rights applications with Ecology to put a total of 132,000 acre-feet of water stored behind Grand Coulee Dam under Reclamation's existing storage right to beneficial use. One of the applications is to put 82,500 acre-feet to beneficial use on an annual basis. Of that amount, 27,500 acre-feet would be dedicated to instream flow augmentation downstream of Grand Coulee Dam. The other application is to put 50,000 acre feet to beneficial use during drought years with 17,000 acre feet of that amount to be dedicated to instream flow augmentation downstream of Grand Coulee Dam. This proposal is discussed in Section 2.5.1 and Chapter 5 of the EIS.

Comments	Discussion/EIS Section Reference
Storage (continued)	
Is Potholes Reservoir Supplemental Feed Route intended to offset the effects of recently implemented conservation measures on ground water feeding the reservoir, or is it intended to facilitate irrigation in the Second Half of the Columbia Basin Project?	The Supplemental Feed Route Project is intended to provide the Bureau of Reclamation with increased operation flexibility in moving irrigation water from Banks Lake to Potholes Reservoir. Currently, most of the flow to Potholes Reservoir is through the East Low Canal. The Supplemental Feed Route Project will provide an alternative route to the Potholes Reservoir and ensure a more reliable supply to the South Columbia Basin Irrigation District. In the future, the Supplemental Feed Route could also play a role in the some of the alternatives under consideration as part of the Bureau of Reclamation's Odessa Special Study Project.
The Moses Coulee storage site has risen to the level of a "project", and thus requires SEPA review.	The Moses Coulee site was evaluated in the Pre-Appraisal Report prepared by Ecology and Reclamation in 2005. It was not selected as one of the four sites that will be evaluated by Reclamation in an Appraisal Report. Therefore, no SEPA review of the site is warranted.
The evaluation should include an alternative that uses 100% of new water that is a result of altering operations of existing storage facilities to in-stream uses.	Refer to the discussion of Alternatives 2C-1, 2C-2 and 2C-3 in Section 2.2 and in Chapter 6.
Explain how storage on tributaries will be addressed in the mainstem program	Proposals for storage projects in the tributaries of the Columbia and Snake Rivers may be eligible for funding from the Columbia River Account provided that they provide some tangible benefits to the Mainstem Columbia and Snake Rivers. Such proposals are currently being inventoried under provisions of Section 5 of the Columbia River Management Act.
Conservation	
Analyze an alternative that does not deliver Columbia Basin Project water to the Odessa Subarea. This should include limited or different farming.	Refer to Section 2.1.2.2 for a discussion of Conservation. Refer to Section 2.1.2.1 for a discussion of alternatives considered for Odessa.
Analyze a demand-management program as an alternative to development of a new water supply, and include the use of pricing mechanisms as a demand management approach.	Refer to Chapter 1 for a discussion of the Columbia River Water Management Act and accompanying requirements, which includes a requirement to address storage options in addition to demand management. Se also Section 2.4.1 regarding a conservation only approach.
Develop a "sustainable agriculture" alternative (i.e., smaller scale, lower chemical use, higher water efficiency and soil building practices).	Sustainable agriculture practices are included in the Conservation Component described in Section 2.1.2.2.
Analyze an alternative that includes aggressive conservation and efficiency measures in the Odessa Subarea.	Refer to Section 2.1.2.2 for a discussion of Conservation. Refer to Section 2.1.2.1 for a discussion of alternatives considered for Odessa.
Irrigation scheduling (IWM) does not qualify for conservation funding under the CRWMP, and it should be considered.	If sufficient quantities of consumptive water savings can be achieved through IWM, and those savings can be placed in trust, Irrigation Water Management could be eligible for funding through the Columbia River Account.
Short-term solutions, such as the Conservation Reserve Enhancement Program, BPA power buybacks, and IWM, should be explored while long-term solutions are sought.	Refer to Section 2.1.2.2 for a discussion of Conservation components, and Section 2.5 for a discussion of early action items being considered.
The EIS should address whether water conservation in the watersheds could be transferred to and serve as mitigation for water use from the mainstem of the Columbia River.	See Sections 6.2.4 and 6.2.7.
Conservation and reclaimed water programs should be evaluated prior to implementation of a new storage project.	The legislation authorizes both storage and conservation projects. The legislation does not require that storage projects are contingent on conservation programs.

Comments	Discussion/EIS Section Reference
Conservation (continued)	
Require new water right recipients to use the best available technology.	This requirement is not included in the legislation, but is one of the things that Ecology can consider in processing water rights.
The EIS should evaluate the useful life of conservation projects, and weigh alternatives for substituting other methods when they become obsolete.	This level of analysis will be conducted at a project level when specific conservation projects are proposed.
Only those lands closest to the East Low Canal, or those with highly efficient irrigation practices, should receive Columbia River water.	The recipients of Columbia River water will be determined as part of the on-going Odessa Subarea studies.
Voluntary Regional Agreements (VRAs)	
How will "no net loss" of in-stream flow during the specified months be ensured for approved VRAs?	Diversions associated with Voluntary Regional Agreements would be required to be measured and reported to Ecology. Ecology is developing additional capacity for verification of diversions.
How will VRAs under the Management Program affect flows outside of the specified months, and will these effects be addressed and mitigated?	The legislation is clear that instream flow mitigation for VRAs is only during July and August on the Columbia River and April to August on the Snake River. Ecology can and will consider the Impacts of VRAs on existing water rights. See the discussion of water quantity impacts in Section 4.1.3.
What sort of monitoring is planned, and what contingency actions will be required, for VRAs?	The ability to measure diversions, monitor trust water acquisitions, and protect state water trust acquisitions will be conditioned through both funding agreements and through Voluntary Regional Agreements.
Is there a timeframe to submit a VRA?	There is no specific time frame for submitting a Voluntary Regional Agreement to Ecology, however, the statutory provision for establishment of VRAs expires June 30, 2012.
How is the term "regional" defined as it apples to a VRA? Is it by WRIA, or some other parameter?	The term "regional" is not defined in statute, but would be determined on a case-by-case basis through each specific Voluntary Regional Agreements that is proposed
What are the rules, or criteria, for a VRA? Does the 4-part test still apply for all water rights issued under a VRA?	The criteria for Voluntary Regional Agreements are described in Section 4 of the Columbia river Management Act, including the "no negative impact" on flows restriction. The four part test as well as other fundamental elements of state water law still apply. Refer to section 5.1.1.5 for a discussion of impacts from VRAs on water rights.
How will the Management Program affect applications that are not part of a VRA?	Refer to Section 6.x.x.x for a discussion of the impacts from the Management Program on processing Water Rights applications.
No negative impact on in-stream flow should be defined as no diminution of flow below the point of diversion, with mitigation at or above the point of diversion.	Refer to Section 6.2.7.
The CSRIA VRA proposal cannot be processed until the policies for the program have been formulated. There is a danger that the analysis will be geared toward the CSRIA proposal and not look at a broad range of proposals.	The ability to measure diversions, monitor trust water acquisitions, and protect state water trust acquisitions will be conditioned through both funding agreements and through Voluntary Regional Agreements.
Ecology should establish basic rules of mitigation, the types of mitigation practices that are acceptable, to be applied when reviewing VRAs. The EIS should evaluate the level of protection these rules would provide.	The mitigation standard for a Voluntary Regional Agreement is established in Section 4 of the legislation. There is also an alternative under consideration to help further define that mitigation. See Sections 6.2.5, 6.2.6, 6.2.9, 6.2.10, and 6.2.11.

Comments	Discussion/EIS Section Reference
Voluntary Regional Agreements (VRAs) (continued)	
The EIS should include an evaluation of conditioning VRAs on attaining flow levels in the FCRS Biological Opinion.	For water rights to fill new off-channel storage facilities, mitigation and instream flow requirements would be developed through environmental review and consultation. The Biological Opinion flow would be a consideration in review of specific projects.
Mitigation water must be added to the river from the same pool as the diversion point; make no assumption that mitigation water would pass downstream of a dam.	Refer to the discussion in Section 6.2.8.
It is premature and inappropriate for the programmatic EIS to encompass a specific voluntary regional agreement.	Voluntary Regional Agreements are being analyzed at a broad, programmatic level within this document to support evaluation of associated policy and rule making options. That does not preclude the subsequent evaluation of the more narrowly focus Columbia Snake River Irrigators' VRA proposal within the same document. The SEPA Rules state that: "The SEPA process shall be integrated with agency activities at the earliest possible time to ensure that planning and decisions reflect environmental values, to avoid delays later in the process, and to seek to resolve potential problems" (WAC 197-11-055).
Surface Water/Instream flows	
Moses Lake could benefit from the Supplemental Feed Route project by additional flushing with clean water.	See Section 5.2.
The EIS should discuss the timing of water diversion and the effects of timing limitations on agriculture.	Timing of diversions may be considered as a form of mitigation for stream flow impacts. See Section 6.2.1.
The EIS should discuss flow velocity and the velocity buffering effect, especially in relation to the release of 87,000 acre-feet of water from McNary Dam, as recently required.	The Biological Opinion flows are discussed in Section 3.6.3.6.
Clarify when and if trans-WRIA transfers will be allowed.	The only limitation placed on trans-WRIA transfers under the Columbia River Management Act is found in Section 2 of the Act, which states that: "Except for the development of new storage projects, there shall be no expenditures from this account [Columbia River Account] for water acquisition or transfers from one water resource inventory area to another without specific legislative authority." Trans-WRIA transfers are discussed in Section 6.3.2. Trans-WRIA acquisitions and transfers funded through a source other than the Columbia River Account are not affected.
Clarify how direct withdrawals from the Columbia River will be treated with regard to the WRIA boundaries.	See Section 6.2.3.
Include Canada and other states when looking at flow projections.	The state of Washington regularly participates with representatives of the states of Idaho, Montana, and Oregon in discussions over governance of the Columbia River. The Columbia River Management Program was developed in consultation with that group, and it is anticipated that discussions will be ongoing in regard to achievement of regional consensus over management of the river system. It is the intent of the state of Washington to engage the

Comments	Discussion/EIS Section Reference
Surface Water/Instream flows	
	governments of Canada and British Columbia in discussions over Columbia River management; however, in recognition of the federal government's role in addressing transboundary issues, those discussions will not be formally initiated until consultation with appropriate federal agencies.
The EIS should consider ground and surface water connectivity.	The Columbia River Management Act did not alter the body of existing water law. Ground and surface water continuity will continue to be considered in all water right decisions.
The EIS should discuss the water quality impacts of surface water storage.	Any proposed surface water storage facility proposed and/or funded under the Columbia River Management Act will undergo environmental review under the State Environmental Policy Act and, potentially, the National Environmental Policy Act. All probable significant environmental impacts, including those to water quality, will be identified and evaluated. Refer to section 4.1.1.3.
The EIS should provide equal emphasis on instream flows enhancement as on out-of-stream uses.	Refer to Section 4.1.1.3.
The EIS should evaluate methods to protect conserved water "instream".	Refer to Section 2.1.2.2, which describes the conservation component. Surface water impacts are discussed in Sections 4.1.1.3 and 5.1.1.3.
Conservation projects should be evaluated from the perspective of protecting instream flows as the baseline.	See Chapter 6.
If instream flows are going to be improved, instream storage is needed to keep up the flow.	Refer to Section 4.1.1.3.
Assess how this state management program will relate to flows prescribed in the biological opinion for FRCPS.	For water rights to fill new off-channel storage facilities, mitigation and instream flow requirements would be developed through environmental review and consultation. The Biological Opinion flow would be a consideration in review of specific projects.
The PEIS should lay the groundwork for establishing new flows, and should discuss how instream flows will be protected and restored as part of the program	Establishing new instream flows is beyond the scope of Columbia River Management Program established by the legislature. Instead of establishing or authorizing establishment of new instream flows, the legislature identified the mitigation standard for Voluntary Regional Agreements (no negative impact on Columbia River mainstem instream flows in the month of July and August) and mandated that 1/3 of new storage be dedicated to instream flow improvement. Water right applications that are not addressed by Voluntary Regional Agreements or storage would be subject to instream flows or mitigation measures determined through consultation under the existing Columbia River Consultation Rule.
The PEIS should assess potential impacts associated with removing water from the Columbia River without mitigation, outside of the July-August timeframe.	See Section 6.2.4 and 6.2.7.
Ground Water	
Lincoln County stratigraphy is critical to understanding ground water issues in the Columbia Basin. The state should be encouraged to fund stratigraphy and aquifer mapping.	Comment noted. Refer to Section 3.5 for a discussion of existing ground water conditions.
The EIS should evaluate the effect of BMPs that might be implemented under the program on habitat, especially with regard to the value of irrigation seepage for aquifer recharge.	Refer to Section 4.1.2.6 for a discussion of impacts of conservation projects on wildlife and habitat.

Comments	Discussion/EIS Section Reference
Ground Water (continued)	
The Odessa Subarea water depth information is 25 years old and should be updated.	Refer to Section 3.5.3 for a discussion of current ground water conditions in the Odessa Subarea. Updated information will be added as it is available.
How much water is being contributed (by both surface and ground water) from WRIA 43 to the Potholes Reservoir as "natural recharge"?	Comment noted. This is out of scope of the EIS.
The EIS should examine the problem of illegally constructed wells and the degree to which these are contributing to the problems in the Odessa area.	It is acknowledged that illegally constructed wells could be contributing to problems in the Odessa area, however, a definitive analysis of such problems in beyond the scope of the Management Plan EIS.
Water Rights/Water Supply	
Would it be necessary to provide "new water" if permits are to be issued from the John Day/McNary pools as described in WAC 173-531A?	Yes. Chapter 173-531A is subject to the consultation process to determine mitigation and flow requirements. Reserved water under Chapter 173-531A must be appropriated through new permits (See WAC 173-531A-060).
The EIS should review Tribal water rights.	Refer to Section 3.6.3.3.
How will the Management Program affect applications for ground water located more than a mile from the main channel of the Columbia or Snake Rivers?	The legislation requires consideration of ground water within a mile of the mainstem rivers. See Section 6.2.8 for a discussion of how the one mile will be measured.
The baseline for water use should be July 1, 2006.	Ecology is limited by the legislation in how it can implement the program. The effective date of the Columbia River Water Management Act is July 1, 2006. Water must meet the requirements of RCW 90.42 for beneficial use.
VRAs may represent a departure from existing rules of prior appropriation in the processing of water rights applications.	Refer to Section 5.3 for a discussion of impacts to water rights from VRAs.
Trust water rights should be used for the twin goals of serving out-of-stream and instream uses.	See the discussion of Alternatives 2C in Chapter 6.2.
Water supply needs should be assessed for out-of-stream consumptive use necessary to meet the public interest as part of the programmatic EIS.	Refer to Section 4.1.1.3. and 4.1.2.3.
Fish and Wildlife	
Full mitigation for impacts to inundated lands should be included as part of the total project costs.	Project costs will be incorporated into feasibility and cost/benefit evaluations conducted by Reclamation, and are not included in this SEPA evaluation.
The EIS should map all habitat types in the basin, and identify which will be impacted by the Management Program.	Refer to Section 3.7.
Impacts to wetlands and potholes (including conversion to open water for storage projects) should be considered in the EIS.	Refer to Section 4.1.1.6 and Section
The EIS should address the potential for conversions from native vegetation to new agricultural uses, including the loss of shrub-steppe habitat and attendant impacts to species dependent on that habitat.	Refer to Section 4.1.1.6.
The EIS should address the effect of conversions of land use from agricultural to municipal uses on seasonality of flows.	Refer to Section 4.1.1.8.
The EIS should analyze risk to salmon from water impacts that result from large off-channel storage projects, including temperature, flow and seasonality.	Refer to Section 4.1.16.
The EIS should address "false attraction" from high flows discharged to tributaries.	Refer to Section 4.1.1.6.
The EIS should consider the benefits of spill versus power generation with regard to dispensation of water allocated for in-stream flow augmentation.	Refer to Sections 4.1.1.6 and 4.1.1.12.

Comments	Discussion/EIS Section Reference
Fish and Wildlife (continued)	
The EIS should consider the costs of monitoring, evaluation and adaptive management for every mitigation alternative.	Cost benefit evaluations will be conducted as part of feasibility evaluations conducted by Reclamation.
The EIS should discuss the flow velocity and temperature relationship to fish health and survival.	Refer to Section 4.1.1.6
Current drawdown for salmon has impacts on carp spawning and spotted frog survival in Kettle River area, which should be evaluated in the EIS.	Refer to Section 4.1.1.6
The EIS should examine the full range of issues discussed in the NAS report and how they can be solved.	Section 4.1.1.6 includes a discussion of those issues included in the NAS report that are relevant to this programmatic evaluation.
The EIS should describe how the Management Program would comport with intertribal fish restoration plans, statutory in-stream flows, and relevant court cases regarding fish habitat protection.	Refer to Section 4.1.1.6 and Section 5.1.1.6.
The EIS should examine the importance of high flows for river health, including consideration of established flow targets for spring and summer migration periods.	Refer to Section 4.1.1.6 and Section 5.1.1.6.
The EIS should address the trout population in Crab Creek and any impacts to that population that might occur as result of the Alternative Feed Route project for Potholes Reservoir.	Refer to Section 4.1.1.6 and Section 5.1.1.6
What sort of economic studies will be done with regard to endangered species?	Socioeconomic evaluations associated with the Management Program are included in Section 4.1.1.7 and 5.1.1.7.
The EIS should examine ways to use an incentive-based program to reward sound stewardship to enhance habitat or species.	Mitigation measures for fish-related impacts associated with the Management Program are included in Section 4.1.1.6. Incentive-based programs for habitat enhancement are not specifically included, but are not precluded from this discussion.
The EIS should assess how this state management program will relate to the biological opinion for FRCPS.	For water rights to fill new off-channel storage facilities, mitigation and instream flow requirements would be developed through environmental review and consultation. The Biological Opinion flow would be a consideration in review of specific projects.
Land Use	
The EIS should address the potential for conversions of land use to new agricultural uses.	Refer to Section 4.1.1.8 and 5.1.1.8.
The EIS should address the potential for conversions of land use from agricultural to municipal uses.	Refer to Section 4.1.1.8 and 5.1.1.8.
Economics	
The EIS should consider economic impacts that could result from adversely affecting hunting, fishing and wildlife watching.	Refer to Section 4.1.1.7 and 5.1.1.7.
The EIS should conduct a robust economic analysis of all alternatives, and should use realistic and peer-reviewed construction cost assumptions.	A detailed economic analysis of all proposed storage alternatives will be conducted by Reclamation and others as part of site-specific evaluations. A programmatic evaluation appropriate for SEPA review is included in Section 4.1.1.7 and 5.1.1.7.
The EIS should evaluate the impacts of the program on farmers who rely on irrigation, and on businesses who rely on those farmers.	Refer to Section 4.1.1.7 and 5.1.1.7.
The document should consider the independent analysis by Texas A&M, and consider the economic impact on all growers in the State, not just those who rely on Columbia River water.	This discussion is included in Section 4.1.1.7 and 5.1.1.7.
The economic analysis should not minimize the economic importance of salmon.	Economic impacts to salmon are included in Chapters 4 and 5.

Comments	Discussion/EIS Section Reference
Economics (continued)	
The EIS should discuss the cost of subsidies for agricultural water users.	Refer to Section 4.1.1.7 and 5.1.1.7 for a programmatic discussion of this issue; this SEPA EIS does not include a cost-benefit analysis.
The EIS should discuss social and economic equity issues related to what groups would benefit most from the Management Program.	Refer to Section 4.1.1.7 and 5.1.1.7.
Recreation	
The EIS should address impacts to hunting, fishing, and wildlife watching, and examine alternatives for avoiding adverse impacts.	Refer to Section 4.1.1.11 and Section 5.1.1.11.
Drawdowns in Lake Roosevelt below elevation 1280' could affect boat access and expose contaminated sediments during peak tourist season.	Refer to Section 4.1.1.11 and Section 5.1.1.11
The EIS should investigate more recreation opportunities associated with wildlife, to get more people out to the country to have fun.	Refer to Section 4.1.1.11 and Section 5.1.1.11
Public Services and Utilities	
The EIS should consider storage tanks versus reservoirs in canyons, and should consider fire control equipment in planning.	Ecology has not yet entertained specific proposals for tanks in lieu of reservoirs, but would be open to such proposals provided they meet the funding criteria that will be established under the Management Plan.
Cultural Resources	
Erosion from additional drawdowns in Lake Roosevelt below elevation 1280' can expose cultural resources to vandalism and other impacts. The costs for enforcement of programs to protect cultural resources should also be considered.	Refer to Section 5.1.1.9. This SEPA EIS does not include a cost benefit evaluation.
The EIS should examine the effects the Management Program could have on tribal fishing and water rights.	Refer to Section 4.1.1.9 and 5.1.1.9, as well as 4.1.1.6 and 4.1.15.
Activities considered under this program could impact cultural resources. Consultation with tribes should be included in the process.	Refer to Section 4.1.1.9 and 5.1.1.9.
Investigations for the supplemental feed routes need to be more than records searches, since these areas have not been studied for archaeology.	Site specific investigations will be part of the NEPA environmental evaluations conducted by Reclamation.
Others	
The EIS should analyze the cumulative impacts of development of the Second Half of the CBP.	The development of the second half of the Columbia Basin Project is not be considered at this time. If Reclamation proposed to develop the Second Half in the futures, NEPA environmental evaluations will be required which will include cumulative impacts.
Ecology should engage in rulemaking to establish policies for the program.	Rule making is being considered by Ecology for resolution of various policy issues associated with implementation of the Columbia River Management Program.
Hydroelectric generation should be considered as part of the Supplemental Feed Route for the Potholes Reservoir project.	The only Supplemental Feed Route alternative with the potential for hydropower generation is the W20 route. The potential for hydropower will be considered by Reclamation as part of the feasibility study for the alternative routes.
The Plain Talk Principles should be used to produce the EIS.	The EIS has been prepared with the intention of being as understandable as possible.
The rulemaking process should be used for developing new BMP requirements.	Rule making is being considered by Ecology for resolution of various policy issues associated with implementation of the Columbia River Management Program.
Any requirement for metering or reporting of all surface or ground water should be addressed by the Legislature.	Section 7 of the Columbia River Management Act provides funding for metering and reporting of ground and surface water use. Section 6 of the Act provides authority to establish a Columbia River Water Resources Information

Comments	Discussion/EIS Section Reference
Others (continued)	
	System under which metering and reporting could be required. Additional statutory authority for metering and monitoring is provided under RCW 90.03.360 and RCW 90.44.450.
How will committee members be chosen, and who will be invited?	Since by statute, development and implementation of the Columbia River Management Program is primarily the responsibility of the Department of Ecology, the members of the Policy Advisory Committee members were appointed by the Director of that department in collaboration with the Governor's Office. In making such appointments, the director attempted to secure participation of a range of tribal and local governments, federal and state agencies, and stakeholder groups to assist Ecology in the implementation of the Act. While a primary consideration in appointing members to the group was to attempt to achieve an appropriate balance among various interests involved in implementation of the Act, consideration was also given to limiting the Policy Advisory Group to a size that would promote efficient operation of the group. See the list of Policy Advisory Committee members at http://www.ecy.wa.gov/programs/wr/cwp/crwmp__info.html
Will the Management Program be based on scientific parameters?	
Will the implementation plans for WRIA planning be addressed by the Management Program?	The EIS includes a discussion of storage projects proposed by WRIAs. See Section 3.4.1.5
Ensure county commissioners and WRIA planning units are involved in planning and implementation.	Following the enactment of the Columbia River Management Act, Ecology met with eastern Washington county commissioners to discuss the most appropriate venue for their participation in the development and implementation of the Columbia River Management Program. As a result of those discussions, the County Commissioners Policy Advisory Group has been established by the Washington State Association of Counties in cooperation with Ecology. This group has established a charter and is consulting with Ecology on an ongoing basis. Ecology also created the Columbia River Water Resources Management Program Policy Advisory Group (PAG) facilitate gathering of input from a range of tribal and local governments, federal and state agencies, and stakeholder groups regarding the implementation of the Act. County commissioners currently have 3 representatives on the Policy Advisory Group. Other local governments, including irrigation districts, cities, and public utility districts are also represented.
Will an agreement be signed between Ecology and the counties, similar to that with Colville Tribe?	No "agreements" between Ecology and counties are contemplated at this time, but the legislation does not foreclose on such agreements as a future option.
PEIS and rulemaking should provide basic guidance on acceptable mitigation practices.	Appropriate mitigation measures for project impacts are described in Chapters 4 and 5. Mitigation for instream flows are discussed in Chapter 6.
Regulations by Ecology, like agricultural burning and spray buffers, are driving farmers off their land. This is leading to "trophy cabins" and big box stores, which are harder on the land than farming. Further regulation will lead to property rights initiatives. If water is not available, there will be more farmers forced off, which will mean more development.	Comment noted.

Appendix C.
Notice of Adoption of the Final Environmental Impact Statement for Watershed Planning Under Chapter 90.82 RCW

NOTICE OF ADOPTION OF EXISTING ENVIRONMENTAL DOCUMENT

Description of current proposal: Columbia River Management Program Draft and Final Programmatic Environmental Impact Statement (EIS)

Proponent: Washington State Department of Ecology

Location of current proposal: Columbia River Basin, State of Washington

Title of document being adopted: Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW

Date adopted document was prepared: July 18, 2003

Description of document (or portion) being adopted: The portions of the document being adopted include Section 1.5 - Watershed Planning Process; Section 1.6 - State Rule-making Process; Chapter 3.0 - Laws, Regulations and Programs Related to Watershed Planning; Chapter 4 - Affected Environment; Section 5 - Alternatives; and Section 6 – Impacts and Mitigation Measures.

If the document being adopted has been challenged (WAC 197-11-630), please describe: N/A

The document is available to be read at (place/time): The Final Environmental Impact Statement for Watershed Planning under Chapter 90.82 RCW was distributed to agencies with jurisdiction, Tribes, and other interested parties in July 2003. The document may be viewed at Department of Ecology offices during normal business hours (8:00 a.m. to 5 p.m., Monday – Friday) at the following locations:

Department of Ecology Headquarters
300 Desmond Drive
Lacey, WA 98503

Department of Ecology Central Regional Office
15 West Yakima Ave -- Suite 200
Yakima, WA 98902-3452

Department of Ecology Eastern Regional Office
N. 4601 Monroe
Spokane, WA 99205-1295

The adopted document can be viewed on-line at: http://www.ecy.wa.gov/biblio/0306013.html

EIS REQUIRED: The lead agency has determined the Columbia River Management Program proposal is likely to have a significant adverse impact on the environment. To meet the requirements of RCW 43.21C.030(2)(c), the lead agency is adopting the portions of document described above, in addition to preparing a stand-alone Draft and Final EIS for the proposal, to fulfill its requirements under SEPA.

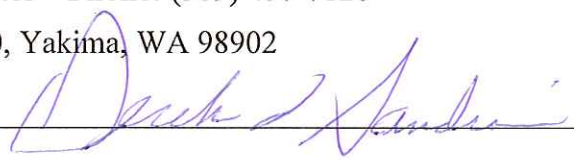
The lead agency has determined that this document is appropriate for this proposal and will accompany the proposal to decision makers.

Name of agency adopting document: Washington State Department of Ecology

Responsible Official: Derek I. Sandison

Position/title: Central Regional Director **Phone:** (509) 457-7120

Address: 15 W Yakima Avenue #200, Yakima, WA 98902

Date: October 5, 2005 **Signature**: 

Appendix D.
Water Rights Summary

Water Rights Summary

Within the Columbia River Basin, three major groups of water rights will affect any decisions on future water plans: state-based water rights, federal tribal reserved water rights, and non-tribal federal reserved water rights.[1] This section describes state-based water rights, federal tribal reserved water rights, along with the special water rights issues that affect the Columbia River Basin, including non-tribal federal reserved rights. In making decisions regarding new sources of water in the basin, it is important to understand how these various water rights were and are created and the relationship between them. The guiding principles are that rights "first-in-time are first-in-right" and water right decisions may not result in impairment of existing rights.

State-Based Water Rights

Establishing a Water Right

Prior to enactment of the Surface Water Code in 1917 and the Ground Water Code in 1945, water rights could be acquired by simply putting water to beneficial use or by posting a notice near the point of diversion, and perhaps filing a copy with the county auditor, and then beginning construction on project works. Riparian rights were acquired on the basis of ownership of land adjacent to or traversed by a watercourse. Riparian rights that were not beneficially used by 1932 were lost (*Ecology v. Abbott* 103 Wn.2d 686 (1985)). The key to preserving pre-code water rights, besides continuing to beneficially use the water through the years, was to file a water right claim under the Claims Registration Act (RCW 90.14.041). The claims registration was first opened in 1974 and again, most recently, in 1997-1998 (RCW 90.14.068). If a person holding a pre-code water right failed to file a claim to that water, the right was lost. A water right claim is not the same as a water right. The claim preserves whatever right may exist, but the final validity of the claim may only be determined in an adjudication by the court.

Since adoption of the Surface Water Code, in order to receive a new water right, a person must first file an application with Ecology to appropriate waters of the state. Ecology shall issue a permit if it makes the following four findings: (1) the proposed use of water is for a beneficial purpose; (2) there is water available for appropriation; (3) the proposed use would not impair existing water rights; and (4) the proposed use would be in the public interest (RCW 90.03.290).

Beneficial uses include such things as stock watering; industrial, commercial, agricultural, and domestic use; irrigation; and fish and wildlife maintenance (RCW 90.54.020(1)). Water availability has both a technical and a legal meaning. Technically, there must be water physically available from the source to meet the uses or needs proposed for the requested quantity of water. Legally, there is water available only if it can be appropriated without impairing existing water rights, either by reducing the quantity available to satisfy those rights or by reducing the quality of the water available. When the facilities have been constructed and the water has been put to beneficial use, the water right is said to have been perfected. Ecology then issues a water right certificate for the purpose of use, place of use, point of diversion or withdrawal, period of use, and quantity of water that has been put to beneficial use.

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[1] The Reclamation holds a large quantity of water rights for the Columbia Basin Reclamation Project. Water rights held by Reclamation are state-based water rights (Chapter 90.40 RCW).

Maintaining a Water Right

With few exceptions, when a water right is perfected, it must continue to be used or it will be considered lost through abandonment or relinquishment (commonly referred to as the "use-it-or-lose-it" provision). Abandonment is a common law doctrine that requires an extended period of non-use and the intent to abandon the water right. Relinquishment is a statutory mechanism for forfeiting a water right that was enacted in 1967. No intent is required. A water right is subject to relinquishment when all or a portion of a water right is not used for five successive years, unless there is a sufficient cause for the non-use or the right is exempt from relinquishment (RCW 90.14.160-180, RCW 90.14.140, Ecology 2005a).

The state legislature has defined sufficient cause to include, but not be limited to, the following circumstances: drought or other unavailability of water, operation of legal proceedings that prevent the use of water, and federal or state leases/option to buy land or water rights that preclude or reduce the use of the right by the owner of the water right (RCW 90.14.140(1)). The Surface Water Code also includes several sufficient causes for non-use that apply specifically to irrigation water rights, including temporary reductions in water use due to varying weather conditions, temporary reliance on return flow instead of withdrawal from the primary source when the return flows are measured or reliably estimated, and reductions in water use due to crop rotation (RCW 90.14.140(1)).

In addition to the "sufficient causes" for not using water, the statute exempts the following water rights from relinquishment: water rights claimed for power development, water rights used for standby or reserve water supply, water claimed for a determined future development, municipal water rights, water rights satisfied by the use of reclaimed agricultural industrial process water, and trust water rights (RCW 90.14.140).

Changing or Transferring a Water Right

With sources of "new" water becoming increasingly scarce, transfers of or changes to existing water rights offer opportunities to obtain additional water without applying for a new water right.[2] RCW 90.03.380 and RCW 90.44.100 provide that any existing surface water or ground water right that has been applied to a beneficial use(s) is eligible for a change in the point of diversion or withdrawal, place of use, or purpose of use, provided the change will not result in impairment to existing water rights. All changes require approval by Ecology, except in cases of direct property transfer where the water right is appurtenant to the land and none of the water right characteristics are modified (RCW 90.03.380, Ecology 2003b).

In making a decision on a change application, Ecology must make a tentative determination of the validity and extent of the water right, whether all or part of the right has been lost due to non-use, and whether the change would impair any other right (RCW 90.03.380 or RCW 90.44.100). In contrast to an application for a new water right, Ecology is not required to consider potential impairment of pending applications for water rights when it makes a decision on a change application. When acting on surface water change applications, Ecology may not deny the

[2] Historically, a water right change referred to a change in certain characteristics of a water right, for example, point of diversion, place of use, or purpose of use; while a water right transfer referred to a transfer of ownership of a water right from one person to another. For purposes of this discussion, the term "change" will encompass both changes and transfers.

application based upon public interest considerations (*Public Utility District No. 1 of Pend Oreille County v. Ecology, 146 Wn.2d 778, 51 P.3d 744 (2002)).*

A frequently requested type of change is from seasonal irrigation to year-round domestic or municipal supply. Such a change is acceptable as long as other water rights will not be impaired. In *R. D. Merrill Co. v. PCHB*, 137 Wn.2d 118 (1999), the state Supreme Court upheld a change from a seasonal to a year-round right:

> However, as with other changes under RCW 90.03.380, a change in time of use may not be made which is detrimental to other appropriators' rights. If a change from seasonal to year-round use would cause injury, approval of a change in time of use should be denied or conditioned to protect other water rights holders by, for example, limiting the use for new purposes to the same season as the historical use (137 Wn.2d at 128-9).

To speed up the process of making decisions on change requests, the state legislature created county water conservancy boards to make initial decisions on such applications (Chapter 90.80 RCW). A water conservancy board applies the same standards as Ecology and sends its record of decision to Ecology. Ecology may affirm, reverse, or modify the action of a board within 45 days (which may be extended by 30 days) of receipt of the record of decision. If Ecology does not act within the prescribed time period, the decision of the board becomes Ecology's decision (RCW 90.80.080).

Exempt Ground Water Rights

One exception to the requirement to obtain a permit from Ecology is the legislatively created exemption for the withdrawal of ground water. Under the exemption, a well can be constructed and water withdrawn from an aquifer without a permit if the water will be used for (1) stock watering; (2) lawn or non-commercial garden watering in an area not exceeding one-half acre; (3) single or group domestic uses not exceeding 5,000 gallons a day; or (4) an industrial purpose not exceeding 5,000 gallons a day (RCW 90.44.050). This section of the RCW is commonly referred to as the “ground water exemption,” and wells developed meeting the use requirements listed above are known as “exempt wells.” An exempt well that is “regularly used beneficially, shall be entitled to a right equal to that established by a permit” (RCW 90.44.050). The use of an exempt well may be regulated to prevent impairment of senior rights.

Although it was a longstanding interpretation that use of an exempt well for stock water was limited to 5,000 gallons per day, a recent opinion of the Attorney General is that the statute does not limit the quantity of water that may be used for stock watering (AGO 2005 No. 17).

Storage Rights

One of the primary components of the Management Program is development of new storage facilities and issuance of new rights from storage. Construction and operation of new storage facilities would require obtaining a reservoir permit from Ecology (RCW 90.03.370). Applications for reservoir permits are subject to the permitting requirements in RCW 90.03.250 through RCW 90.03.320, and require Ecology to make the same four findings as for new surface water diversionary rights or ground water rights. The Surface Water Code sets forth

requirements for both storage reservoir permits and for secondary permits—the latter being permits for beneficial use of the water stored in reservoirs (RCW 90.03.370). The construction or modification of a dam or controlling works for storage of 10 acre-feet or more requires Ecology's approval of plans and specifications for the project (RCW 90.03.350). The Water Code considers underground geologic formations used for aquifer storage and recovery (ASR) projects to be "reservoirs," and provides for permitting of such projects under the reservoir permit provisions of the code (RCW 90.03.360).

Instream Flow Rights

Chapter 90.22 RCW specifically authorizes Ecology to "establish minimum water flows or levels for streams, lakes, or other public waters [waters of the state] for purposes of protecting fish, game, birds, or other wildlife resources, or recreational or aesthetic values of said public waters whenever it appears to be in the public interest to establish the same" (RCW 90.22.010). Chapter 90.03 RCW stipulates that setting minimum flows by rule for a water body constitutes an appropriation of water. The priority date for such an appropriation is the effective date of the rule, unless otherwise specified in statute (RCW 90.03.345) (*Postema v. PCHB*, 142 Wn.2d 68, 81 (2000)). Therefore, any permits issued by Ecology for appropriation of water from a stream for which minimum flows have been adopted must be conditioned to protect the minimum flows (RCW 90.03.247).

Under Chapter 90.22 RCW, the authority of Ecology to establish minimum flows does not extend to water artificially stored in existing reservoirs or to the rights associated with the use of such waters. However, in granting storage permits under Chapter 90.03 RCW, Ecology is required to give "full recognition" to any minimum flows that have been established for stream reaches below a storage facility. In addition, Ecology is precluded from issuing rights to divert or store waters of the state that would conflict with a rule adopted as set forth in Chapter 90.22 RCW (RCW 90.22.010, RCW 90.22.030).

As such, the instream flow rights are subordinate to "existing water rights, riparian, appropriate, or otherwise, existing on the effective date of this chapter, including existing rights relating to the operation of any navigation, hydroelectric, or water storage reservoir, or related facilities" (WAC 173-563-020(3)). The instream flow rights are also subordinate to any water withdrawal at the request of Reclamation for the complete development of the Columbia Basin Project (RCW 90.40.030, RCW 90.40.100). Approximately one-half of the Columbia Basin Project-authorized lands are not yet irrigated, and any water diverted for these new lands in the project area would also be senior to the mainstem instream flow rights. The instream flow rights are also subordinate to any federal agency or tribal reserved water right established before 1980. Thus, this collection of various rights (existing pre-1980 rights, pre-1980 reserved water rights, and additional water withdrawn for the Columbia Basin Project) are essentially senior to the instream flow rights. They are also referred to as "uninterruptible water rights" (NRC 2004).

Municipal Water Rights

In 2003, the state legislature enacted the Municipal Water Supply-Efficiency Requirements Act (Municipal Water Law), which made changes to water resources statutes and Department of Health (DOH) statutes pertaining to municipal water rights and public water systems. The

legislation clarified the definition of municipal water supply and authorized the use of a municipal water right for environmental purposes (such as fish and wildlife, water quality, or habitat values) and to implement watershed plans, habitat conservation plans, and Federal Energy Regulatory Commission (FERC) licenses (RCW 90.03.015, RCW 90.03.550).[3] The law also established that the place of use of a municipal water right is the service area in a water system plan approved by DOH. An expansion in the place of use may be created through approval of water system plans, small water system management programs, coordinated water system plans, and engineering documents (RCW 90.03.386(2)). Unperfected surface water rights for municipal water supply purposes may be changed or transferred subject to conditions including compliance with the supplier's water system plan (RCW 90.03.570).

Trust Water Rights

A "trust water right" is a right or a portion of a right acquired by the state for management in the Trust Water Right Program (Trust Program) (RCW 90.42.020(3)). The state may acquire all or portions of water rights by purchase, lease, or donation, and may acquire trust water rights on a permanent or a temporary basis (RCW 90.42.080(3), RCW 90.42.080(1)(a)). A trust water right retains the same priority date as the original water right and, importantly, is not subject to relinquishment while in the Trust Program (RCW 90.42.040(3), (6)). For a water right transferred to trust on a temporary basis, "the full quantity of water diverted or withdrawn to exercise the right before the donation or acquisition" reverts to the donor when the temporary trust period ends (RCW 90.42.080(9)).[4] Although trust water rights are most commonly acquired for purposes of instream flow, trust water rights may in fact also be authorized for other beneficial uses including "irrigation, municipal, or other beneficial uses consistent with applicable regional plans for pilot planning areas, or to resolve critical water supply problems" (RCW 90.42.040(1)).

Under the Management Program, net water savings from conservation actions will be placed into the Trust Program in proportion to the amount of funding provided by the state (ESSHB 2860, Section 2(4)).

Federal Tribal Reserved Water Rights

Federal tribal reserved water rights are primarily based on the Winters doctrine established by the U. S. Supreme Court in *Winters v. United States*, 207 U.S. 564 (1908). The doctrine established that when the United States creates reservations, it implies the reservation of water in an amount necessary to fulfill the purposes of the reservation. The priority date of the water right is the date the reservation was created. Courts have generally held that agriculture was the purpose of tribal reservations created in the nineteenth century. Creation of a tribal reservation may also imply the use of water for long-established aboriginal uses such as fishing and hunting. The priority date for water for such aboriginal uses is time immemorial (Ecology 2005c).

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[3] Municipal water supply is defined to include (1) water supplied to 15 or more residential connections, (2) water used for governmental purposes (by counties, cities, towns, public utility districts, and water and sewer districts), and (3) other beneficial uses generally associated with water use within a municipality (for example, fire flow, park irrigation, industrial/commercial, system maintenance, etc.) (RCW 90.03.015).

[4] Ecology interprets the phrase "to exercise the right" as putting the right to its authorized beneficial use. An instream flow right is exercised when it is protected based upon its priority date from any reduction by use of junior water rights.

Significantly, federal tribal reserved water rights are not subject to relinquishment or abandonment for non-use. The rights are for potential future use as well as historic use. The future water right for agriculture is defined by the practicably irrigable acres (PIA) standard, and includes the number of acres currently irrigated and the number of irrigable acres that may be developed at a reasonable cost in the future.

Appendix E.
Instream Flows Set by WAC 173-563 and the 2004 Biological Opinion

Instream Flows Set by WAC 173-563 and the 2004 Biological Opinion

	Chief Joseph		Wells & Rocky Reach		Rock Island & Wanapum		Priest Rapids			McNary			John Day		Bonneville	The Dalles	
	WAC 173-563		WAC 173-563		WAC 173-563		WAC 173-563		2004 BiOp	WAC 173-563		2004 BiOp	WAC 173-563		2004 BiOp	WAC 173-563	
Date	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Flow Objective (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Flow Objective (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)	Flow Objective (kcfs)	Min. Q_i (kcfs)	Min. Avg. Weekly Flows (kcfs)
Jan	10	30	10	30	10	30	50	70	--	20	60	--	20	60	?[b]	20	60
Feb	10	30	10	30	10	30	50	70	--	20	60	--	20	60	?[b]	20	60
Mar	10	30	10	30	10	30	50	70	--	50	60	--	50	60	?[b]	50	60
Apr 1-2	20	50	20	50	20	60	50	70	--	50	100	--	50	100	?[b]	70	120
3-9	20	50	20	50	20	60	50	70	--	50	100	--	50	100	?[b]	70	120
10-15	20	50	20	50	20	60	50	70	135	50	100	220-260[a]	50	100	?[b]	70	120
16-25	20	60	30	60	30	60	50	70	135	70	150	220-260[a]	70	150	?[b]	70	160
26-30	20	90	50	100	50	110	50	110	135	70	200	220-260[a]	70	200	?[b]	70	200
May	20	100	50	115	50	130	50	130	135	70	220	220-260[a]	70	220	?[b]	70	220
Jun 1-15	20	80	50	110	50	110	50	110	135	70	200	220-260[a]	70	200	?[b]	70	200
16-20	10	60	20	80	20	80	50	80	135	50	120	220-260[a]	50	120	?[b]	50	120
21-30	10	60	20	80	20	80	50	80	135	50	120	220-260[a]	50	120	?[b]	50	120
Jul 1-15	10	60	20	80	20	80	50	80	--	50	120	200	50	120	--	50	120
16-31	10	90	50	100	50	110	50	110	--	50	140	200	50	140	--	50	140
Aug	10	85	50	90	50	95	50	95	--	50	120	200	50	120	--	50	120
Sep	10	40	20	40	20	40	36	40	--	50	60	--	50	85	--	50	90
Oct 1-15	10	30	20	35	20	40	36	40	--	50	60	--	50	85	--	50	90
16-31	10	30	20	35	20	40	50	70	--	50	60	--	50	85	--	50	90
Nov	10	30	10	30	10	30	50	70	--	50	60	--	50	60	125-160[b]	50	60
Dec	10	30	10	30	10	30	50	70	--	20	60	--	20	60	?[b]	20	60

NOTES:

Abbreviations: Min = Minimum; Qi = instantaneous flow; Avg. = Average; WAC = Washington State Administrative Code; kcfs = thousand cubic feet per second

a. Objective varies according to water volume forecasts.

b. Objective varies based on actual and forecasted water conditions. The dates to which this flow objective applies include 11/1 to emergence (spring season) which may vary each year.

c. The 2004 Biological Opinion was issued by NMFS regarding the Federal Columbia River Power System (FCRPS). The data in the table is from Bureau of Reclamation, Bonneville Power Administration, and U.S. Army Corps of Engineers (Action Agencies). 2004. Final Updated Proposed Action for the FCRPS Biological Opinion Remand. November 24, 2004.

Appendix F.
Water Storage Opportunities in Water Resource Inventory Areas (WRIAs)

WATER STORAGE OPPORTUNITIES IN WRIAS

The following is a summary of water storage opportunities that have been identified in watershed assessments in WRIAs in the Columbia River Basin. There is no WRIA level information available on storage opportunities in WRIAs 28, 29, 33, 34, 36, 40 to 42, 47, 49, 51 to 54, 58, and 60 to 62 at this time.

WRIA 30 (Klickitat Basin)

Two storage assessment reports have been completed for WRIA 30. The *WRIA 30 Multipurpose Water Storage Screening Assessment Report* and the *Addendum to WRIA 30 Multipurpose Water Storage Screening Assessment Report* evaluated off-channel and on-channel impoundments and aquifer storage in the Swale Creek and Little Klickitat Subbasins (Watershed Professionals Network and Aspect Consulting 2005).

WRIA 31 (Rock/Glade Basin)

The WRIA 31 storage assessment includes an evaluation of the feasibility of applying ASR within the Kennewick and Glade/Fourmile Subbasins (Aspect 2004).

WRIA 32 (Walla Walla Basin)

The Candidate SASR Sites Hydrogeology memo, Locher Road and Hall-Wentland SAR site work plans and Multi-Purpose Storage Assessment were completed to identify and evaluate storage opportunities. The Candidate SASR Sites Hydrogeology memo identified four shallow aquifer storage sites: East Little Walla Walla River, Locher Road gravel pit, Lower Yellowhawk Creek and Cottonwood Creek (Kennedy/Jenks 2003). The Hall Wentland site was tested in early 2006 and the Locher Road site has been characterized, but no testing has begun at this time. In addition, the City of Walla Walla received a grant from Ecology to study shallow aquifer recharge near their water treatment plant.

WRIA 35 (Middle Snake Basin)

A multi-purpose storage assessment is being prepared in conjunction with the WRIA 35 watershed plan, but is not yet completed. The study is evaluating two aquifer storage sites in the Asotin Creek drainage and one wetland storage site in the Tucannon River Basin (HDR 2006).

WRIAs 37, 38, and 39 (Yakima Basin)

In June 2006, the *Yakima River Basin Storage Alternatives Appraisal Assessment* was completed and released to the public. This report analyzed the Bumping Lake Enlargement, Keechelus to Kachess Pipeline, and Wymer Dam alternatives to determine their viability and capability to meet storage goals. In February 2005, the *Appraisal Assessment of the Black Rock Alternative* was completed and released to the public (Reclamation 2006).

Reclamation is currently in the process of completing a feasibility study for water storage projects within the Yakima River Basin. The goals of the storage projects are to provide a more normal flow condition for fish, more reliable water supply for current water users, and additional

water supplies for future demands. The feasibility studies are evaluating at two alternatives, the Black Rock Alternative and Wymer Dam Alternative, which were determined to be technically viable and meet the needs of the Storage Study. The feasibility studies are expected to be completed by the end of 2008 (Reclamation 2006).

The City of Yakima is investigating the use of ASR in the Ahtanum-Moxee subbasin of the Yakima Watershed where conditions are favorable for groundwater storage. The City of Yakima completed an ASR pilot test in 2001 and 2002 to evaluate groundwater storage as described in the *Naches Basin (WRIA 38) Storage Assessment, Application of Aquifer Storage and Recovery Report* (Golder 2002). The City used the Kissel Well, completed in Ellensburg Formation sand and gravel overlying Columbia River Basalt, as an ASR well, and recharge water was supplied from the City's treatment plant on the Naches River. About 45 million gallons (139 acre-feet) were recharged, stored, and then recovered. The results of the pilot testing were successful. A groundwater flow model developed as part of the project indicated that storage of 2,400 acre-feet was feasible.

Evaluations of geologic conditions in other areas of the Yakima Basin suggest that ground water storage may be feasible near the City of Ellensburg, where geologic conditions are similar to those near Yakima, and in areas of the lower Yakima Valley.

WRIA 45 (Wenatchee Basin)

The *Multi-Purpose Water Storage Assessment in the Wenatchee River Watershed* was recently completed (MWG 2006). The study identifies and reviews many potential water storage strategies such as new reservoirs, ground water recharge, enlarging existing lakes, optimizing existing reservoirs and stream restoration that would improve stream flow and water supply in WRIA 45. Eighteen potential water storage opportunities were identified in basins with the greatest water supply and instream flow issues and were reviewed in greater detail. This report is part of a preliminary phase. Feasibility studies have yet to be completed for any of these strategies.

WRIA 46 (Entiat Basin)

The Report to WRIA 46 (Entiat) Storage Sub-committee Step A Water Storage Assessment provides storage options for further evaluation in the Step B assessment (Golder 2006). Storage options include off-channel reservoirs (18 sites), small impoundments, expanding the storage capacity of existing lakes (Myrtle Lake and Lake Creek basin), storage tanks (City of Entiat, Ardenvoir, near smaller communities in the Entiat Valley), floodplain storage (above the Potato Creek moraine), and passive storage projects (conjunctive use of surface and ground water, side channel construction and floodplain management, snow fences and vegetation management) (Golder 2006).

WRIAs 44 and 50 (Douglas County)

The *WRIA 44/50 Storage Assessment and Feasibility Study* evaluates storage options within Douglas County. Small storage opportunities such as check dams on the East Fork Foster Creek, a small instream reservoir on Douglas Creek and infiltration of surface water during winter and

spring to augment groundwater were analyzed. Additional review of the ground water recharge alternative is being conducted to determine its feasibility.

WRIA 48 (Methow Basin)

In WRIA 48, Reclamation and the USGS analyzed seven alternatives for storing additional runoff. The alternatives include operational changes to two existing storage facilities—the Uphill Reservoir and Elbow Coulee and Dead Horse Reservoirs (Methow Basin Planning Unit 2005). Ground water storage was not included as an option for this watershed.

WRIAs 55 and 57 (Little and Middle Spokane Basins)

The *Storage Assessment: Little and Middle Spokane Watersheds* investigated storage alternatives for enhancing existing streamflow, preventing future decreases in low summer flows that may occur due to increased water use, increasing water supply reliability, and meeting future demand. Three options were identified that required further evaluation including ASR in the lower Little Spokane Watershed, evaluating surface storage potential on Beaver and Buck Creeks, and restoring the Saltese Flats (Little Spokane River and Middle Spokane River Planning Unit 2006).

WRIA 56 (Hangman Basin)

The *Draft Multi-Purpose Storage Assessment for Hangman (Latah) Creek Watershed Report* evaluates storage options in WRIA 56. Options that were evaluated include wetland restoration, developing catchment basins and ponds to catch and store runoff, constructing dams (two sites), reforestation and land management practices (beaver ponds, snow fences, spreader structures, vegetated filter strips, no till/direct seed, water conservation, other agricultural best management practices) (The Hangman (Latah) Creek Watershed Planning Unit WRIA 56 2005).

WRIA 59 (Colville Basin)

In the Colville Watershed, the *Assessment of Multi-Purpose Water Storage Opportunities* evaluated storage options. The assessment focused on potential opportunities for storing excess flow and identified possible locations and methods (GeoEngineers 2004).

Appendix G.
Lake Roosevelt Drawdown – Water Quality Related Studies

Lake Roosevelt Drawdown – Water Quality Related Studies

Bortleson, G.C., Cox, S.E., Munn, M.D., Schumacker, R.J., Block, E.K., Lucy, and Cornelius, S.B., 1994, Sediment-quality assessment of Franklin D. Roosevelt Lake and upstream reach of the Columbia River, Washington, 1992: U.S. Geological Survey Open-File Report 94-315, 130 p.

Bortleson, G.C., Cox, S.E., Munn, M.D., Shumaker, R.J., and Block, E.K., 2001, Sediment-quality assessment of Franklin D. Roosevelt Lake and upstream reach of the Columbia River, Washington, 1992: U.S. Geological Survey Water-Supply Paper 2496, 130 p.

Cox, S.E., Bell, P.R., Lowther, J.S., VanMetre, P.C., 2003, The occurrence of trace elements and metallurgical slag in sediment cores from Lake Roosevelt, Washington State: 2003 Seattle Annual Meeting, The Geological Society of America, November 2-5, 2003, Seattle Washington, Paper no. 59-4.

Cox, S.E., Bell, Peter, Lowther, Stewart, and VanMetre, P.C., 2004, Occurrence of trace elements and metallurgical slag in sediment cores from Lake Roosevelt, Washington [poster]: U.S. Geological Survey Western Region Science Symposium, Henderson, Nevada, March 15-19, 2004. (PDF, 1.43 MB)

Cox, S.E., Bell, P.R., Lowther, J.S., and vanMetre, P.C., 2005, Trace-element concentrations and occurrence of metallurgical slag particles in bed sediment cores from Lake Roosevelt, Washington: Presentation by the U.S. Geological Survey at the 5th Washington Hydrogeology Symposium, Tacoma, Washington, April 12-14, 2005, 20 p. (PDF, 16.77 MB)

Cox, S.E., Bell, P.R., Lowther, J.S., VanMetre, P.C., 2005, Vertical distribution of trace element concentrations and occurrence of metallurgical slag particles accumulated bed sediments of Lake Roosevelt, Washington, September 2002: U.S. Geological Survey Scientific Investigations Report 2004-5090, 70 p.

Cox, S.E., Bell, P.R., Lowther, J.S., and vanMetre, P.C., 2005, Trace-element concentrations and occurrence of metallurgical slag particles in bed sediment cores from Lake Roosevelt, Washington [abs.]: 5th Washington Hydrogeology Symposium, Tacoma, Washington, April 12-14, 2005, Program, p. 49. (PDF, 2.13 MB)

Erwin, M.L., and Munn, M.D., 1997, Are walleye from Lake Roosevelt contaminated with mercury?: U.S. Geological Survey Fact Sheet FS-102-97, 4 p.

Kahle, S.C., and Majewski, M.S., 2003, Trace Elements in Lake Roosevelt Air: Presentation by the U.S. Geological Survey at the Lake Water Quality Council Meeting, Spokane, WA, December 4, 2003. (PDF, 717 KB)

Kahle, S. C. and Majewski, M.S., 2004, Trace elements in air at Lake Roosevelt, Washington: Presentation by the U.S. Geological Survey at the Lake Roosevelt Natural Resources Management Meeting, Davenport, WA, March 16, 2004. (PDF, 611 KB)

Majewski, Michael, Kahle, Sue, 2003, Occurrence and Distribution of Trace Elements in Lake Roosevelt Beach and Bed Sediments, and Air: 4th Symposium on the Hydrogeology of Washington State, April 8-10, 2003, Tacoma, Washington, (6.2 MB PDF)

Majewski, M.S., Kahle, S.C., Ebbert, J.C., and Josberger, E.G., 2003, Concentrations and distribution of slag-related trace elements and mercury in fine - grained beach and bed sediments of Lake Roosevelt, Washington, April-May 2001: U.S. Geological Survey Water-Resources Investigations Report 03-4170, 29 p.

Majewski, M.S., and Kahle, S.C., 2003, Occurrence and distribution of trace elements in Lake Roosevelt beach and bed sediments and air (abs.): 4th Symposium on the Hydrogeology of Washington State, April 8-10, 2003, Tacoma, Washington, Program, p. 19.

Majewski, M.S., and Kahle, S.C., 2005, Occurrence and distribution of trace elements in Lake Roosevelt Beach, bed sediments, and air [abs.]: 5th Washington Hydrogeology Symposium, Tacoma, Washington, April 12-14, 2005, Program, p. 86. (PDF, 2.13 MB)

Majewski, M.S., and Kahle, S.C., 2005, Occurrence and distribution of trace elements in Lake Roosevelt beach, bed sediments, and air [poster.]: 5th Washington Hydrogeology Symposium, Tacoma, Washington, April 12-14, 2005. (PDF, 2.23 MB)

Munn, M.D., Cox, S.E., and Dean, C.J., 1995, Concentrations of mercury and other trace elements in walleye, smallmouth bass and rainbow trout in Franklin D. Roosevelt lake and the upper Columbia River, Washington, 1994: U.S. Geological Survey Open-File Report 95-195, 35 p.

Munn, M.D., and Short, T.M., 1997, Spatial heterogeneity of mercury bioaccumulation by walleye in Franklin D. Roosevelt Lake and upper Columbia River, Washington: Transactions of the American Fisheries Society, v. 126, p. 477 - 487.

Munn, M.D., 2000, Contaminant trends in sport fish from Lake Roosevelt and upper Columbia River, Washington, 1994 - 1998: U.S. Geological Survey Water-Resources Investigations Report 00-4024, 13 p.

Paulson, A.J., Moran, P.W., and Wagner, R.J., 2004, The effects of trace elements on water quality and biological health in the Lake Roosevelt National Recreational Area, Columbia River, Washington: Presentation by the U.S. Geological Survey Lake Roosevelt Water Quality Council Meeting, Tacoma, Washington, May 7, 2004. (PDF 930 KB).

Appendix H.
Select List of Freshwater Fish Species of the Columbia Basin

Select List of Freshwater Fish Species of the Columbia Basin.

Family	Latin Name	English Name	Status
Acipenseridae	*Acipenser transmontanus*	White Sturgeon	Native
Cyprinidae	*Acrocheilus alutaceus*	Chiselmouth	Native
Cyprinidae	*Carassius auratus*	Goldfish	Introduced
Cyprinidae	*Couesius plumbeus*	Lake Chub	Native
Cyprinidae	*Cyprinus carpio*	Carp	Introduced
Cyprinidae	*Mylocheilus caurinus*	Peamouth Chub	Native
Cyprinidae	*Ptychocheilus oregonesis*	Northern pikeminnow	Native
Cyprinidae	*Rhinichthys cataractae*	Longnose Dace	Native
Cyprinidae	*Rhinichthys falcatus*	Leopard Dace	Native
Cyprinidae	*Rhinichthys osculus*	Speckled Dace	Native
Cyprinidae	*Rhinichthys umatilla*	Umatilla Dace	Native
Cyprinidae	*Richardsonius balteatus*	Redside Shiner	Native
Cyprinidae	*Tinca tinca*	Tench	Introduced
Catostomidae	*Catostomus catostomus*	Longnose Sucker	Native
Catostomidae	*Catostomus macrocheilus*	Largescale Sucker	Native
Catostomidae	*Catostomus platyrhynchus*	Mountain Sucker	Native
Catostomidae	*Catostomus columbianus*	White Sucker	Native
Ictaluridae	*Ameiurus melas*	Black Catfish	Introduced
Ictaluridae	*Ameiurus nebulosus*	Brown Catfish	Introduced
Salmonidae	*Oncorhynchus clarki lewisi*	Cutthroat Trout	Native
Salmonidae	*Oncorhynchus nerka*	Sockeye (Kokanee) salmon	Native
Salmonidae	*Oncorhynchus mykiss*	Steelhead (Rainbow) Trout	Native
Salmonidae	*Oncorhynchus tshawytscha*	Chinook Salmon	Native
Salmonidae	*Oncorhynchus kisutch*	Coho Salmon	Native
Salmonidae	*Oncorhynchus keta*	Chum Salmon	Native
Salmonidae	*Salmo trutta*	Brown Trout	Introduced
Salmonidae	*Salvelinus confluentus*	Bull Trout	Native
Salmonidae	*Salvelinus fontinalis*	Brook Trout	Introduced
Salmonidae	*Salvelinus namaycush*	Lake Trout	Introduced
Salmonidae: Thymalinae	*Thymallus arcticus*	Arctic Grayling	Introduced
Salmonidae: Coregoninae	*Coregonus clupeaformis*	Lake Whitefish	Introduced
Salmonidae Coregoninae	*Prosopium williamsoni*	Mountain Whitefish	Native
Salmonidae Coregoninae	*Prosopium coulteri*	Pygmy Whitefish	Native
Gadidae	*Lota lota*	Burbot	Native
Cottidae	*Cottus asper*	Prickly Sculpin	Native

Family	Latin Name	English Name	Status
Cottidae	*Cottus bairdi*	Mottled Sculpin	Native
Cottidae	*Cottus cognatus*	Slimy Sculpin	Native
Cottidae	*Cottus confusus*	Shorthead Sculpin	Native
Cottidae	*Cottus rhotheus*	Torrent Sculpin	Native
Centrarchidae	*Lepomis gibbosus*	Pumpkinseed	Introduced
Centrarchidae	*Micropterus dolomieui*	Smallmouth Bass	Introduced
Centrarchidae	*Micropterus salmoides*	Largemouth Bass	Introduced
Centrarchidae	*Promoxis nigromaculatus*	Black Crappie	Introduced
Percidae	*Perca flavescens*	Yellow Perch	Introduced
Percidae	*Stizostedion vitreum*	Walleye	Introduced
Percidae	*Alosa sapidissima*	American Shad	Introduced
Osmeridae	*Thaleichthys pacificus*	Smelt (eulachon)	Native

Appendix I.
State Listed Plant and Wildlife Species

State Listed Plant Species

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Ames' Milk-vetch	*Astragalus pulsiferae var. suksdorfii*	Endangered	Species of Concern	Open Ponderosa Pine forest
Bradshaw's Lomatium	*Lomatium bradshawii*	Endangered	Endangered	Wet prairie/ grassland
Broad-fruit Mariposa	*Calochortus nitidus*	Endangered	Species of Concern	Grassland / moist swales
Chelan Rockmat	*Petrophyton cinerascens*	Endangered	Species of Concern	Basalt cliffs
Columbia Crazyweed	*Oxytropis campestris var. columbiana*	Endangered		Rock – river and lakeshore
Douglas' Clover	*Trifolium douglasii*	Endangered		Forested wetland / wet meadow
Golden Paintbrush	*Castilleja levisecta*	Endangered	Threatened	Open grassland – Puget Trough
Hairy-stemmed Checker-mallow	*Sidalcea hirtipes*	Endangered		Prairie – Puget Trough
Jessica's Aster	*Aster jessicae*	Endangered	Species of Concern	Palouse grassland
Kalm's Lobelia	*Lobelia kalmii*	Endangered		Marl/peat bog / shoreline
Kellogg's Rush	*Juncus kelloggii*	Endangered		Wet meadow
Least Phacelia	*Phacelia minutissima*	Endangered	Species of Concern	Wet meadow
Nelson's Checker-mallow	*Sidalcea nelsoniana*	Endangered	Threatened	Open grassland / moist areas
Northern Wormwood	*Artemisia campestris ssp. borealis var. wormskioldii*	Endangered	Candidate	Shrub-steppe
Northwest Raspberry	*Rubus nigerrimus*	Endangered	Species of Concern	Wet meadow / drainages
Obscure Buttercup	*Ranunculus reconditus*	Endangered	Species of Concern	Meadow-steppe
Oregon Sullivantia	*Sullivantia oregana*	Endangered	Species of Concern	Moist cliffs
Persistentsepal Yellowcress	*Rorippa columbiae*	Endangered	Species of Concern	Near water
Piper's Milk-vetch	*Astragalus riparius*	Endangered		Prairie / dry bluffs / canyon bank
Ross' Avens	*Geum rossii var. depressum*	Endangered		Talus slopes / rock crevices
Rosy Owl-clover	*Orthocarpus bracteosus*	Endangered		Moist meadow

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Sabin's Lupine	*Lupinus sabinii*	Endangered		Coniferous forest / transition grassland
Sagebrush Mariposa-lily	*Calochortus macrocarpus var. maculosus*	Endangered		Grassland
Showy Stickseed	*Hackelia venusta*	Endangered	Endangered	Granite / talus
Smooth Goldfields	*Lasthenia glaberrima*	Endangered		Wet stream banks / vernal pools
Squaw Currant	*Ribes cereum var. colubrinum*	Endangered		Dry, rocky slopes / along streams – Snake River drainage
Twayblade	*Liparis loeselii*	Endangered		Springs/bogs / wet and sunny areas
Umtanum Desert Buckwheat	*Eriogonum codium*	Endangered	Candidate	Basalt cliffs
Ute Ladies' Tresses	*Spiranthes diluvialis*	Endangered	Threatened	Intermontane valley plains
Wanapum Crazyweed	*Oxytropis campestris var. wanapum*	Endangered	Species of Concern	Open grassland / shrubland
Wenatchee Mountain Checker-mallow	*Sidalcea oregana var. calva*	Endangered	Endangered	Moist meadow
Whited's Milk-vetch	*Astragalus sinuatus*	Endangered	Species of Concern	Rocky hillsides
Adder's-tongue	*Ophioglossum pusillum*	Threatened		Pastures / disturbed areas
Alpine Azalea	*Loiseleuria procumbens*	Threatened		Dry alpine areas
American Pillwort	*Pilularia americana*	Threatened		Vernal pools
Austin's Knotweed	*Polygonum austiniae*	Threatened		Sagebrush plain / Ponderosa Pine
Awned Halfchaff Sedge	*Lipocarpha aristulata*	Threatened		Shorelines below high water
Barrett's Beardtongue	*Penstemon barrettiae*	Threatened	Species of Concern	Basalt cliffs / talus / other rocky areas
Basalt Daisy	*Erigeron basalticus*	Threatened	Candidate	Basalt cliffs
Beaked Cryptantha	*Cryptantha rostellata*	Threatened		Dry drainages
Blue Mountain Onion	*Allium dictuon*	Threatened	Species of Concern	Steep slopes, gravelly soil
Brewer's Cinquefoil	*Potentilla breweri*	Threatened		Alpine – moist meadows / riparian

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Bronze Sedge	*Carex foenea*	Threatened		Standing water / very moist ground
Canyon Bog-orchid	*Platanthera sparsiflora*	Threatened		Open, wet areas / seeps / bogs
Cross-haired Rockcress	*Arabis crucisetosa*	Threatened		Smooth sumac grass community
Cusick Monkeyflower	*Mimulus cusickii*	Threatened		Moist areas / scree
Davis' Milkweed	*Asclepias cryptoceras ssp. davisii*	Threatened		Heavy clay / basalt soil
Dense Sedge	*Carex densa*	Threatened		Intertidal marshes
Desert Dodder	*Cuscuta denticulata*	Threatened		Desert
Diffuse Stickseed	*Hackelia diffusa var. diffusa*	Threatened		Cliffs / talus / wooded flats
Douglas' Draba	*Cusickiella douglasii*	Threatened		Open, rocky areas
Dwarf Rush	*Juncus hemiendytus var. hemiendytus*	Threatened		Vernal pools / vernal meadows
Fee's Lip-fern	*Cheilanthes feei*	Threatened		Rocky areas
Five-leaved Cinquefoil	*Potentilla quinquefolia*	Threatened		High elevation – meadows, river bars
Fremont's Combleaf	*Polyctenium fremontii var. fremontii*	Threatened		Moist areas in sagebrush desert
Fringed Grass-of-parnassus	*Parnassia fimbriata var. hoodiana*	Threatened		Wet areas – high elevation
Fringed Waterplantain	*Damasonium californicum*	Threatened		Wet areas – low elevation
Geyer's Milk-vetch	*Astragalus geyeri*	Threatened		Dry, arid valleys
Gorge Daisy	*Erigeron oreganus*	Threatened	Species of Concern	Basalt cliffs
Grand Redstem	*Ammannia robusta*	Threatened		Riparian mudflat wetlands
Great Basin Gilia	*Gilia leptomeria*	Threatened		Dry, rocky areas
Great Polemonium	*Polemonium carneum*	Threatened		Open forest / meadow / prairie / fencelines
Hall's Aster	*Aster hallii*	Threatened		Dry, open valleys and plains
Hoary Willow	*Salix candida*	Threatened		Bogs / fens / swamps
Hoover's Tauschia	*Tauschia hooveri*	Threatened	Species of Concern	Shrub-steppe

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Hot-rock Penstemon	*Penstemon deustus var. variabilis*	Threatened		Dry foothills / lowlands over thin soil
Howellia	*Howellia aquatilis*	Threatened	Threatened	Seasonally dry areas of wetlands
Howell's Daisy	*Erigeron howellii*	Threatened	Species of Concern	Thin soils, steep slope
Howell's Rush	*Juncus howellii*	Threatened		Mountain riparian
Large-awn Sedge	*Carex macrochaeta*	Threatened		Basalt cliffs near water
Little Bluestem	*Schizachyrium scoparium var. scoparium*	Threatened		Gravel bars near high water mark
Loeflingia	*Loeflingia squarrosa var. squarrosa*	Threatened		Low swales within sandy areas
Lowland Toothcup	*Rotala ramosior*	Threatened		Damp areas
Marigold Navarretia	*Navarretia tagetina*	Threatened		Seasonally moist areas
Meadow Pussy-toes	*Antennaria corymbosa*	Threatened		Moist areas
Nagoonberry	*Rubus acaulis*	Threatened		Damp spruce forest
Northwestern Yellowflax	*Sclerolinon digynum*	Threatened		Grassland vernal pools
Nuttall's Sandwort	*Minuartia nuttallii ssp. fragilis*	Threatened		Dry, rocky areas at elevation
Oregon Coyote-thistle	*Eryngium petiolatum*	Threatened		Wet prairies / low ground
Oregon Goldenaster	*Heterotheca oregona*	Threatened		Gravel / sandbars along rivers
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	Threatened	Species of Concern	Seasonally moist meadows
Palouse Goldenweed	*Haplopappus liatriformis*	Threatened	Species of Concern	Grasslands
Palouse Milk-vetch	*Astragalus arrectus*	Threatened		Grassland / sagebrush / open forest
Parry's Knotweed	*Polygonum parryi*	Threatened		Vernally moist areas
Pasqueflower	*Anemone nuttalliana*	Threatened		Prairies / wet meadows / alpine
Plumed Clover	*Trifolium plumosum var. plumosum*	Threatened		Dry hillsides / meadows
Red Poverty-weed	*Monolepis pusilla*	Threatened		Desert – alkaline or saline soils
Rocky Mountain Bulrush	*Scirpus saximontanus*	Threatened		Damp and seasonally moist areas

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Rocky Mountain Rockmat	*Petrophyton caespitosum var. caespitosum*	Threatened		Limestone cliffs / ledges
Rollins' Desert-parsley	*Lomatium rollinsii*	Threatened		Canyon grasslands
Rosy Pussypaws	*Calyptridium roseum*	Threatened		Sagebrush shrubland
Rough Stickseed	*Hackelia hispida var. hispida*	Threatened		Cliffs / talus / disturbed areas
Rush Aster	*Aster borealis*	Threatened		Marshes / bogs / fens / lakesides
Sierra Onion	*Allium campanulatum*	Threatened		Medium to high elevation – dry soils
Siskiyou False-hellebore	*Veratrum insolitum*	Threatened		Open, rocky slopes
Skinny Moonwort	*Botrychium lineare*	Threatened	Candidate	Forest floodplain
Smoky Mountain Sedge	*Carex proposita*	Threatened		Talus / rocky areas – high elevation
Smooth Desert-parsley	*Lomatium laevigatum*	Threatened		Basalt cliffs / rocky slopes
Spalding's Silene	*Silene spaldingii*	Threatened	Threatened	Open grasslands
Sparse-leaved Sedge	*Carex tenuiflora*	Threatened		Marshes / bogs
Stalk-leaved Monkeyflower	*Mimulus patulus*	Threatened		Seasonally wet grasslands / seeps
Sticky Phacelia	*Phacelia lenta*	Threatened	Species of Concern	Basalt cliffs
Strawberry Saxifrage	*Saxifragopsis fragarioides*	Threatened		Rock outcrops / cliffs
Strict Blue-eyed-grass	*Sisyrinchium montanum*	Threatened		Moist meadows in shrub-steppe
Thompson's Clover	*Trifolium thompsonii*	Threatened	Species of Concern	Open coniferous forest / grassland
Tiehm's Rush	*Juncus tiehmii*	Threatened		Moist areas – shrub-steppe
Torrey's Peavine	*Lathyrus torreyi*	Threatened	Species of Concern	Info not available
Tufted Evening-primrose	*Oenothera caespitosa ssp. marginata*	Threatened		Desert / open areas / wooded areas
Two-spiked Moonwort	*Botrychium paradoxum*	Threatened	Species of Concern	Forest floodplain / stream terraces
Washington Polemonium	*Polemonium pectinatum*	Threatened	Species of Concern	Sagebrush

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Wenatchee Larkspur	*Delphinium viridescens*	Threatened	Species of Concern	Moist meadows – open areas
Western Moonwort	*Botrychium hesperium*	Threatened		Sagebrush shrubland
Western Wahoo	*Euonymus occidentalis*	Threatened		Forest – shaded draws and ravines
Western Yellow Oxalis	*Oxalis suksdorfii*	Threatened		Meadows / moist woods
White Bluffs Bladderpod	*Lesquerella tuplashensis*	Threatened	Candidate	Sagebrush – highly alkaline/dry soil
White Eatonella	*Eatonella nivea*	Threatened		Shrub-steppe
White Meconella	*Meconella oregana*	Threatened	Species of Concern	Open grassland
Yellow Lady's-slipper	*Cypripedium parviflorum*	Threatened		Bogs / wet forest
Alice's Fleabane	*Erigeron aliceae*	Sensitive		Sub-alpine
Arctic Aster	*Aster sibiricus var. meritus*	Sensitive		Open, rocky – high elevation
Arrow Thelypody	*Thelypodium sagittatum ssp. sagittatum*	Sensitive		Shrub-steppe – moist swales
Arthur's Milk-vetch	*Astragalus arthurii*	Sensitive		Grassy hills / stony meadows
Baker's Linanthus	*Linanthus bolanderi*	Sensitive		Dry, rocky soils / open slopes
Beaked Sedge	*Carex rostrata*	Sensitive		Lake shorelines
Beaked Spike-rush	*Eleocharis rostellata*	Sensitive		Riparian areas – can be alkaline/salt
Black Snake-root	*Sanicula marilandica*	Sensitive		Meadow / riparian
Blue-eyed Grass	*Sisyrinchium septentrionale*	Sensitive		Open, wet meadow
Bog Clubmoss	*Lycopodiella inundata*	Sensitive		Moist, sandy areas
Bolandra	*Bolandra oregana*	Sensitive		Riparian / rocky
Branching Montia	*Montia diffusa*	Sensitive		Moist, open forest
Brewer's Cliff-brake	*Pellaea breweri*	Sensitive		Rocky – alpine
Bristle-flowered Collomia	*Collomia macrocalyx*	Sensitive		Talus, rock outcrops
Bristly Sedge	*Carex comosa*	Sensitive		Marshes, lake shores, wet meadows

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Bulb-bearing Water-hemlock	*Cicuta bulbifera*	Sensitive		Wetlands
Canadian Single-spike Sedge	*Carex scirpoidea var. scirpoidea*	Sensitive		Moist meadows / streambanks – high elevation
Canadian St. John's-wort	*Hypericum majus*	Sensitive		Riparian
Cespitose Evening-primrose	*Oenothera caespitosa ssp. caespitosa*	Sensitive		Talus / rocky slopes on Columbia River
Clackamas Corydalis	*Corydalis aquae-gelidae*	Sensitive	Species of Concern	Coniferous forest – riparian
Clustered Lady's-slipper	*Cypripedium fasciculatum*	Sensitive	Species of Concern	Coniferous forest
Columbia Milk-vetch	*Astragalus columbianus*	Sensitive	Species of Concern	Shrub-steppe
Common Blue-cup	*Githopsis specularioides*	Sensitive		Open areas – rocky, gravelly soils
Common Twinpod	*Physaria didymocarpa var. didymocarpa*	Sensitive		Gravelly soil
Constricted Douglas' Onion	*Allium constrictum*	Sensitive		Vernally moist areas
Cordroot Sedge	*Carex chordorrhiza*	Sensitive		Wetlands / other riparian
Coyote Tobacco	*Nicotiana attenuata*	Sensitive		Dry, open areas / sandy / rocky soils
Creeping Snowberry	*Gaultheria hispidula*	Sensitive		Sphagnum bogs / forest
Crenulate Moonwort	*Botrychium crenulatum*	Sensitive	Species of Concern	Moist areas – coniferous forest
Crested Shield-fern	*Dryopteris cristata*	Sensitive		Wetlands / wet meadows
Curved Woodrush	*Luzula arcuata*	Sensitive		Glacial moraines – high elevation
Cusick's Milk-vetch	*Astragalus cusickii var. cusickii*	Sensitive		Basalt cliffs / roadcuts / talus / sagebrush plains
Diverse-leaved Cinquefoil	*Potentilla diversifolia var. perdissecta*	Sensitive		High elevation – gullies / ridge tops / wet meadow
Dwarf Evening-primrose	*Camissonia pygmaea*	Sensitive		Talus / dry wash / banks / roadcuts
Dwarf Phacelia	*Phacelia tetramera*	Sensitive		Alkaline soils – vernally-moist wetlands, shrub-steppe
Few-flowered Collinsia	*Collinsia sparsiflora var. bruceae*	Sensitive		Open areas – thin soils
Few-flowered Sedge	*Carex pauciflora*	Sensitive		Wet, acidic environments

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Flat-leaved Bladderwort	*Utricularia intermedia*	Sensitive		Shallow ponds / slow-moving streams / wet sedge/rush meadows
Floating Water Pennywort	*Hydrocotyle ranunculoides*	Sensitive		Shallow freshwater
Fuzzytongue Penstemon	*Penstemon eriantherus var. whitedii*	Sensitive		Dry, open – plains / valleys / foothills
Glaucous Gentian	*Gentiana glauca*	Sensitive		Sub-alpine and alpine wet meadows
Glaucous Willow	*Salix glauca*	Sensitive		High elevation
Golden Chinquapin	*Chrysolepis chrysophylla*	Sensitive		Dry, open sites / thick coniferous forest
Golden Draba	*Draba aurea*	Sensitive		Forested slopes / alpine meadows
Gooseberry-leaved Alumroot	*Heuchera grossulariifolia var. tenuifolia*	Sensitive		Basalt cliffs / steep, moist slopes
Gray Cryptantha	*Cryptantha leucophaea*	Sensitive	Species of Concern	Sandy soils – Columbia riparian
Gray Stickseed	*Hackelia cinerea*	Sensitive		Basalt cliffs / talus
Green Keeled Cotton-grass	*Eriophorum viridicarinatum*	Sensitive		High elevation – swamps / bogs
Hair-like Sedge	*Carex capillaris*	Sensitive		Riparian / wet meadows
Hoover's Desert-parsley	*Lomatium tuberosum*	Sensitive	Species of Concern	Loose talus
Idaho Gooseberry	*Ribes oxyacanthoides ssp. irriguum*	Sensitive		Riparian – coniferous forest
Inch-high Rush	*Juncus uncialis*	Sensitive		Vernal pools
Kidney-leaved Violet	*Viola renifolia*	Sensitive		Moist, forested areas / riparian
Kotzebue's Grass-of-parnassus	*Parnassia kotzebuei*	Sensitive		Moist sub-alpine
Lance-leaved Draba	*Draba cana*	Sensitive		Sub-alpine/alpine meadows
Least Bladdery Milk-vetch	*Astragalus microcystis*	Sensitive		Riparian / open woods – sandy to gravelly soils
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Sensitive	Species of Concern	Coniferous forest
Longsepal Globemallow	*Iliamna longisepala*	Sensitive		Shrub-steppe / coniferous forest

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Loose-flowered Bluegrass	*Poa laxiflora*	Sensitive		Moist woods / rocky, open slopes
Maccall's Willow	*Salix maccalliana*	Sensitive		Bogs, fens, swamps, marshes
Many-headed Sedge	*Carex sychnocephala*	Sensitive		Marshes / lakeshores
Marsh Muhly	*Muhlenbergia glomerata*	Sensitive		Riparian
Miner's Candle	*Cryptantha scoparia*	Sensitive		Talus / canyons
Mountain Buttercup	*Ranunculus populago*	Sensitive		Moist meadows / riparian
Mousetail	*Myosurus clavicaulis*	Sensitive		Vernal pools
Mt. Rainier Lousewort	*Pedicularis rainierensis*	Sensitive		Info not available
Naked-stemmed Evening-primrose	*Camissonia scapoidea*	Sensitive		Sagebrush desert
Narrow-leaved Sedge	*Carex eleocharis*	Sensitive		Dry plains / gravelly soils
Narrow-stem Cryptantha	*Cryptantha gracilis*	Sensitive		Talus / pockets of silt
Nodding Saxifrage	*Saxifraga cernua*	Sensitive		Seepage areas / moist crevices / along streambanks
Northern Bentgrass	*Agrostis borealis*	Sensitive		Alpine talus slopes
Northern Golden-carpet	*Chrysosplenium tetrandrum*	Sensitive		Open, wet areas – seeps, crevices
Northern Microseris	*Microseris borealis*	Sensitive		Wet meadows / sphagnum bogs
Nuttall's Pussy-toes	*Antennaria parvifolia*	Sensitive		Ponderosa pine forests – sandy or gravelly soils
Nuttall's Quillwort	*Isoetes nuttallii*	Sensitive		Wet ground, seepages, mud near vernal pools
Obscure Indian-paintbrush	*Castilleja cryptantha*	Sensitive	Species of Concern	Sub-alpine meadows / parklands – Mt. Rainier Nat'l Park
Pale Alpine-forget-me-not	*Eritrichium nanum var. elongatum*	Sensitive		High elevation – open and rocky
Pauper Milk-vetch	*Astragalus misellus var. pauper*	Sensitive		Open ridgetops, upper slopes
Pink Fawn-lily	*Erythronium revolutum*	Sensitive		Swampy, coniferous forest
Piper's Daisy	*Erigeron piperianus*	Sensitive		Dry, open areas / sagebrush

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Poor Sedge	*Carex magellanica ssp. irrigua*	Sensitive		High elevation – wet areas
Prairie Cordgrass	*Spartina pectinata*	Sensitive		Wet areas – salt and freshwater
Pulsifer's Monkey-flower	*Mimulus pulsiferae*	Sensitive		Seasonally wet, open areas
Purple Meadowrue	*Thalictrum dasycarpum*	Sensitive		Deciduous riparian woods
Pygmy Saxifrage	*Saxifraga rivularis*	Sensitive		Talus / damp cliffs / alpine slopes
Sagebrush Stickseed	*Hackelia hispida var. disjuncta*	Sensitive		Rocky talus
Salish Fleabane	*Erigeron salishii*	Sensitive		Alpine – talus / scree
Scandinavian Sedge	*Carex norvegica*	Sensitive		Riparian / moist meadows
Scribner-grass	*Scribneria bolanderi*	Sensitive		Grasslands / along roadsides
Seely's Silene	*Silene seelyi*	Sensitive	Species of Concern	Basalt cliffs / talus
Sierra Cliff-brake	*Pellaea brachyptera*	Sensitive		Sparse conifer forest, rocky/dry soil
Skunk Polemonium	*Polemonium viscosum*	Sensitive		High elevation – talus / rocky areas
Slender Crazyweed	*Oxytropis campestris var. gracilis*	Sensitive		Prairie / mountain meadow / open woodland
Slender Gentian	*Gentianella tenella*	Sensitive		Sub-alpine / alpine meadows
Small Northern Bog-orchid	*Platanthera obtusata*	Sensitive		Wet forest / riparian areas
Small-flower Evening-primrose	*Camissonia minor*	Sensitive		Gravelly basalt / sand / cryptogamic crust
Small-flowered Trillium	*Trillium parviflorum*	Sensitive		Upland edge of riparian zones
Snake Canyon Desert-parsley	*Lomatium serpentinum*	Sensitive		Basalt cliffs / talus
Snake River Cryptantha	*Cryptantha spiculifera*	Sensitive		Dry, open areas in stony soils
Snow Cinquefoil	*Potentilla nivea*	Sensitive		Alpine meadows – rocky substrates
Soft-leaved Willow	*Salix sessilifolia*	Sensitive		Riparian forest / silty soils
Stalked Moonwort	*Botrychium pedunculosum*	Sensitive	Species of Concern	Meadow / perennial streams / coniferous forest

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Steller's Rockbrake	*Cryptogramma stelleri*	Sensitive		Limestone cliffs / rocky soils
Suksdorf's Desert-parsley	*Lomatium suksdorfii*	Sensitive	Species of Concern	Rocky hillsides – moderate to steep slopes
Suksdorf's Monkey-flower	*Mimulus suksdorfii*	Sensitive		Sagebrush steppe – moist areas
Swamp Gentian	*Gentiana douglasiana*	Sensitive		Moist to wet meadows
Tall Agoseris	*Agoseris elata*	Sensitive		Meadows / open woods / exposed ridges
Tall Bitter Fleabane	*Trimorpha elata*	Sensitive		Wet, swampy areas / along creeks
Tall Bugbane	*Cimicifuga elata*	Sensitive	Species of Concern	Coniferous forest
Thompson's Chaenactis	*Chaenactis thompsonii*	Sensitive		Dry, rocky slopes – elevation
Treelike Clubmoss	*Lycopodium dendroideum*	Sensitive		Rock outcrops / talus / boulder fields
Triangular-lobed Moonwort	*Botrychium ascendens*	Sensitive	Species of Concern	Coniferous forest / meadows / ravines
Tweedy's Willow	*Salix tweedyi*	Sensitive		Wet areas – high elevation
Valley Sedge	*Carex vallicola*	Sensitive		Sagebrush type
Velvet-leaf Blueberry	*Vaccinium myrtilloides*	Sensitive		Open forest
Water Avens	*Geum rivale*	Sensitive		Moist areas
Water-pimpernel	*Samolus parviflorus*	Sensitive		Moist soils / riparian / marshes
Western Hedysarum	*Hedysarum occidentale*	Sensitive		Meadows / boulder fields / talus
Western Ladies-tresses	*Spiranthes porrifolia*	Sensitive		Wet meadows / other moist areas
Wheeler's Bluegrass	*Poa nervosa*	Sensitive		Rock outcrops / talus
White-top Aster	*Aster curtus*	Sensitive	Species of Concern	Open grassland
Wilcox's Penstemon	*Penstemon wilcoxii*	Sensitive		Shrubby areas / forest / rocky hills
Yellow Bog Sedge	*Carex dioica*	Sensitive		Wet, marshy areas
Yellow Mountain-avens	*Dryas drummondii*	Sensitive		Cliffs / limestone / other rocky areas

COMMON NAME	SCIENTIFIC NAME	STATE STATUS	FEDERAL STATUS	HABITAT
Yellow Sedge	*Carex flava*	Sensitive		Riparian / wet meadows
Cusick's Desert-parsley	*Lomatium cusickii*	Extinct?		Open, rocky areas
Jointed Coyote-thistle	*Eryngium articulatum*	Extinct?		Riparian areas / dry streambeds
Leiberg's Tauschia	*Tauschia tenuissima*	Extinct?		Grassy openings – moist habitats
Liverwort Monkey-flower	*Mimulus jungermannioides*	Extinct?	Species of Concern	Basalt cliffs
Long-tubed Evening-primrose	*Oenothera flava*	Extinct?		Riparian
Newberry Cinquefoil	*Potentilla newberryi*	Extinct?		Receding shoreline of Columbia River
Pale Bugseed	*Corispermum pallidum*	Extinct?		Sandy sagebrush plain
Rock Willow	*Salix vestita var. erecta*	Extinct?		High elevation – near springs
Snap-dragon Skullcap	*Scutellaria antirrhinoides*	Extinct?		Mixed conifer / oak woodlands
Washington Monkey-flower	Mimulus washingtonensis	Extinct?		No info available

State Listings, as determined by the Washington Natural Heritage Program:

- Endangered = In danger of becoming extinct or extirpated from Washington.
- Threatened = Likely to become Endangered in Washington.
- Sensitive = Vulnerable or declining and could become Endangered or Threatened in the state.
- Extinct? = Possibly extinct or Extirpated from Washington.

Federal Listings, under the Endangered Species Act – as published in the Federal Register:

- Endangered = Listed Endangered. In danger of extinction.
- Threatened = Listed Threatened. Likely to become endangered.
- Candidate = Candidate species. Sufficient information exists to support listing as Endangered or Threatened.
- Species of Concern = An unofficial status. The species appears to be in jeopardy, but insufficient information exists to support listing.

Appendix J.
Washington Department of Fish and Wildlife Mitigation Policy

Department of Fish and Wildlife POL-M5002
POLICY TITLE: Requiring or Recommending Mitigation
Replaces:
See Also:WDW POL 3000, 3001 and 3002,
all dated 10/1/92; WDW POL 3003,
dated 9/16/92; WDF Policy 410,
dated 9/10/90; and WDF Policy 404,
dated 5/1/87
Commission Policies

POL-M5002 REQUIRING OR RECOMMENDING MITIGATION
This policy applies to all habitat protection assignments where the Washington Department of Fish and Wildlife (WDFW) is issuing or commenting on environmental protection permits, documents, or violation settlements; or when seeking commensurate compensation for impacts to fish and wildlife resources resulting from oil or other toxic spills.

1. Goal is to achieve no loss of habitat functions and values. The goal of WDFW is to maintain the functions and values of fish and wildlife habitat in the state. We strive to protect the productive capacity and opportunities reasonably expected of a site in the future. In the long-term, WDFW shall seek a net gain in productive capacity of habitat through restoration, creation, and enhancement.

   Mitigation credits and debits shall be based on a scientifically valid measure of habitat function, value, and area. Ratios shall be greater than 1:1 to compensate for temporal losses, uncertainty of performance, and differences in functions and values.

2. WDFW uses the following definition of mitigation; avoiding impacts is the highest mitigation priority.

   "Mitigation" means actions that shall be required or recommended to avoid or compensate for impacts to fish, wildlife, or habitat from the proposed project activity. The type(s) of mitigation required shall be considered and implemented, where feasible, in the following sequential order of preference:

   - Avoiding the impact altogether by not taking a certain action or parts of an action.
   - Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
   - Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
   - Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
   - Compensating for the impact by replacing or providing substitute resources or environments.
   - Monitoring the impact and taking appropriate corrective measures to achieve the identified goal.

3. WDFW requires mitigation when issuing environmental permits or documents.

4. WDFW recommends mitigation on permits or documents issued by other agencies.

5. Complete mitigation ensures no loss of habitat functions or values, or populations. Complete mitigation is achieved when mitigation elements in number 2 (A-F) ensures no loss of habitat functions or values, or fish and wildlife populations. Habitat loss and mitigation success shall be measured with the Habitat Evaluation Procedure (HEP) or other method acceptable to WDFW.

6. On-site in-kind mitigation is the highest priority. WDFW priorities for mitigation location and type, in the following sequential order of preference, are:

   On-site, in-kind.
   Off-site, in-kind.
   On-site, out-of-kind.
   Off-site, out-of-kind.

   For off-site mitigation to be accepted, the project proponent must demonstrate to WDFW's satisfaction that greater habitat function and value can be achieved off-site than on-site. Combination of the four types may be accepted. "On-site" means on or adjacent to the project impact site. "In-kind" means the same species or habitat that was impacted.

   Out-of-kind mitigation is not acceptable for impacts to priority habitats and species, with two exceptions: (1) priority habitats and species that are at greater risk can be substituted for impacted priority habitats and species; and (2) for hydraulic projects, WDFW shall consider off-site and/or out-of-kind mitigation where equal or better biological functions and values are provided (see number 8 below). Priority habitats, and habitats of priority species, may be replaced at a level greater than the impacts of the project on those habitats and species.

7. For off-site fish mitigation, mitigation must occur in the same Water Resource Inventory Area (WRIA) as the impacts. Exceptions to the above must be approved by the director. For federal endangered or threatened species, mitigation must occur within the habitat supporting the same Evolutionary Significant Unit (ESU).

8. WDFW may not limit mitigation to on-site, in-kind mitigation when making decisions on hydraulic project approvals for infrastructure development projects.

   The State Legislature has declared that it is the policy of the state to authorize innovative mitigation measures by requiring state regulatory agencies to consider mitigation proposals for infrastructure projects that are timed, designed, and located in a manner to provide equal or better biological functions and values compared to traditional on-site, in-kind mitigation proposals. For these types of projects, WDFW may not limit the scope of options in a mitigation plan to areas on or near the project site, or to habitat types of the same type as contained on a project site. When making a permit decision, WDFW shall consider whether the mitigation plan provides equal or better biological functions and values, compared to the

existing conditions, for the target resources or species identified in the mitigation plan. The factors WDFW must consider in making this decision are identified in RCW 90.74.020 (3).

Also see RCW 75.20.098 and Chapter 90.74 RCW.

9. When WDFW is issuing a Hydraulic Project Approval in relation to state or federal cleanup sites, and WDFW is the sole decision-maker, WDFW can only require mitigation if the sediment dredging or capping actions do not result in a cleaner aquatic environment and equal or better habitat functions and values.

   When other agencies are decision-makers, recommendations for mitigation may be made under other state or federal authority to protect habitat functions and values.

10. When WDFW is issuing a Hydraulic Project Approval and is the sole decision-maker, WDFW can request, but cannot require "habitat mitigation" for maintenance dredging of existing navigable channels and berthing areas.

    The phrase, "habitat mitigation" is analogous to compensatory mitigation. See RCW 75.20.325. When other agencies are decision-makers, recommendations for mitigation may be made under other state or federal authority to protect habitat functions and values.

11. Preserving at-risk, high quality priority habitat may be considered as part of an acceptable mitigation plan.

    When high quality areas of priority habitats or habitats of priority species are at risk, preservation of those habitats may be accepted as part of a mitigation plan, as long as there is no loss of habitat function.

12. Habitat replacement is preferred to hatcheries for fish mitigation.

    Commission policy directs WDFW to give priority to natural production rather than hatchery production, within habitat capabilities.

13. Mitigation game fish may be purchased from aquatic farmers.

    If WDFW requires, as part of a mitigation agreement, that resident hatchery game fish be stocked, RCW 77.18.020 requires that WDFW notify the project proponent that the fish may be purchased from a private aquatic farmer. WDFW shall specify fish health requirements, pounds or numbers, species, stock, and/or race of the fish to be provided.

14. Where authority exists, strive to maintain recreational and harvest opportunities.

15. Approved habitat mitigation measures shall be based on best available science.

16. Mitigation plans shall be required for a project with significant impacts. Mitigation plans shall include the following:

- Baseline data
- Estimate of impacts
- Mitigation measures
- Goals and objectives
- Detailed implementation plan
- Adequate replacement ratio
- Performance standards to measure whether goals are being reached
- Maps and drawings of proposal
- As-built drawings
- Operation and maintenance plans (including who will perform)
- Monitoring and evaluation plans (including schedules)
- Contingency plans, including corrective actions that will be taken if mitigation developments do not meet goals and objectives
- Any agreements on performance bonds or other guarantees that the proponent will fulfill mitigation, operation and maintenance, monitoring, and contingency plan.

17. Proven mitigation techniques must be used.

    Experimental mitigation techniques are allowable only if advance mitigation is being performed and will be fully functional prior to the project impacts.

18. Mitigation shall proceed along with project construction. Mitigation measures are an integral part of a construction project and shall be completed before or during project construction, except projects with impacts that have no proven mitigation techniques.

    Those projects require advance mitigation.

19. Delayed mitigation shall include replacement that is greater than losses.

    Mitigation that is implemented after project construction, or that requires a long time to reach replacement value, shall include additional habitat value (over and above replacement value) equal to the loss through time.

20. WDFW shall determine impacts and mitigation.

    WDFW shall determine the project impact, significance of impact, amount of mitigation required, and amount of mitigation achieved, based on the best available information, including the applicant's plans and specifications.

    For large projects with potentially significant impacts, this will be based on review of studies approved by WDFW.

21. Cumulative impacts of projects shall be considered.

    Cumulative impacts of projects shall be considered and appropriate measures taken to avoid or minimize those impacts.

22. Project proponent pays mitigation costs.

    Mitigation costs may include but are not limited to:

    - Studies to determine impacts and mitigation needs.
    - Alteration of project design.
    - Planning, design, and construction of mitigation features.
    - Operation and maintenance of mitigation measures for duration of project (including personnel).
    - Monitoring of mitigation measures and fish and wildlife response.
    - All WDFW costs including engineering analysis and input.

23. Performance bond or other monetary assurance may be accepted.

    A performance bond, letter of credit, escrow account, or other written financial guarantee may be accepted to ensure that the project proponent will fulfill mitigation requirements, operation and maintenance, monitoring, and contingency plans. The amount of the bond should cover the costs plus 10 percent.

24. Mitigation site shall be protected for the life of the project.

    The mitigation site shall be protected permanently, or at a minimum, for the life of the project. This protection shall be through conservation easement, deed restriction, donation to WDFW, or other legally binding method.

25. WDFW shall seek mitigation for unmitigated projects.

    WDFW shall seek mitigation for unmitigated or undermitigated existing projects. Criteria for prioritizing unmitigated projects are:

    - Fish and wildlife losses from the project.
    - Potential gains of fish and wildlife.
    - Likelihood of achieving mitigation.
    - Time required to achieve mitigation.
    - Support from other agencies and tribes.
    - Presence of priority habitats and species.
    - Cost to WDFW.

26. Compliance monitoring shall be performed as funding allows.

27. Mitigation banking may be an acceptable form of mitigation.

    The term "mitigation bank" as used here refers to a habitat creation, restoration, or enhancement project undertaken by a project proponent to act as a bank of credits to compensate for habitat impacts from future development projects. Credits and debits shall be based on area or a scientifically valid measure of habitat function and value acceptable to

WDFW, such as the Habitat Evaluation Procedure (HEP). The use of credits from a mitigation bank as a form of compensation shall occur only after the standard sequencing of mitigation negotiations (avoid, minimize, rectify, reduce, and then compensate). Habitat units may be traded or sold.

28. Terms of mitigation must be documented.

    A mitigation contract is necessary to document the terms of the mitigation. Mitigation contracts may take several forms:

    - Mitigation agreement (must be approved by Office of Attorney General).
    - Federal Energy Regulatory Commission (FERC) order.
    - Conditions on an environmental permit.
    - Statements in a final environmental impact statement.
    - Conservation easement.
    - Energy Facility Site Evaluation Council (EFSEC) site certification.
    - Landowner Landscape Plan.

29. Habitat and Lands Services Program coordinates all mitigation projects except Columbia and Snake River mainstem fish mitigation projects that are coordinated by the Intergovernmental Fisheries Program.

    The program that coordinates the mitigation projects is responsible for coordinating with all other programs and regions that have interest or involvement in the project.

30. Facilities shall be transferred to the appropriate program for management.

    When mitigation planning is completed, responsibility for any facilities (land, fish cultural facility, etc.) shall be transferred to the appropriate program and region. During the latter stages of planning, the managing program shall be phased into the process.

31. Managing programs shall follow the mitigation contract.

    The program and region managing a mitigation facility or project shall follow the terms of the mitigation contract at all times. No deviations shall be made from the mitigation contract unless approved by the program that negotiated the contract.