

UNITED STATES DEPARTMENT OF AGRICULTURE

FARM SERVICE AGENCY



Washington Conservation Reserve Enhancement Program FINAL Programmatic Environmental Assessment August 2006



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COVER SHEET

Proposed Action: The U.S. Department of Agriculture, Commodity Credit Corporation (USDA/CCC) and the State of Washington have agreed to implement the Washington Conservation Reserve Enhancement Program (CREP), a component of the national Conservation Reserve Program (CRP).

USDA provided the statutory authority by the provisions of the Food Security Act of 1985, as amended (16 U.S.C. 3830 et seq.), and the regulations at 7 CFR 1410. In accordance with the 1985 Act, USDA/CCC is authorized to enroll lands through December 31, 2007.

The Farm Service Agency (FSA) of USDA proposes to enter into a CREP agreement with the State of Washington covering the counties of Asotin, Benton, Chelan, Clallam, Clark, Columbia, Cowlitz, Garfield, Grays Harbor, Jefferson, King, Kitsap, Kittitas, Klickitat, Lewis, Mason, Okanogan Pacific, Pierce, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, Walla Walla, Whatcom, and Whitman. CREP is a voluntary land conservation program for State agricultural land producers.

Type of Document: This PEA was prepared in accordance with the USDA FSA National Environmental Policy Act Implementation Procedures found in 7 CFR 799, as well as the National Environmental Policy Act of 1969, Public Law 91-190, 42 U.S.C. 4321-4347, 1 January 1970, as amended. A Notice of Availability is being published in the Federal Register concurrent with this Final PEA.

Lead Agency: U.S. Department of Agriculture, Farm Service Agency

Cooperating Agency: Washington Conservation Commission, U.S. Department of Agriculture, Natural Resources Conservation Service

Further Information: Rod Hamilton
U.S. Department of Agriculture
316 W. Boone Avenue, Suite 568
Spokane, WA 99201-2350

Comments: Any written comments regarding this assessment shall be submitted to:
Melissa Cummins
State Environmental Coordinator
U.S. Department of Agriculture
316 W. Boone Avenue, Suite 568
Spokane, WA 99201-2350

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EXECUTIVE SUMMARY

This programmatic environmental assessment identifies the possible environmental consequences resulting from the proposed implementation of the Conservation Reserve Enhancement Program agreement for the State of Washington. The Programmatic Environmental Assessment (PEA) process is designed to inform decision-makers and the public about the potential environmental effects of the Proposed Action and to ensure public involvement in the process. The process will help decision-makers take into account all environmental factors when making decisions related to the Proposed Action as outlined in the Conservation Reserve Enhancement Program agreement.

This PEA has been prepared by the United States Department of Agriculture Farm Service Agency (the lead agency) in accordance with the requirements of the National Environmental Policy Act (42 U.S.C. 55 parts 4321 et seq., 2000), the Council on Environmental Quality implementing regulations (40 CFR 30 parts 1500 et seq., 2004), and Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act (7 CFR 7 parts 799 et seq., 2004).

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to implement the Washington Conservation Reserve Enhancement Program Agreement as amended. Under this agreement, approximately 100,000 acres of eligible annual and perennial cropland currently in crop production in 27 designated counties, would be enrolled and enhanced through implementation of approved conservation practices. The goal of this agreement is to improve water quality and assist in the recovery of threatened or endangered salmonids. Conservation practices involved in this agreement include the restoration of riparian habitat, installation of filter strips, and planting of hedgerows.

A number of salmonid species native to Washington have been either listed or proposed for listing as threatened or endangered under the Federal Endangered Species Act. Agricultural activities in riparian corridors, along with agriculture-related impacts on water quality, have contributed to habitat loss of these coldwater fish species in Washington.

DESCRIPTION OF ALTERNATIVES

The alternatives that will be discussed in the Programmatic Environmental Assessment include three possible actions: Alternative A (Proposed Action), Alternative B (Proposed Action with Alterations), and Alternative C (No Action: CREP without amendments).

Alternative A (Proposed Action): Implement the Washington Conservation Reserve Enhancement Program Agreement as amended

The lead agency's Proposed Action is also the preferred alternative (Alternative A). The Proposed Action assumes the implementation of the Washington Conservation Reserve Enhancement Program Agreement as amended.

The Proposed Action targets 100,000 acres for the installation and maintenance of riparian buffers, filter strips, and hedgerow plantings on annual and perennial cropland in 27 counties. The Commodity Credit Corporation is authorized to enroll land in Conservation Reserve Enhancement Program through December 31, 2007 or until the 100,000 acres are enrolled. Eligible land includes agricultural land adjacent to water bodies that provide, or have the potential to provide, important habitat for salmonids.

Land placed under Conservation Reserve Enhancement Program contracts would be retired from crop production and irrigation for 10 to 15 years. Conservation Reserve Enhancement Program would provide Washington producers with financial and technical assistance to voluntarily remove their lands from agricultural production for contract periods of 10 to 15 years and install riparian buffers, filter strips, and

hedgerow plantings that would conserve soil and water; filter nutrients and pesticides; and enhance and restore wildlife habitat.

Alternative B: (Proposed Action with Alterations): Implement the Washington Conservation Reserve Enhancement Program Agreement as amended for annual cropland only

Alternative B targets 100,000 acres for the installation and maintenance of riparian buffers, filter strips, and hedgerow plantings on annual cropland. Unlike Alternative A, Alternative B does not consider perennial cropland eligible for enrollment. Eligible land placed under Conservation Reserve Enhancement Program contracts would be retired from crop production and irrigation for 10 to 15 years. Conservation Reserve Enhancement Program would provide the financial and technical assistance necessary to assist eligible Washington producers in establishing riparian buffers, filter strips, and hedgerow plantings that would conserve soil and water; filter nutrients and pesticides; and enhance and restore wildlife habitat.

Alternative C: (No Action): Continue Implementation of the Washington Conservation Reserve Enhancement Program Agreement Without Amendments

Alternative C, which is the Washington Conservation Reserve Enhancement Program currently in progress, targets 100,000 acres for the installation and maintenance of riparian buffers on annual cropland. Unlike Alternative A, Alternative C does not consider perennial cropland eligible for enrollment, and does not include the installation of either filter strips or hedgerow conservation practices. Eligible land, including annual and perennial crops, placed under Conservation Reserve Enhancement Program contracts would be retired from crop production and irrigation for 10 to 15 years. Conservation Reserve Enhancement Program would provide the financial and technical assistance necessary to assist eligible Washington producers in establishing riparian buffers that would conserve soil and water; filter nutrients and pesticides; and enhance and restore wildlife habitat.

A summary comparison of the three alternatives can be found in Table 2.3 on pages 28-29.

How the Final Programmatic Environmental Assessment was Prepared

This document was prepared with the cooperation of State of Washington personnel. The best available information was used to develop this document; the majority of information was obtained from State and Federal agency reports. The majority of these reports came from the following agencies:

- Washington Department of Ecology
- Washington Department of Natural Resources
- Washington Department of Fish and Wildlife
- Washington Department of Agriculture
- Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Department of Agriculture, National Agricultural Statistics Services
- U.S. Department of Agriculture, Farm Service Agency

Public Comments

A Notice of Availability is being published in local newspapers concurrent with this Programmatic Environmental Assessment. Any written comments concerning this Programmatic Environmental Assessment should be submitted to:

Melissa Cummins
State Environmental Coordinator
U.S. Department of Agriculture
316 W. Boone Avenue, Suite 568
Spokane, WA 99201-2350

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ACRONYMS AND ABBREVIATIONS

μM	micrometers
303(d) List	Water Quality Limited Segments List
BA	Biological Assessment
BMPs	best management practices
BO	biological opinion
CAA	Clean Air Act
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality Regulations
CFR	Code of Federal Regulations
CP	Conservation Practice
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DO	dissolved oxygen
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EE	Environmental Evaluation
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPT insects	insects in the orders Ephemeroptera, Plecoptera, and Trichoptera
ESA	Endangered Species Act
ESUs	Evolutionary Significant Units
FEMA	Federal Emergency Management Agency
FOTG	Field Office Technical Guide
FR	Federal Register
FSA	Farm Service Agency
FWS	Fish and Wildlife Service
GWMA	Groundwater Management Area
MCL	Maximum Contaminant Level
mL	milliliter
MR	Monitoring or Reporting Violation
MSFW	Migrant and Seasonal Farm Worker
N	Nitrogen
NAWQA	National Water Quality Assessment Program
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNLs	National Natural Landmarks

NOAA	National Oceanic and Atmospheric Administration
NPS	National Parks Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
ODW	Office of Drinking Water
PAM	polyacrylamide
PCBs	polychlorinated biphenyls
PEA	Programmatic Environmental Assessment
PEIS	Programmatic Environmental Impact Statement
PHS	Priority Habitats and Species
PWSS	Public Water Supply System
RPMs	Reasonable and Prudent Measures
SASSI	Salmon and Steelhead Stock Inventory Report
SCI	stream condition index
SDWA	Safe Drinking Water Act
SEA	Shorelands and Environmental Assistance
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Office
SMA	Shoreline Management Act
SOC	Species of Concern
SSA	Sole Source Aquifer
SWAP	Source Water Assessment Program
SWCC	Soil and Water Conservation Committee
SWPA	Source Water Protection Area
T&E	threatened and endangered
TCP	Traditional Cultural Property
TMDL	Total Maximum Daily Load
TCR	Total Coliform Rule
TT	Treatment Technique Violation
U.S.	United States
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
Integrated Report	<i>Washington State's Water Quality Assessment [303(d) & 305(b)] Report</i>
WA CREP	Washington Conservation Reserve Enhancement Program
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOH	Washington Department of Health
WHIP	Wildlife Habitat Incentives Program
WHPP	Wellhead Protection Program
WNHP	Washington Natural Heritage Program
WRP	Wetlands Reserve Program

CHAPTER 1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 CONSERVATION RESERVE ENHANCEMENT PROGRAM OVERVIEW

The U.S. Department of Agriculture (USDA)/Commodity Credit Corporation (CCC) and the State of Washington propose to amend the Washington Conservation Reserve Enhancement Program (WA CREP) Agreement, administered by USDA's Farm Service Agency (FSA). Amendments to the original CREP agreement include (1) extending the enrollment period to December 31, 2007; (2) expanding the eligibility requirements for land to include perennial crops; (3) irrigated rental rates, and (4) filter strips and hedgerow plantings as additional eligible CPs (See Appendix A).



CREP is a component of FSA's Conservation Reserve Program (CRP), which targets the specific environmental needs of each State. CRP was established under subtitle D of the Food Security Act of 1985. The purpose of CRP is to cost effectively assist producers in conserving and improving soil, water, and wildlife resources on their farms and ranches. Highly erodible and other environmentally sensitive acreage, normally devoted to the production of agricultural commodities, is converted to a long term resource conservation cover. CRP participants enter into contracts for periods of 10 to 15 years in exchange for annual rental payments and cost-share assistance for installing certain FSA-approved conservation practices (CPs).

The initial goal of CRP was to reduce soil erosion on highly erodible cropland. Subsequent amendments of the CRP regulations have made certain cropland and pastureland eligible for CRP based on its benefits to erosion control, water quality, and wildlife habitat. The environmental impact of this program shift was studied in the 2002 Programmatic Environmental Impact Statement (PEIS) and previous analysis referenced in that document. The Farm Security and Rural Investment Act of 2002 authorized CRP through 2007 and raised the overall enrollment cap to 39.2 million acres.

In 1997, the Secretary of Agriculture initiated CREP as a joint Federal-State partnership that provides agricultural producers with financial incentives to install CPs. CREP is authorized pursuant to the 1996 Federal Agriculture Improvement and Reform Act. CREP agreements are done as partnerships between USDA, State and/or Tribal governments, other Federal and State agencies, environmental groups, wildlife groups, and other non-government organizations. This voluntary program uses financial incentives to encourage producers and ranchers to enroll in 10 to 15-year contracts to remove lands from agricultural production. Through CREP, producers receive annual rental payments and cost-share assistance to establish long term, resource-conserving covers on eligible land. The two primary objectives of CREP are to:

- Coordinate Federal and non-Federal resources to address specific conservation objectives of a State (or Tribal) government and the Nation in a cost-effective manner.
- Control erosion and improve water quality and wildlife habitat related to agricultural use in specific geographic areas.

This Final Programmatic Environmental Assessment (PEA) has been conducted in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended 42 USC 4321 – 4347, the NEPA implementing regulations of the USDA, 7 Code of Federal Regulations (CFR) Part Ib, and the FSA NEPA implementation procedures found in 7 CFR Part 799. This PEA does not address individual site specific impacts which will be addressed at the time when an application offer is received and the conservation plan is prepared.



CRP and CREP are administered by FSA in cooperation with the Natural Resources Conservation Service (NRCS), Cooperative State Research and Education Extension Service, State forestry agencies, and local Soil and Water Conservation Districts. FSA is the lead agency developing this PEA.

1.1.2 PURPOSE OF USING A PROGRAMMATIC ENVIRONMENTAL ASSESSMENT TO ANALYZE THIS ACTION

FSA's regulations for classifying the Agency's actions into levels of environmental review such as categorical exclusions, environmental assessments (EAs), and environmental impact statements (EISs). Compliance with the National Historic Preservation Act (NHPA) and other cultural resource considerations also are incorporated into FSA's NEPA process.

The preparation of this PEA meets the requirements of NEPA, Council on Environmental Quality Regulations (CEQ) section 1502.4: Major Federal actions requiring the preparation of EISs, and 7 CFR Part 799: Environmental Quality and Related Environmental Concerns—Compliance with NEPA.

FSA has a framework in place to ensure NEPA compliance at the field level, where site specific environmental reviews will take place prior to implementing an approved CREP contract. The review will consist of completing a site specific environmental review, which may require consultation with applicable governmental agencies.

A PEA allows FSA to reduce paperwork (CEQ section 1500.4) and identify potential site specific impacts at a State level. FSA plans to use this Final PEA to address similar actions in the implementation of this program and to tier off of this document for site specific implementation of the program whenever NEPA analysis is required.

Relevant Federal laws regarding CREP implementation are defined in Appendix B.

1.2 PURPOSE AND NEED FOR ACTION

The purpose of WA CREP Agreement is to assist in the recovery of salmonid species that have been listed as threatened or endangered (T&E) species under the Federal Endangered Species Act (ESA). Implementation of approved FSA CPs is designed to improve the water quality of discharges coming from agricultural land and increase the amount of habitat available to wildlife in the project area.

There are over 27,000 farms and 4.1 million acres of cropland in WA CREP project area (NASS, 2005a). Nonpoint source pollution of surface water and groundwater quality is a widespread problem in

Washington State. Common pollutants include excessive nutrients, sediments, pesticides, and bacteria. Many of Washington's rivers, lakes, and coastal waters receive direct discharge of treated effluent from municipal and industrial sources as well as runoff from urbanized areas, construction sites, and agricultural areas. Sedimentation, nutrient enrichment, and toxic material loading are problems associated with runoff that can impact surface water quality and the biological communities that the waterbodies are designated and protected to support.

Implementing WA CREP would decrease the amount of nonpoint source pollution and improve habitat quality for T&E salmonid species. The decrease in watershed contaminants would improve water quality; enhance wildlife habitat; and provide cleaner water sources for drinking, recreation, and other uses for the growing Washington population.

The primary goal of WA CREP is to provide an opportunity, through financial and technical assistance within targeted counties, for eligible producers to voluntarily establish riparian habitat and hedgerow plantings, which will increase the amount of available water and improve water quality in the project area. In addition, implementing WA CREP would (Agreement, 2003):

- Protect and conserve the diversity of aquatic life including T&E species; and
- Provide economic benefits to the producer.

The project area is of tremendous economic and ecological importance internationally, nationally, regionally, and for the State of Washington.

1.3 OBJECTIVES

A number of salmonid species native to Washington have been either listed or proposed for listing as threatened or endangered under the ESA. Agricultural activities in riparian corridors and agriculture-related impacts on water quality have contributed to the habitat loss of these coldwater fish species in Washington. This Agreement for WA CREP is designed to help alleviate some of these problems.

It is the intent of USDA, CCC, and the State of Washington that this CREP will address the following objectives:

- Restoration of properly functioning condition (i.e., distribution and growth of woody plant species) to 100 percent for the land enrolled in the riparian forest practice.
- Reduction of sediment and nutrient pollution from agricultural lands adjacent to the riparian buffers by more than 50 percent.
- Establishment of adequate vegetation on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.
- Reduction of the rate of stream water heating to meet State ambient water quality standards by planting adequate vegetation on all riparian buffer lands.
- Provision of a contributing mechanism for producers and ranchers to meet the water quality requirements established under Federal law and under Washington's water quality laws.
- Provision of adequate riparian buffers on 2,700 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics which meet habitat requirements of salmonids.

1.4 ORGANIZATION OF THE PEA

The PEA is organized into 10 chapters:

Chapter 1: Introduction is an introductory chapter that discusses the program, background, regulatory framework, and permits, licenses, and entitlements necessary to implement the proposed action.

Chapter 2: Alternatives Including the Proposed Action describes the preferred action including three alternatives. These alternatives are compared in summary tables in terms of their individual environmental impacts and their achievement of objectives. The geographic and temporal boundaries of the proposed action are defined, and alternatives and resources eliminated from consideration are described.

Chapter 3: Affected Environment provides a description of each resource and identifies specific resources in the CREP area that may be affected. The resources most likely to receive impacts from the alternatives include:

- Biological Resources (Protected Species and Habitat; Wildlife and Fisheries; Vegetation)
- Cultural Resources (Archaeological Resources, Architectural Resources, and Traditional Cultural Properties)
- Water Resources (Surface and Groundwater, Sole Source Aquifers, Coastal Zones, Wetlands, and Floodplains)
- Human Health and Safety
- Socioeconomics
- Environmental Justice
- Wild and Scenic Rivers

A description of each resource is followed by a discussion of the affected environment.

Chapter 4: Environmental Consequences provides a discussion of the environmental consequences of the proposed action on the resources described in Chapter 3, including the level of impact, and the effects of each alternative.

Chapter 5: Cumulative Effects describes the cumulative effects of the proposed action. Following a brief introduction of cumulative effects, past, present, and reasonably foreseeable actions are presented. The cumulative effects of the proposed action are summarized in a cumulative effects matrix.

Chapter 6: Mitigation Measures describes the mitigation measures, including a brief introduction, roles and responsibilities, and a mitigation matrix.

Chapter 7: List of Preparers lists individuals who assisted in the preparation of this PEA.

Chapter 8: Persons and Agencies Contacted lists all agencies, agency personnel, and other experts who participated in supplying data for the PEA.

Chapter 9: Glossary

Chapter 10: References

CHAPTER 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 PROPOSED ACTION

FSA proposed to implement the amended WA CREP Agreement. The installation of approved CPs on up to 100,000 acres of agricultural land will assist in the recovery of salmonid species that have been listed as T&E species under ESA.

WA CREP will consist of a special continuous sign-up CRP component and a State of Washington incentive. WA CREP will seek to enroll up to 100,000 acres of agricultural lands adjacent to waterbodies that provide, or have the potential to provide, important habitat for salmonids. These waterbodies will be identified using maps from the 1993 Salmon and Steelhead Stock Inventory Report (SASSI) or updates to SASSI maps carried out by local conservation districts with the concurrence of Washington Department of Fish and Wildlife (WDFW) and Tribal fisheries biologists.

In addition, lands eligible for CREP enrollment have been identified in Habitat Limiting Factors Analyses conducted by the Washington State Conservation Commission, which identifies the known and presumed distribution of salmonids and salmonid habitat in need of restoration. In cases where habitat has not been evaluated, eligible streams may be designated if the conservation district, WDFW, and Tribal biologists all agree riparian habitat is a significant limiting factor for salmonids.

As of January 1, 2006, there were 623 CREP contracts covering 10,129 acres in the CREP area. The Columbia and Snake River Basins, including Asotin, Columbia, Garfield, and Walla Walla Counties, account for nearly 65 percent of the total known acreage enrolled in WA CREP (Table 2.1). Additionally, Whatcom County also includes substantial CREP acreage (FSA, 2005).

Table 2.1. County summary of active contracts and acres enrolled in WA CREP as of January 1, 2006.

County	Contracts	Acres	County	Contracts	Acres
Asotin	28	1,145.6	Lewis	23	512.8
Benton	NA ¹		Mason	6	37.3
Chelan	NA		Okanogan	8	33.9
Clallam	6	48.9	Pacific	6	105.9
Clark	10	104.0	Pierce	NA	
Columbia	81	1,733.5	Skagit	70	475.2
Cowlitz	NA		Snohomish	14	202.9
Garfield	53	1,046.2	Thurston	4	21.4
Grays Harbor	10	87.1	Wahkiakum	5	131.6
Jefferson	13	108.0	Walla Walla	112	2,596.3
King	NA		Whatcom	153	1,357.4
Kitsap	NA		Yakima	4	158.9
Klickitat	4	47.5	State Total	623	10,129.6 ²

¹ NA = Data not available due to privacy restrictions required by the Farm Security and Rural Investment Act of 2002.

² State Total does not equal sum total due to rounding and privacy restrictions.

Source: FSA, 2005.

2.2 SCOPING

2.2.1 CONSULTATION WITH THE FISH AND WILDLIFE SERVICE AND NATIONAL MARINE FISHERIES SERVICE

Under section 7 of ESA, FSA requested formal consultation with Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) in 1999 for the original CREP Agreement. As a part of the formal consultation request, FSA submitted a biological assessment (BA) describing CREP, potential effects of CREP on T&E species, and best management practices (BMPs) that would be implemented to minimize adverse effects. A biological opinion (BO) (NMFS Log # WSB-99-462 and FWS Log # 1-3-F-0064) issued by FWS and NMFS in 2000 was partially based upon the BA and finalized FSA's formal consultation request for the original CREP Agreement (Appendix C; FWS and NMFS, 2000).

The BO concluded that CREP would not "jeopardize the continued existence of threatened or endangered species or species which are listed or proposed for listing under the Endangered Species Act." The BO also stated that the full achievement of CREP would substantially contribute to the survival and recovery of T&E species.

However, FWS and NMFS expressed concern that some site specific activities may result in short term adverse effects to listed species, including incidental take. These effects are described in more detail in Chapter 4: Environmental Consequences. These activities are identified within the BO and include, but are not limited to, actions such as (1) bank shaping that exceeds 30 linear feet and (2) any activities that are not consistent with the CREP BA (BMPs inclusive) and this BO (Reasonable and Prudent Measures [RPMs] and Terms and Conditions inclusive) (FWS and NMFS, 2000). These activities are described in more detail in the BO in Appendix C.

Accordingly, FWS and NMFS provided a set of RPMs necessary to minimize the take of listed species associated with CREP with which FSA must comply. Should additional critical habitat be designated in areas inhabited by listed species, these RPMs would also minimize adverse effects to that habitat (FWS and NMFS, 2000). These RPMs are:

- Ensure the development and implementation of a comprehensive monitoring program to assess the effectiveness of the CREP in meeting its objectives;
- Avoid take of listed species in any restoration activities that are part of WA CREP;
- Manage herbicides, pesticides, and other chemicals as needed to ensure that no degradation of water quality, aquatic habitats, and wetlands occurs in the activity area or downstream;
- Locate, design, and maintain livestock crossings or fords necessary to minimize degradation of riparian and aquatic habitats in the activity area and downstream; and
- Minimize take of listed species associated with instream work or ground-disturbing activities within the riparian zone proposed in the CREP BA (i.e., streambank stabilization, site-preparation, off-channel livestock watering facilities, and livestock crossings) by applying appropriate timing restrictions.

FWS and NMFS believe that programmatic consultation for CREP removes the requirement for most project level consultation (Appendix H). Consequently, unless otherwise identified within the BO, activities performed within CREP that are consistent with BMPs described in the CREP BA and RPMs and Terms and Conditions described in the BO will not require further consultation. However, the BO also states that reinitiation of programmatic consultation is required if "the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion" (FWS and NMFS, 2000).

Because amendments to the original CREP Agreement would add additional CPs (i.e., grass filter strips and hedgerow plantings) that may have an effect on T&E species, FSA requested reinitiation of

consultation to fully comply with ESA's section 7 and to adhere to BO's conditions. These requests were made in letters dated September 15, 2005, and October 3, 2005.

At this time, NMFS and FWS have stated that consultation on the amendments will be more appropriate after the public comment period for the Final PEA has been completed and the details of the amendments are finalized. Accordingly, FSA withdrew their request for consultation in a letter dated January 12, 2006. However, open communication will be maintained with FWS and NMFS throughout the amendments' planning process and FSA will solicit early input from FWS and NMFS regarding the potential effects of proposed CP implementation on T&E species. Once the NEPA process has been completed and details of the amendment are finalized, FSA will renew their consultation request to FWS and NMFS.

2.2.2 CONSULTATION WITH THE STATE HISTORIC PRESERVATION OFFICE

Currently, consultation with the State Historic Preservation Office (SHPO) is an informal site specific process and has been ongoing since CREP was first implemented in Washington. In order to fully comply with section 106 of NHPA, FSA, in letters dated September 15, 2005, and October 3, 2005, made requests to SHPO to review this process at the programmatic level (Appendix H). Until further notice from SHPO, the informal consultation process outlined below will continue to be used for each CREP contract.

Once a parcel of land has been selected for CREP enrollment, the local FSA County Executive Director initiates consultation with a letter to SHPO describing the area of impact and requests comments. In response, SHPO indicates whether or not a site specific survey is required. If a site specific survey is required, FSA conducts and reviews the surveys and sends copies to SHPO and any affected Tribes along with any findings based on the survey. This process will be implemented for all future enrollments in WA CREP.

After reviewing the area of impact, SHPO may determine that Tribal consultation is also necessary and will defer to the appropriate Tribe(s). Tribes that have been a part of this consultation process to date include the Nooksack, Lummi, Yakama, Spokane, and Nez Perce. In Yakima County, FSA has contracted with the Yakama Tribe to have an archaeologist on site during any excavations. Tribal consultation will be initiated when appropriate for all future enrollments in WA CREP.

2.2.3 CONSULTATION WITH THE ENVIRONMENTAL PROTECTION AGENCY

Section 1424(e) of the Safe Drinking Water Act (SDWA) requires U.S. Environmental Protection Agency (EPA) review of any Federal actions that may affect sole source aquifers (SSAs). Since there are SSAs located in CREP counties, FSA made a request to EPA to review CREP activities. In a letter dated October 6, 2005, EPA replied with the following evaluation of CREP's effects on SSAs:

This USDA program clearly protects, if not enhances, groundwater quality in EPA-designated SSA areas. We agree that the program likely reduces pesticide use, increases filtering of surface water infiltration, and provides an additional institutional environmental review of subject lands. We do not believe that the CREP projects will have any adverse impact on groundwater located in SSA areas, and therefore we will not need to review specific projects in your program (Appendix H).

2.2.4 RESOURCES CONSIDERED BUT ELIMINATED FROM ANALYSIS

The following resources were eliminated from analysis because they are not expected to be directly impacted by CREP.

Soil Resources

The implementation of CREP is unlikely to impact soil resources. Any marginal impacts on soil resources are likely to be beneficial, but will be unquantifiable at the programmatic scale of CREP. Impacts on soil resources will be evaluated at a site specific level prior to the implementation of CPs. The implementation of CPs may provide minimal ancillary benefits to soil resources by minimizing erosion potential.

Air and Noise

Noise will not be reduced nor generated as a result of CREP implementation. Use of mechanized equipment will be minimal, as required by the FWS's BMPs to reduce adverse environmental impacts resulting from the installation of CREP practices (FWS and NMFS, 2000). Air quality is not likely to be impacted as a result of CREP. While the potential exists for minor localized improvements in air and noise quality, the potential benefits would be minor and unquantifiable at the programmatic level of this PEA.

Recreation

Recreational access to streams affected by CREP will be minimal because these streams are located on private land. CREP is not expected to directly affect recreation (fishing, swimming, or boating), although ancillary benefits to sport fish populations, such as improved water quality, may marginally increase recreational opportunities and localized revenues. For this reason, recreation issues are minimally addressed in the Socioeconomics section.

Traffic and Transportation

The implementation of CREP will not impact the transportation structure within the project area. Traffic on roadways will not be impacted because CREP is not a major construction activity and non-mechanized means will be employed to install CPs. Roadways will not be used except for the transport of materials, which should not affect traffic flow more than normal day to day operations of farms and ranches.

National Natural Landmarks

The National Natural Landmarks (NNLs) Program recognizes and encourages the conservation of outstanding examples of the Nation's natural history. It identifies and recognizes the best examples of biological and geological features in both public and private producership. With the producer's concurrence, NNLs are designated by the Secretary of the Interior and the program is administered by the National Park Service (NPS) (NPS, 2005a). There are 17 NNLs in Washington (Table 2.2), with 12 in the CREP project area. CREP is not expected to directly impact NNLs. If impacts are apparent, CREP and the installation of CPs are consistent with the protection and restoration of these national treasures.

Wilderness

There are 30 wilderness areas in Washington State, covering 4,317,132 acres, 25 of which are within CREP boundaries. These wilderness areas are managed by the Forest Service, FWS, NPS, and the U.S. Bureau of Land Management (Wilderness.net, 2005). However, because WA CREP is only available for enrollment of private land, federally owned wilderness areas are excluded. Therefore, although CREP may complement wilderness areas by improving habitat for aquatic wildlife, this resource has been eliminated from further analysis.

Table 2.2. National Natural Landmarks in Washington State (CREP NNLs in Italics).

National Natural Landmark	Location	Land Productership
Boulder Park and McNeil Canyon Haystack Rocks	Douglas County	State, Private
<i>Davis Canyon</i>	<i>Okanogan County</i>	<i>State, Private</i>
Drumheller Channels	Douglas County	Federal, State, Private
Grand Coulee	Grant County	Federal, State, Private
The Great Gravel Bar of Moses Coulee	Douglas County	State, Private
<i>Ginkgo Petrified Forest</i>	<i>Kittitas County</i>	<i>State</i>
<i>Grande Ronde Feeder Dikes</i>	<i>Asotin County</i>	<i>Private</i>
<i>Grand Ronde Goosenecks</i>	<i>Asotin County</i>	<i>Federal, State, Private</i>
<i>Mima Mounds</i>	<i>Thurston County</i>	<i>State</i>
<i>Nisqually Delta</i>	<i>Pierce and Thurston Counties</i>	<i>Federal, State, Private</i>
<i>Point of Arches</i>	<i>Clallam County</i>	<i>Federal, State</i>
<i>Rose Creek Preserve</i>	<i>Whitman County</i>	<i>Private</i>
Sims Corner Eskers and Kame Complex	Douglas County	Federal, State, Private
<i>Steptoe and Kamiak Buttes</i>	<i>Whitman County</i>	<i>State, County, Private</i>
<i>Umtanum Ridge Water Gap</i>	<i>Kittitas County</i>	<i>Federal, State, Private</i>
<i>Wallula Gap</i>	<i>Benton and Walla Walla Counties</i>	<i>Federal, Municipal, Private</i>
Withrow Moraine and Jameson Lake Drumlin Field	Douglas County	Private

Source: NPS, 2005a.

2.3 ALTERNATIVES ELIMINATED FROM ANALYSIS

No alternatives were eliminated from analysis. Only alternatives considered are analyzed.

2.4 ALTERNATIVES SELECTED FOR ANALYSIS

The original WA CREP agreement, signed in October, 1998, is in the process of being amended. Amendments to the original CREP agreement include (1) extending the enrollment period to December 31, 2007, (2) expanding the eligibility requirements for land to include perennial crops, (3) irrigated rental rates, and (4) filter strips and hedgerow plantings as additional eligible CPs. These amendments form the basis for three separate alternatives: Alternative A (the proposed action), Alternative B (proposed action with alterations), and Alternative C (no action).

2.4.1 ALTERNATIVE A: PROPOSED ACTION

Payment of irrigated rental rates on annual and perennial cropland enrolled with implementation of riparian buffers, filter strips, and hedgerow planting.

Implementation of Alternative A would target 100,000 acres of annual and perennial cropland over 28 counties for the installation and maintenance of three CPs: filter strips, riparian buffers, and hedgerow planting.

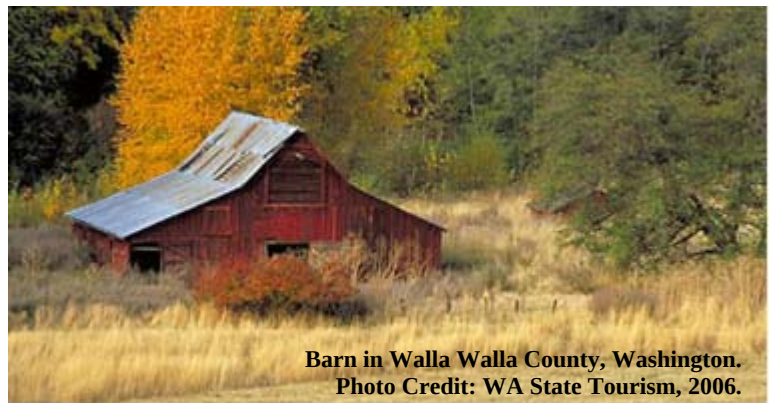
CP 21 Filter Strips: Filter strips are areas of herbaceous vegetation situated between cropland, grazing land, forest land, disturbed land, or other environmentally sensitive lands including streams, lakes, and wetlands. Filter strips reduce sedimentation and contamination from runoff, while restoring or enhancing herbaceous habitat for wildlife and beneficial insects and maintaining or enhancing watershed functions and values.

CP 22 Riparian Buffer: Riparian buffers are strips of grass, trees, or shrubs established adjacent to streams, ditches, wetlands, or other waterbodies. Riparian buffers reduce pollution and protect surface and subsurface water quality while enhancing the aquatic ecosystem.

Hedgerow Planting: Hedgerow planting is the establishment of dense vegetation in a linear design. Hedgerow plantings may provide food, cover, and corridors for terrestrial wildlife and aquatic organisms, reduce noise and dust into water courses, and improve the appearance of the landscape.

CPs must meet the minimum specifications outlined in the NRCS Field Office Technical Guide (FOTG) as well as all other applicable Federal, State, and local requirements. Detailed rental and incentive payments, cost share and maintenance payments, technical requirements, and operating procedures for each practice are outlined in the FSA Handbook 2-CRP and are included in Appendix D of this PEA.

Land enrolled in CREP would be retired from crop production and irrigation for 10-15 years. CREP would provide the financial and technical assistance necessary to assist eligible Washington producers in voluntarily establishing CPs to restore habitat conditions and control nonpoint source pollution, including nutrient loading, soil erosion, and sedimentation. Producers will be eligible to receive rental payments and other financial assistance in return for removal of their lands from agricultural production. Under alternative A, an irrigated soil rental rate will be paid for each acre enrolled in the program. Annual irrigated rental rates for WA CREP vary by watershed but currently range from \$80 to \$200 per acre. The project would be jointly funded by USDA/CCC and the State of Washington.



Barn in Walla Walla County, Washington.
Photo Credit: WA State Tourism, 2006.

2.4.2 ALTERNATIVE B: PROPOSED ACTION WITH ALTERATIONS

Payment of irrigated rental rates on annual cropland enrolled with implementation of riparian buffers, filter strips, and hedgerow planting.

Implementation of Alternative B would target 100,000 acres of annual cropland over 28 counties for the installation and maintenance of three CPs: riparian buffers, filter strips, and hedgerow planting.

CPs must meet the minimum specifications outlined in the NRCS FOTG as well as all other applicable Federal, State, and local requirements. Detailed rental and incentive payments, cost share and

maintenance payments, technical requirements, and operating procedures for each practice are outlined in the FSA Handbook 2-CRP and are included in Appendix D of this PEA.

Land enrolled in CREP would be retired from crop production and irrigation for 10-15 years. CREP would provide the financial and technical assistance necessary to assist eligible Washington producers in voluntarily establishing CPs to restore habitat conditions and control nonpoint source pollution including nutrient loading, soil erosion, and sedimentation. The producers would be funded to install FSA approved CPs and compensated at irrigated rental rates provided by FSA. Annual irrigated rental rates for WA CREP vary by watershed but currently range from \$80 to \$200 per acre. The project would be jointly funded by USDA/CCC and the State of Washington.

2.4.3 ALTERNATIVE C: NO ACTION (CONTINUE IMPLEMENTATION OF CREP WITHOUT AMENDMENTS)

Payment of dryland rental rates on annual cropland enrolled with implementation of riparian buffers.

Implementation of Alternative C would target 100,000 acres of annual cropland over 28 counties for the installation and maintenance of CP 22: riparian vegetation.

CPs must meet the minimum specifications outlined in the NRCS FOTG as well as all other applicable Federal, State, and local requirements. Detailed rental and incentive payments, cost share and maintenance payments, technical requirements, and operating procedures for each practice are outlined in the FSA Handbook 2-CRP and are included in Appendix D of this PEA.

Land enrolled in CREP would be retired from crop production and irrigation for 10-15 years. CREP would provide the financial and technical assistance necessary to assist eligible Washington producers in voluntarily establishing CPs to restore habitat conditions and control nonpoint source pollution including nutrient loading, soil erosion, and sedimentation. The producers

would be funded to install FSA approved CPs and compensated at dryland rental rates provided by FSA. The project would be jointly funded by USDA/CCC and the State of Washington.



Erosion on a farm in southeastern Washington.
Photo Credit: NRCS, 2006.

2.5 COMPARISON OF ALTERNATIVES

Table 2.3 summarizes how each alternative will achieve the six objectives of WA CREP. Table 2.4 summarizes the impacts of CP installation on affected resources.

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Table 2.3. Comparison of three alternatives and how each will achieve the objectives of CREP.

Objectives	Alternative A: Proposed Action	Alternative B: Proposed Action with Alterations	Alternative C: No Action
Objective #1: Restoration of properly functioning condition (i.e., distribution and growth of woody plant species) to 100 percent for the land enrolled in the riparian forest practice.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs would be established to restore the natural vegetative community.	Retire approximately 100,000 acres of eligible/irrigated annual cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs would be established to restore the natural vegetative community.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) would be established to restore the natural vegetative community.
Objective #2: Reduction of sediment and nutrient pollution from agricultural lands adjacent to the riparian buffers by more than 50 percent.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs would be established to reduce sedimentation and nutrient loading to adjacent rivers and streams.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs would be established to reduce sedimentation and nutrient loading to adjacent rivers and streams.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) would be established to reduce sedimentation and nutrient loading to adjacent rivers and streams.
Objective #3: Establishment of adequate vegetation on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream banks would restore natural stabilization and reduce stream bank erosion.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream banks would restore natural stabilization and reduce stream bank erosion.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) established along stream banks would restore natural stabilization and reduce stream bank erosion.
Objective #4: Reduction of the rate of stream water heating to meet State ambient water quality standards by planting adequate vegetation on all riparian buffer lands.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream banks would provide natural shading to lower water temperatures and reduce evapotranspiration.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream banks would provide natural shading to lower water temperatures and reduce evapotranspiration.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) established along stream banks would provide natural shading to lower water temperatures and reduce evapotranspiration.

Objective #5: Provision of a contributing mechanism for producers and ranchers to meet the water quality requirements established under Federal law and under Washington's water quality laws.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream improve water quality by limiting sedimentation and nutrient loading, minimizing input of fertilizers, stabilizing stream banks, and reducing water temperatures.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along stream improve water quality by limiting sedimentation and nutrient loading, minimizing input of fertilizers, stabilizing stream banks, and reducing water temperatures.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) established along stream improve water quality by limiting sedimentation and nutrient loading, minimizing input of fertilizers, stabilizing stream banks, and reducing water temperatures.
Objective #6: Provision of adequate riparian buffers on 2,700 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics which meet habitat requirements of salmonids.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along streams banks would restore natural stream flow dynamics and physical characteristics, while providing provide high quality salmonid habitat conducive to spawning and rearing juveniles.	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22), filter strips (CP 21), and hedgerow planting CPs established along streams banks would restore natural stream flow dynamics and physical characteristics, while providing provide high quality salmonid habitat conducive to spawning and rearing juveniles	Retire approximately 100,000 acres of eligible annual and perennial cropland. Riparian buffers (CP 22) established along streams banks would restore natural stream flow dynamics and physical characteristics, while providing provide high quality salmonid habitat conducive to spawning and rearing juveniles.

Table 2.4 Summary comparison of the effects of Alternatives A, B, and C on the affected resources.

Resource	Alternative A: Proposed Action	Alternative B: Proposed Action with Alterations	Alternative C: No Action
Biological Resources	Installation of CPs would improve water quality for aquatic wildlife and protected species by stabilizing stream banks, increasing stream shading, filtering nutrients and contaminants, and improving wildlife habitat along riparian corridors. Temporary negative impacts could result during site preparation for CP installation.	Installation of CPs would improve water quality for aquatic wildlife and protected species by stabilizing stream banks, increasing stream shading, filtering nutrients and contaminants, and improving wildlife habitat along riparian corridors. Temporary negative impacts could result during site preparation for CP installation. Fewer lands would be eligible under this alternative.	Installation of CPs would improve water quality for aquatic wildlife and protected species by stabilizing stream banks, increasing stream shading, filtering nutrients and contaminants, and improving wildlife habitat along riparian corridors. Temporary negative impacts could result during site preparation for CP installation. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.
Cultural Resources	Cultural resources are unlikely to be impacted if coordination with the State Historic Preservation Office and Tribes to minimize impacts is carried out. CPs may serve to protect inappropriate access to cultural resources.	Cultural resources are unlikely to be impacted if coordination with the State and/or Tribal Historic Preservation Office and Tribes to minimize impacts is carried out. CPs may serve to protect inappropriate access to cultural resources.	Cultural resources are unlikely to be impacted if coordination with the State and/or Tribal Historic Preservation Office and Tribes to minimize impacts is carried out. CPs may serve to protect inappropriate access to cultural resources.
Surface Water	Installation of CPs would improve surface water quality by decreasing sedimentation, increasing shading, decreasing nutrient loading and contamination. The removal of lands from production would reduce application of fertilizers and pesticides, and reduce the amount of surface water needed for irrigation. Potential temporary negative impacts on surface waters may result during site preparation for CP installation.	Installation of CPs would improve surface water quality by decreasing sedimentation, increasing shading, decreasing nutrient loading and contamination. The removal of lands from production would reduce application of fertilizers and pesticides, and reduce the amount of surface water needed for irrigation. Potential temporary negative impacts on surface waters may result during site preparation for CP installation. Fewer lands would be eligible under this alternative.	Installation of CPs would improve surface water quality by decreasing sedimentation, increasing shading, decreasing nutrient loading and contamination. The removal of lands from production would reduce application of fertilizers and pesticides, and reduce the amount of surface water needed for irrigation. Potential temporary negative impacts on surface waters may result during site preparation for CP installation. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.
Groundwater	CP installation would improve water quality, reducing contamination of wellheads by filtering agricultural runoff and improving quality in recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, and could reduce the amount of water used for irrigation.	CP installation would improve water quality, reducing contamination of wellheads by filtering agricultural runoff and improving quality in recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, and could reduce the amount of water used for irrigation. Fewer lands would be eligible for enrollment.	CP installation would improve water quality, reducing contamination of wellheads by filtering agricultural runoff and improving quality in recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, and could reduce the amount of water used for irrigation. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.

Resource	Alternative A: Proposed Action	Alternative B: Proposed Action with Alterations	Alternative C: No Action
Drinking Water including Sole Source Aquifers	CP installation would improve surface water quality, reducing contamination of wellheads by filtering agricultural runoff and improving water quality in SSA recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, reducing the potential for contamination of drinking water sources.	CP installation would improve surface water quality, reducing contamination of wellheads by filtering agricultural runoff and improving water quality in SSA recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, reducing the potential for contamination of drinking water sources. Fewer lands would be eligible for enrollment.	CP installation would improve surface water quality, reducing contamination of wellheads by filtering agricultural runoff and improving water quality in SSA recharge areas. The removal of lands from production would reduce application of fertilizers and pesticides, reducing the potential for contamination of drinking water sources. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.
Coastal Resources	CP installation would filter sediment, contaminants, and nutrients from runoff and prevent soil erosion. Water quality in coastal areas would improve due to improved quality in rivers and streams, benefiting wildlife. Also, CPs would improve conditions for salmonids, who migrate from fresh to saline waters and play a dynamic role in coastal communities. Reductions in nutrient loading to coastal systems would decrease eutrophication, further improving coastal water quality.	CP installation would filter sediment, contaminants, and nutrients from runoff and prevent soil erosion. Water quality in coastal areas would improve due to improved quality in rivers and streams, benefiting wildlife. Also, CPs would improve conditions for salmonids, who migrate from fresh to saline waters and play a dynamic role in coastal communities. Reductions in nutrient loading to coastal systems would decrease eutrophication, further improving coastal water quality. Fewer lands would be eligible for enrollment.	CP installation would filter sediment, contaminants, and nutrients from runoff and prevent soil erosion. Water quality in coastal areas would improve due to improved quality in rivers and streams, benefiting wildlife. Also, CPs would improve conditions for salmonids, who migrate from fresh to saline waters and play a dynamic role in coastal communities. Reductions in nutrient loading to coastal systems would decrease eutrophication, further improving coastal water quality. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.
Wetlands	Installation of CPs would result in minimal positive impacts on wetlands as a result of improvements in water quality and wildlife habitat.	Installation of CPs would result in minimal positive impacts on wetlands as a result of improvements in water quality and wildlife habitat.	Installation of CPs would result in minimal positive impacts on wetlands as a result of improvements in water quality and wildlife habitat.
Floodplains	Installation of CPs would benefit floodplains by improving floodwater retention, increasing storage capacity, and providing flood damage protection from filter strips and hedgerows. CPs would assist in controlling flood events.	Installation of CPs would benefit floodplains by improving floodwater retention, increasing storage capacity, and providing flood damage protection from filter strips and hedgerows. CPs would assist in controlling flood events. Fewer lands would be eligible for enrollment.	Installation of CPs would benefit floodplains by improving floodwater retention and increasing storage capacity. CPs would assist in controlling flood events. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.

Resource	Alternative A: Proposed Action	Alternative B: Proposed Action with Alterations	Alternative C: No Action
Human Health and Safety	CP installation would take agricultural lands out of production and reduce the need for fertilizers and harmful pesticides. Less exposure to chemicals may improve the health of farm workers.	CP installation would take agricultural lands out of production and reduce the need for fertilizers and harmful pesticides. Less exposure to chemicals may improve the health of farm workers.	CP installation would take agricultural lands out of production and reduce the need for fertilizers and harmful pesticides. Less exposure to chemicals may improve the health of farm workers.
Socioeconomics	Producers would benefit from installation of CPs through annual irrigated rental rates and incentive payments. Economic benefits due to improvements in wildlife-related recreation would result from environmental benefits provided by CREP.	Producers would benefit from installation of CPs through annual irrigated rental rates and incentive payments. Economic benefits due to improvements in wildlife-related recreation would result from environmental benefits provided by CREP. Fewer lands would be eligible for enrollment.	Producers would benefit from installation of CPs through annual non-irrigated rental rates and incentive payments. Economic benefits due to improvements in wildlife-related recreation would result from environmental benefits provided by CREP. Under this alternative fewer lands would be eligible and benefits would result from restoration of riparian buffers only.
Environmental Justice	By enrolling marginal, less productive agricultural lands, landowners should be able to reduce overall input costs for farming operations and maintain or increase production by being able to concentrate resources on the remaining farmland. Disproportionate effects on minority or underrepresented groups are unlikely.	By enrolling marginal, less productive agricultural lands, landowners should be able to reduce overall input costs for farming operations and maintain or increase production by being able to concentrate resources on the remaining farmland. Disproportionate effects on minority or underrepresented groups are unlikely.	By enrolling marginal, less productive agricultural lands, landowners should be able to reduce overall input costs for farming operations and maintain or increase production by being able to concentrate resources on the remaining farmland. Disproportionate effects on minority or underrepresented groups are unlikely.

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2.5.1 IDENTIFICATION OF GEOGRAPHICAL BOUNDARIES

WA CREP targets 100,000 acres of potential salmonid habitat on 30,933,120 acres comprised of the following counties (Figure 2.1):

- Asotin
- Benton
- Chelan
- Clallam
- Clark
- Columbia
- Cowlitz
- Garfield
- Grays Harbor
- Jefferson
- King
- Kitsap
- Kittitas
- Klickitat
- Lewis
- Mason
- Okanogan
- Pacific
- Pierce
- Skagit
- Skamania
- Snohomish
- Thurston
- Wahkiakum
- Walla Walla
- Whatcom
- Whitman
- Yakima

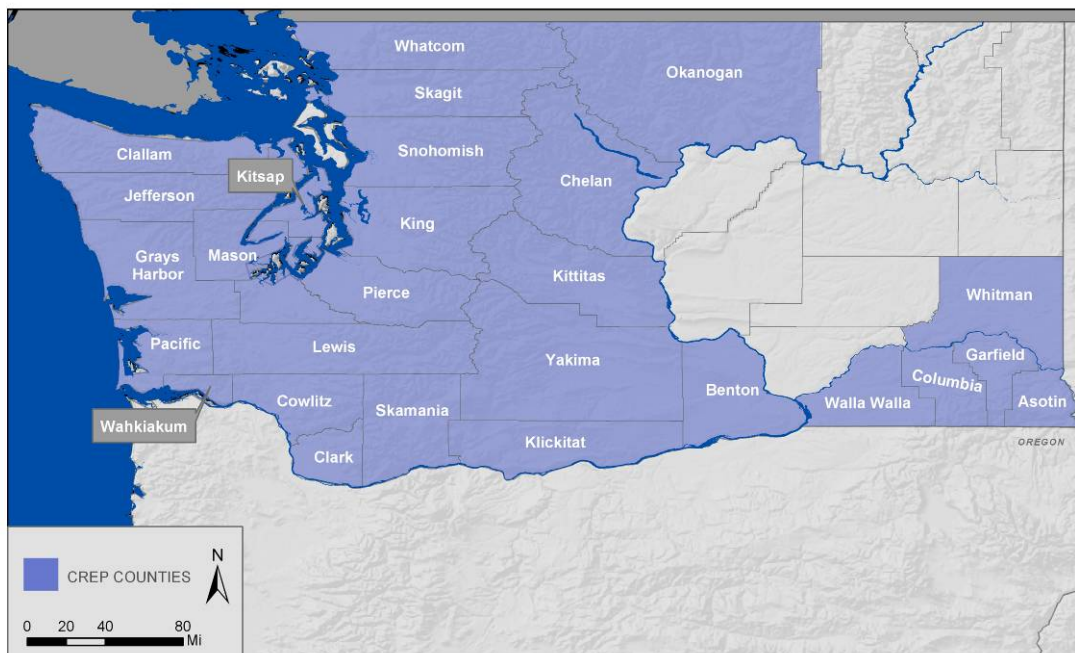


Figure 2.1. Geographical boundaries of WA CREP.

2.5.2 IDENTIFICATION OF TEMPORAL BOUNDARIES

In accordance with the Food Security Act of 1985, the CCC is authorized to enroll land in CRP, including CREP, through December 31, 2007. The continuous sign-up CRP contracts for acres enrolled in this CREP must be a minimum of 10 years, but may not exceed a maximum of 15 years (Agreement, 2003). Enrollment through 2007 would allow contracts to continue through 2022.

The primary long term benefits CPs will provide for salmonids are shade and the corresponding reduction in water temperature. However, sporadic enrollment and the time needed for woody species growth will

delay direct observation of this benefit. WA CREP has been envisioned as providing a long term benefit that will take several years to be fully realized. Immediate benefits that may be realized include nutrient uptake ability of riparian vegetation and the opportunity to substantially reduce sediment runoff (WCC, 2004). Based upon the long term improvements due to CREP, this assessment estimates a temporal boundary of 20 to 50 years to assess environmental effects.

CHAPTER 3.0 AFFECTED ENVIRONMENT

3.1 BIOLOGICAL RESOURCES

Washington is one of the most ecologically diverse States in the Nation. This diversity is the result of many natural factors, such as the State's varied topography, its exposure to Pacific Ocean currents and weather patterns, and its location on the migratory path of many wildlife species including birds, California gray whales, and Pacific Northwest salmon (WDFW, 2005a). The responsibility for the protection of Washington's biological resources is shared by three State agencies: the Department of Natural Resources (WDNR), Department of Ecology (Ecology), and WDFW. The combined mission of these agencies is to protect and preserve the environment and natural resources of Washington State.



Individual observing wildlife in a Washington pond.
Photo Credit: NRCS, 2006.

3.1.1 PROTECTED SPECIES AND HABITAT

Description

Federal

ESA was enacted to protect T&E species and to provide a means to conserve critical habitat. ESA defines an endangered species as one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is likely to become endangered within the foreseeable future. T&E designations may be applied to all species of plants and animals except pest insects. A species may be threatened at the State level, but that same designation does not automatically apply nationwide, as species numbers may be greater in other States. Washington has 33 federally listed T&E animals and 9 federally listed T&E plants (Table 3.1) (FWS, 2005a).

Critical habitat is defined by ESA as areas that are essential to the conservation of listed species. Private, city, and State lands are generally not affected by critical habitat until the property producer needs a Federal permit or requests Federal funding. Because WA CREP is partially funded by Federal dollars, consultation with FWS will be required when T&E species or critical habitat are encountered for CREP contracts. FWS has recently proposed rules that would help remove disincentives from private producers that wish to manage their property for the benefit of listed species (64 FR 32706-32716). This would entail the development of Safe Harbor Agreements and Candidate Conservation Agreements with Assurances. These agreements ensure agricultural producers that traditional agricultural uses could continue alongside habitat improvements. They also address the issue of "incidental take" with regard to activities such as habitat restoration.

Section 7 of ESA, called "Interagency Cooperation," is the mechanism by which Federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species.

Under section 7, consultation with FWS is initiated when any action an agency carries out, funds, or authorizes may affect T&E species or critical habitat. This process usually begins as informal

consultation. In the early stages of project planning, a Federal agency approaches FWS and requests informal consultation. Discussions between the two agencies may include what types of listed species may occur in the proposed project area, and what effect the proposed action may have on those species. For each CREP contract, this process begins with the environmental review is completed.

If the Federal agency, after discussions with FWS, determines that the proposed action is not likely to affect any listed species in the project area, and if FWS concurs, the informal consultation is complete and the proposed project moves ahead. If it appears that the agency's action may affect a listed species, that agency may then prepare a BA to help determine the project's effect on a species.

If a Federal agency determines that an action is likely to adversely affect a listed species, the agency must conduct a formal consultation, in which information about the proposed project and the species likely to be affected is shared among the agency and FWS. Following initial consultation, the FWS prepares a BO on whether the proposed activity will jeopardize the continued existence of a listed species. FWS and NMFS completed a Section 7 Consultation for WA CREP. In the BO the agencies concluded that CREP will not jeopardize the continued existence of T&E species listed or proposed for listing under ESA.

State

WDFW publishes a Priority Habitats and Species (PHS) list and a Species of Concern (SOC) list. The PHS list is a catalog of habitats and species considered to be priorities for conservation and management. *Priority species* require protective measures for their perpetuation because of their population status, sensitivity to habitat alteration, and/or recreational, commercial, or Tribal importance. *Priority species* include State Endangered, Threatened, Sensitive, and Candidate species and animal aggregations considered vulnerable.. *Priority habitats* are those habitat types or elements with unique or significant value to a diverse assemblage of species. A *priority habitat* may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element.

The SOC list includes native Washington fish and wildlife species listed as Endangered, Threatened, or Sensitive, or as Candidates for these designations. Endangered, Threatened, and Sensitive species are legally established in Washington Administrative Codes, while candidate species are established by WDFW policy.

Affected Environment

There are currently 42 federally listed T&E species in Washington, including 32 vertebrates, 1 invertebrates, and 9 plants (FWS, 2005a). A complete list of federally and state listed species occurring or with the potential to occur in Washington is included in Table 3.1.

Table 3.1. Federally-listed species in Washington State.

Common Name	Species Name	Status ¹
Short-tailed albatross	<i>Phoebastria (=Diomedea) albatrus</i>	E
Grizzly bear	<i>Ursus arctos horribilis</i>	T
Oregon silverspot butterfly	<i>Speyeria zerene hippolyta</i>	T
Woodland caribou	<i>Rangifer tarandus caribou</i>	E
Eskimo curlew	<i>Numenius borealis</i>	E
Columbian white-tailed deer (Columbia River DPS)	<i>Odocoileus virginianus leucurus</i>	E
Bald eagle	<i>Haliaeetus leucocephalus</i>	T
Canada lynx	<i>Lynx canadensis</i>	T
Marbled murrelet	<i>Brachyramphus marmoratus marmoratus</i>	T
Southern sea otter, southern	<i>Enhydra lutris nereis</i>	T

Common Name	Species Name	Status ¹
Northern spotted owl	<i>Strix occidentalis caurina</i>	T
Brown pelican	<i>Pelecanus occidentalis</i>	E
Western snowy plover (Pacific coastal pop.)	<i>Charadrius alexandrinus nivosus</i>	T
Pygmy rabbit (Columbia Basin DPS)	<i>Brachylagus idahoensis</i>	E
Chinook salmon (Puget Sound)	<i>Oncorhynchus tshawytscha</i>	T
Chinook salmon (Snake R.)	<i>Oncorhynchus tshawytscha</i>	T
Chinook salmon (lower Columbia R.)	<i>Oncorhynchus tshawytscha</i>	T
Chinook salmon (spring upper Columbia R.)	<i>Oncorhynchus tshawytscha</i>	E
Chinook salmon (spring/summer Snake R.)	<i>Oncorhynchus tshawytscha</i>	T
Chum salmon (Columbia R.)	<i>Oncorhynchus keta</i>	T
Chum salmon (summer-run Hood Canal)	<i>Oncorhynchus keta</i>	T
Coho salmon (Lower Columbia River)	<i>Oncorhynchus kisutch</i>	T
Sockeye salmon (Ozette Lake)	<i>Oncorhynchus nerka</i>	T
Green sea turtle	<i>Chelonia mydas</i>	T
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E
Stellar sea lion (eastern pop.)	<i>Eumetopias jubatus</i>	T
Stellar sea lion (western pop.)	<i>Eumetopias jubatus</i>	E
Steelhead (Snake R. Basin)	<i>Oncorhynchus mykiss</i>	T
Steelhead (lower Columbia R.)	<i>Oncorhynchus mykiss</i>	T
Steelhead (middle Columbia R.)	<i>Oncorhynchus mykiss</i>	T
Steelhead (upper Columbia R. Basin)	<i>Oncorhynchus mykiss</i>	E
Humpback whale	<i>Megaptera novaeangliae</i>	E
Gray wolf	<i>Canis lupus</i>	E
Spalding's Catchfly	<i>Silene spaldingii</i>	T
Nelson's Checker-mallow	<i>Sidalcea nelsoniana</i>	T
Checker-mallow (Wenatchee Mountains)	<i>Sidalcea oregana var. calva</i>	E
Bradshaw's Desert-parsley	<i>Lomatium bradshawii</i>	E
Water Howellia	<i>Howellia aquatilis</i>	T
Ute Ladies'-tresses	<i>Spiranthes diluvialis</i>	T
Kincaid's Lupine	<i>Lupinus sulphureus ssp. kincaidii</i>	T
Golden Paintbrush	<i>Castilleja levisecta</i>	T
Showy Stickseed	<i>Hackelia venusta</i>	E

¹ T= Threatened, E = Endangered.

Source: FWS, 2005a.

The SOC list includes 24 Endangered, 11 Threatened, 4 Sensitive, and 103 Candidate species (WDFW, 2005b). A current list of SOC species is included in Appendix E. There are 18 habitat types, 140 vertebrate species, 28 invertebrate species, and 14 species groups currently on the PHS list. These constitute about 16 percent of Washington's approximately 1000 vertebrate species and a fraction of the

State's invertebrate fauna. Priority habitats protected and impacted by CREP include: instream and freshwater wetlands, marine and estuarine shorelines, riparian areas, snags and logs, and vegetated marine and estuarine habitat (e.g., eelgrass) (WDFW, 2005b). There is also an estimated 50,000 miles of anadromous fish-bearing streams in the State, 15,000-20,000 miles of which pass through privately owned agricultural lands (FWS and NMFS, 2000).

Bald eagles, Northern spotted owls, and marbled murrelet are among the protected species in the CREP project area, in addition to salmonids, which will be discussed in wildlife and fisheries (NRCS 2006a). The northwest coast of North America, particularly British Columbia and Alaska, is the predominant range for bald eagles. This range is due in part to the abundance of salmon, which are an important food source for all bald eagles. Elimination of DDT use, coupled with active management programs, have caused Bald eagle populations to recover in recent years, prompting the FWS to consider delisting the species. The bald eagle could be delisted as early as 2007, and the USFWS has issued guidelines on how the bald eagle should be protected by landowners and others, once it's no longer safeguarded as a "threatened" species. There are proposals which prohibit disturbing the bald eagle, which include disruption of its breeding, feeding or sheltering practices, which could cause death, injury or nest abandonment (NatureServe 2006).

The Spotted owl is arguably one of the most well-known of all endangered species in North America. Its dependence on mature or old-growth coniferous forests has caused conflict with the timber harvesting industry, and its management has created a large amount of research and debate. Forests in the CREP area, particularly Douglas-fir, but also mature hardwood forests of alders, oak, and sycamore, are habitat for spotted owls. Spotted owl populations are in decline due to continued loss or fragmentation of old-growth forests (NatureServe 2006).

The marbled murrelet is a small seabird which nests in the coastal, old-growth forests of the Pacific Northwest, including the CREP project area west of the Olympic Mountains. Its preferred habitat is mature or old-growth coastal coniferous forests and the species depends on coastal marine feeding areas, which have raised conflicts with human economic interests. Populations of marbled murrelet are declining as a result of loss of habitat due to logging, oil spills, and gill net fisheries (NatureServe 2006).

3.1.2 VEGETATION

Description

In 1981, the Washington State legislature amended the Natural Area Preserves Act (Ch. 79.70 RCW) and established the Washington Natural Heritage Program (WNHP) within the WDNR. The WNHP collects data about existing native ecosystems and species to provide an objective, scientific basis from which to determine protection needs. The program also develops and recommends strategies to protect the State's most threatened native ecosystems and species (WDNR, 2006).

The WNHP uses a three-step method, which includes classification, inventory, and protection planning, as part of an iterative process that is repeated as new information is collected and natural features are successfully protected. The methodology used by the WNHP is shared by a network of more than 75 Natural Heritage Programs and Conservation Data Centers, including all 50 States, several Canadian provinces, and Latin American and Caribbean countries. This information is used by producers, State and Federal government agencies, consulting firms, planning departments, and conservation groups to support the State's environmental and economic health (WDNR, 2006).

The WNHP's mandate is to:

- Develop a classification of the natural heritage resources of the State,
- Maintain an inventory of the location of these resources,

- Maintain a data base for such information,
- Make the information from the database available to public and private agencies and individuals for environmental assessment and proprietary land management purposes, and
- Provide assistance in the selection and nomination of areas containing natural heritage resources for registration or dedication.

Affected Environment

Because of domestic crop production in Washington and throughout the West, natural grasslands, woodlands, and wetlands have been eliminated. Ninety-two percent of the original fire-maintained prairies and floodplain forests of the Puget Lowlands (see Figure 3.5) have been replaced with croplands and urban development. By the late 1970s, more than 40 percent of the tidal marshes and 75 percent of the tidal swamps in the Pacific Northwest were lost, primarily due to diking (FWS and NMFS, 2000).

Replacement of natural forest and shrubland vegetation with annual crops frequently results in large areas of tilled soil that become increasingly compacted by machinery and are only covered with vegetation for part of the year. Commonly, little or no riparian vegetation is retained along streams as producers attempt to maximize acreage in production. Although some agricultural lands may be restored to more natural communities, cropland conversion is usually a permanent alteration of the landscape (FWS and NMFS, 2000).

There are three federally listed plant species in the CREP project area. Bradshaw's lomatium (*Lomatium bradshawii*) is an endangered species, while Nelson's checkermallow (*Sidalcea nelsoniana*) and Ute Ladies' tresses (*Spiranthes diluvialis*) are threatened (FWS and NMFS, 2000). Bradshaw's lomatium occurs on wet prairies in the Willamette Valley and in Clark County. This species is associated with Wapto, Bashaw, and Mcalpin soil series (FWS and NMFS, 2000). Nelson's checkermallow occurs on wetlands and riparian areas in the Willapa Hills/Coast Range and in Cowlitz County. It is associated with Wapto, Bashaw, Mcalpin, Malabon, Coburg, and Salem soil series (FWS and NMFS, 2000). Ute Ladies' tresses occur on floodplains and wet meadows in Okanogan County. This species is associated with Wapto, Bashaw, Mcalpin, Malabon, Coburg, and Salem soil series (FWS and NMFS, 2000).

Ecoregions

Natural vegetation is a result of the combination of geography, soils, and climate, and can best be exemplified at a regional scope. This PEA employs NRCS Land Resource Regions and Major Land Resource Areas Handbook to describe the existing biological environment as related to resource area (NRCS, 2006a). Major land resource areas (MLRAs) are geographically associated land resource units. Land resource regions (LRRs) are a group of geographically associated MLRAs. Identification of these large areas is important in statewide agricultural planning and has value in interstate, regional, and national planning. LRRs are also useful in characterizing natural vegetation over large geographic areas. The CREP project area includes two LRRs: the Northwestern Forest, Forage, and Specialty Crop LRR and the Northwestern Wheat and Range LRR, each of which includes several MLRAs .

The Northwestern Forest, Forage, and Specialty Crop Region is characterized by two major mountains systems, the Coast Range, anchored by the Olympic Mountains along the Washington coastline, and the Cascade Mountains (Figure 3.1). The Willamette Valley, which empties into Puget Sound, separates the Coast Range from the higher Cascade mountains inland. The climate produces wet, mild winters with heavy precipitation averaging 45 to 60 inches and dry summers. Average annual rainfall in the mountains can exceed 100 inches and temperatures generally range from 45 to 55 degrees F. The mild climate, high rainfall, and deep soils make is a rich agricultural area, and the heavily forested mountains are used for timber production (NRCS, 2006a).

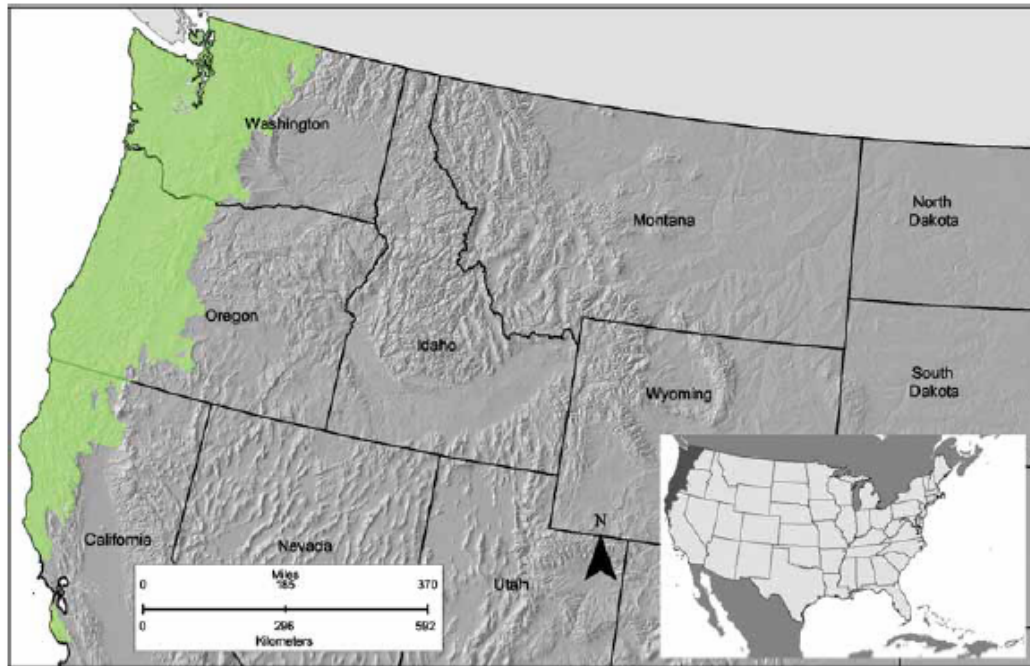


Figure 3.1. The Northwestern Forest, Forage, and Specialty Crop LRR. Source: NRCS 2006a.

This LRR encompasses five distinct Major Land Resource Areas (MLRAs) included in the CREP area: The Northern Pacific Coast Range, Foothills, and Valleys, the Willamette and Puget Sound Valleys, the Olympic and Cascade Mountains, the Sitka Spruce Belt, and the Cascade Mountains, Eastern Slope. Forested areas in the Olympic and Cascade Mountains and the Willamette and Puget Sound Valleys support dense stands of Douglas fir, western hemlock, Pacific silver fir, and red alder. The prairies and savannas of the Willamette and Puget Sound Valleys support fescues, bromes, and sedges. Sitka spruce dominated communities in the Olympic Mountains grade to pine dominated terraces and dominant tree species on the eastern slope of the Cascade Mountains include ponderosa pine, white fir, and lodgepole pine. The coastal floodplains and estuaries are dominated by saltgrass, sedges, and reeds. Grasslands on the eastern slope of the Cascade Mountains support wheatgrass, sagebrush, and fescue (NRCS, 2006a).

The Northwestern Wheat and Range Region is on the lee side of the Cascade Mountains in Washington and Oregon and extends east into Idaho along the Snake River Plains (Figure 3.2). It is an area of smooth to deeply dissected plains and plateaus with well developed terraces along the Snake River. The climate produces wet, mild winters with precipitation averaging 6 to 20 inches and dry summers. Average temperatures range from 30 to 55 degrees F. Land use is primarily a mixture of grazing and cropland with some forested areas (NRCS, 2006a).

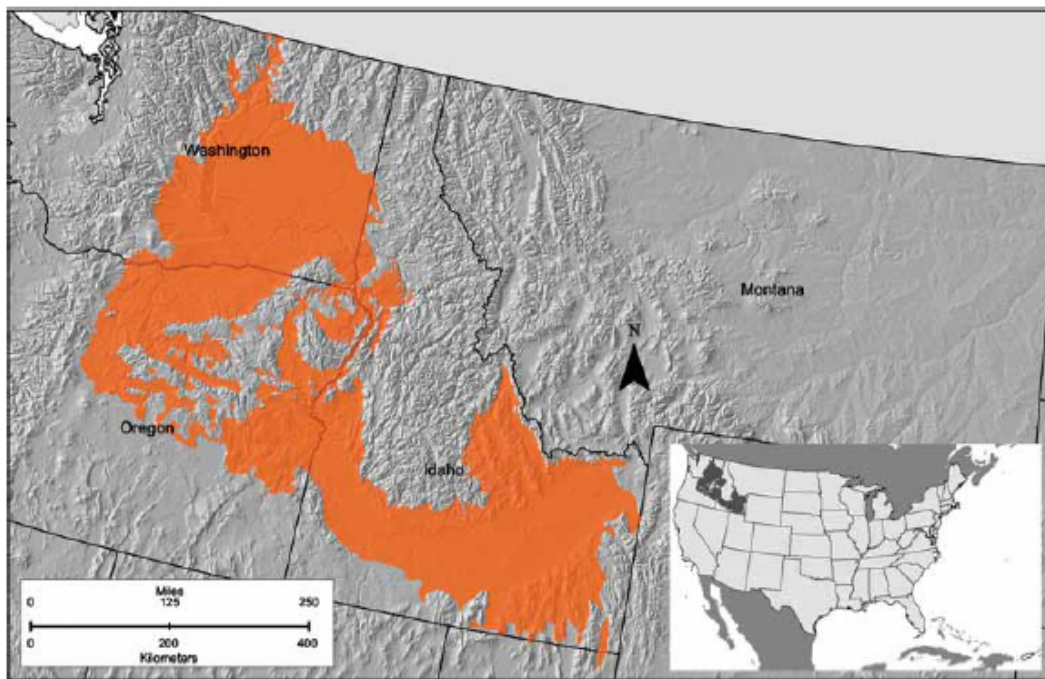


Figure 3.2. Northwestern Wheat and Range LRR. Source: NRCS 2006a.

The portion of this LRR in the CREP area includes three MLRAs: the Columbia Basin, the Columbia Plateau, and the Palouse and Nez Perce Prairies. Much of the region is agricultural land and the MLRAs support shrub-grass associations dominated by sagebrush and wheatgrass. Ponderosa pine, oak, and Douglas Fir occur in forested areas and snowberry dominates the shrub-plant community in the eastern Palouse and Nez Pierce Prairies (NRCS, 2006a).

3.1.3 WILDLIFE AND FISHERIES

Description

Washington is permanent or temporary home to thousands of plant and animal species, including 140 mammals, 470 freshwater and saltwater fish species, and 341 species of birds that either breed or rest in Washington during annual migrations. Washington also hosts 150 other vertebrate species, 3,100 vascular plant species, and more than 20,000 classified invertebrates. More than 3,000 of the invertebrate species are butterflies and moths (WDFW, 2005a).

As Washington continues to grow and develop, fish and wildlife habitat is being altered and sometimes lost, resulting in a net loss of biodiversity (Ecology, 2001a). The following major influences have the greatest impact on Washington's fish, wildlife, and habitat base, most of which are likely to be impacted by CREP practices:

- Habitat loss through conversion, fragmentation and degradation;
- Invasive alien plant and animal species;
- Water quantity—allocation and diversion of surface water;
- Water quality issues;

- Salmonid recovery;
- Agricultural and livestock grazing practices;
- Disease and pathogens;
- Inadequate data on wildlife species, populations, and habitat; and
- Forest conservation and management practices.

Affected Environment

Washington State has a wide variety of habitats that support a diverse biological community, extending from marine waters to the coastal estuaries and wetlands, and reaching from the vast network of freshwater streams and rivers banked by riparian corridors to the grassland prairies and densely forested mountains.

Washington's terrestrial species include a number of game species such as deer, elk, bear, quail, and waterfowl (WDFW 2001). In the CREP area, black-tailed deer, which prefer herbaceous vegetation indicative of early to mid-successional species are common. The black-tailed deer population has been stable since 1995 despite negative impacts from the loss of quality forage due to declines in timber harvest and the maturity of forested habitat. Conflicts between deer and agricultural production arise where local deer densities and agriculture overlap (WDFW 2001). Elk is a popular game species and is common in forested habitat in the CREP area. Statewide elk populations are stable, estimated at 52,000 to 58,000 animals. Some populations, such as the Blue Mountains in southeastern Washington are low, while others such as the Yakima herd are near population targets set by WDFW. Elk prefer early to mid-successional vegetation and benefit from timber harvest practices. Threats to elk populations include habitat loss and degradation, conflicts with agriculture, and high hunting demands by tribal and non-tribal hunters (WDFW 2001). Other wildlife species common in the CREP project area include coyote, osprey, California quail, burrowing owl, songbirds, sharp-tailed grouse, and mourning dove (NRCS 2006).

The Pacific Coast is one most productive areas in the world for phytoplankton, which allows Washington's marine waters to support an abundance of fish and marine mammals, including harbor porpoises, sea lions, seals, California Gray whales, Minke whales, Dall's porpoises, and Pacific white-sided dolphins (Ecology, 2001a). Coastal wetlands and estuaries provide great volumes of food that attract many animal species including oysters, clams, crabs, fish, and birds. Many marine animals find essential shelter in various habitats and these systems are also important wintering grounds for some waterfowl species. Sooty shearwaters, brown pelicans, gulls, loons, western grebes and cormorants use estuaries for roosting and foraging areas (Ecology, 2001a).

The freshwater network is the very lifeblood of Washington's living communities, including human society. Seventy percent of Washington's wildlife depends upon the plants along freshwater riverbanks for habitat during all or part of the year. Freshwater wetland and riparian areas serve as spawning habitat or as nurseries for juvenile fish, particularly salmonids. Marshes and other riparian areas recharge groundwater, maintain water quality, stabilize shorelines, and play a role in flood control. Riparian areas contain elements of both aquatic and terrestrial ecosystems which provide a rich and vital resource to Washington's fish and wildlife because of their high productivity, diversity, continuity, and critical contributions to aquatic and upland ecosystems (Ecology, 2001a).

Fisheries: Salmonid Recovery

Eighteen species of salmonids, which include trout, chars, and salmon species, are currently found in Washington State waters (WDFW, 1997). Salmonids have important biological, cultural, commercial and recreational values. Commercial landings in 2004 generated \$162,981,619 for all aquatic species, over \$16 million of which was attributed to salmon landings (NOAA, 2006b). As a keystone species, salmon

are a critical component of the State's overall wildlife diversity and an important indicator of ecosystem health.

Unfortunately, the State's salmonid resource has been under heavy pressure from human population growth and development for many years. Urban and industrial land conversion, forest and agricultural practices, water diversion, municipal water demands, overfishing, and hydropower development have all contributed to the decline of the number and health of salmon stocks in Puget Sound watersheds and the Columbia River system. Pacific Northwest salmon have now been reduced to approximately



Trees and rocks used for bank stabilization in Washington.
Photo Credit: NRCS, 2006.

five percent of their historical abundance, once estimated at 16 million in the Columbia River Basin alone (NOAA, 2005a). During the 1990s, this documented decline in several salmonid species' populations resulted in many species listed as T&E under ESA. To prevent further declines and improve the condition of imperiled salmon stocks, a large ESA recovery effort at local, State, and Federal levels is now underway in Washington and other Pacific Northwest states, as well as in Canada (Ecology, 2001a).

Healthy habitat and ecological conditions are necessary at each stage of a salmonid's life cycle to restore populations to sustainable levels. Momentum is building to protect watersheds and save salmonids. Several tools and options are available under the ESA to help these efforts (NOAA, 2005a).

Population declines have led to protections for 26 different groups, or Evolutionary Significant Units (ESUs), of Pacific salmon and steelhead under ESA. Currently, there are seven salmonid populations federally listed as T&E in different regions of the State (Table 3.2), including Snake River sockeye salmon and steelhead; fall, spring, and summer Chinook salmon; upper and lower Columbia steelhead; and Klamath River and Columbia River bull trout. Of the 435 wild steelhead and salmon stocks in Washington, less than half are considered healthy, while in Puget Sound's 209 salmon and steelhead stocks, 93 are healthy and 55 are critical or depressed (WDFW, 2005c). Recovering these salmon populations is a high priority for local, Tribal, State, and Federal interests, as well as the general public.

Resident salmonids remain in freshwater habitat for their entire life cycle. Some of the most important and widespread native species of resident salmonids are rainbow trout, cutthroat trout, and bull trout. There are a number of introduced (non-native) resident salmonid species in Washington's lakes and streams, including brown trout, golden trout, lake trout, and eastern brook trout.

Table 3.2. Threatened and Endangered Salmonid Evolutionarily Significant Units in Washington State.

Species	Evolutionary Significant Units Status	
	Endangered	Threatened
Chinook	Upper Columbia River Spring	SNAKE RIVER FALL RUN
		SNAKE RIVER SPRING/SUMMER RUN
		PUGET SOUND
		LOWER COLUMBIA RIVER
		UPPER WILLAMETTE RIVER
Chum		HOOD CANAL SUMMER RUN

		Columbia River
Coho		Lower Columbia River
		Puget Sound/Strait of Georgia (Species of
Sockeye	Snake River	Ozette Lake
Steelhead	Upper Columbia River	Upper Willamette River
		Middle Columbia River
		Snake River Basin
		Lower Columbia River

Source: NOAA, 2006a.

Fish that hatch and rear in freshwater spend a portion of their life in salt water and then return to freshwater to spawn are referred to as anadromous species. Washington has seven native species of anadromous fish, including Chinook, Coho, chum, and sockeye salmon; steelhead; and sea-run coastal cutthroat trout. In addition, Washington also has a native anadromous species belonging to the genus *Salvelinus*, bull trout.

Anadromous species have a unique life cycle (Figure 3.3) that occurs in a vast network of freshwater, estuarine, and ocean habitats. Freshwater habitats are used by salmonid for spawning, incubation, and juvenile rearing. In estuarine habitats, juvenile salmonids experience rapid growth and make critical adjustments in the chemical balance of their body fluid as they transition between fresh and salt water. Salmonids gain most of their adult body mass in ocean habitats before returning to rivers to spawn. Returning salmonids provide a flow of nutrients into freshwater habitats and play a critical role in the ability of watersheds to retain overall productivity of salmonid runs (WDFW, 2005c).

Wild salmonid are an essential element of Washington's natural environment. When thousands of mature salmonids spawn and die, they do far more than produce another generation. This source of nutrition, arriving in the fall, allows many animals to survive the harshness of winter. Where salmonid runs have become extinct, the local ecosystem suffers. Species such as bear, eagle, mink, and river otter suffer large population losses. Other species show less dramatic, but significant, declines. The result is a permanently altered ecosystem (WDFW, 2005c).

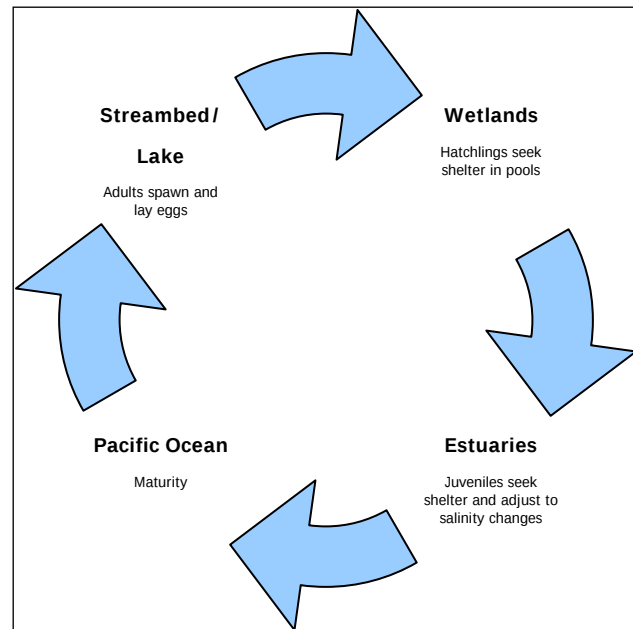


Figure 3.3. The life cycle of anadromous salmonid species.
Source: Ecology 2001a

Status of Washington Salmonid Evolutionary Significant Units in the CREP Project Area

The unique life history and dependence on coastal, marine, and freshwater ecosystems make anadromous salmonid species particularly vulnerable to habitat degradation. As a result of human induced changes to the ecosystem, several stocks of anadromous salmonid are declining and listed as threatened or

endangered (see Table 3.2). Each species is briefly described and its critical habitat designation identified below.

Chinook Salmon – Chinook salmon are the largest of all salmon. There are different seasonal “runs” or modes in the species’ migration from ocean to freshwater. These runs are usually identified as spring, summer, fall, or winter and are based on when the adult salmon enter freshwater to begin their spawning migration. A number of ESUs of Chinook salmon are listed as endangered or threatened under the ESA, including the Snake River Fall-run (threatened), Snake River Spring/Summer-run (threatened), Lower Columbia River Chinook (threatened), Puget Sound (threatened), and Upper-Columbia River Spring-run (endangered) ESUs (NOAA, 2006a). In Washington, critical habitat has been designated for this species in Puget Sound, the Lower Columbia River, and Upper Columbia River (Spring-run) ESUs (Figure 3.4).

Coho Salmon – Coho salmon have a long freshwater rearing period, which makes them more dependent on flow and freshwater habitat than salmonids with shorter freshwater rearing times. Until they return to their stream of origin to spawn and die, the remainder of their life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean. In the Columbia River Basin, the Lower Columbia River ESU is listed as threatened under ESA, while the Puget Sound/Strait of Georgia ESU is a SOC (NOAA, 2006a).

Chum Salmon – Chum salmon are large salmon, second only to Chinook salmon in size. They spawn in the lower reaches of rivers and creeks, typically within 60 miles of the Pacific Ocean. They migrate almost immediately after hatching to estuarine and ocean habitats; thus, survival and growth of juvenile chum depend on estuarine and marine habitat quality. The Columbia River ESU and Hood Canal Summer-Run ESU are listed as threatened species under the ESA (NOAA, 2006a). Critical habitat for this species is designated in the Lower Columbia River and in the Hood Canal (summer-run), along with nearshore habitat in Puget Sound near the Hood Canal (Figure 3.5) (NOAA, 2005b).

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. The Snake River sockeye salmon is listed as an endangered species, and the Ozette Lake ESU has been listed as threatened (NOAA, 2006a). Critical habitat has been designated in Ozette Lake (Figure 3.6) (NOAA, 2005b).

Steelhead – Steelhead are sea-going rainbow trout. Because they rear for two years in freshwater rivers and creeks before migrating to marine waters, they are highly dependent on freshwater habitat. Most steelhead spawn from mid-winter to late-spring. However, two distinct “runs” of steelhead return to freshwater at different times, a winter run and a summer run (Ecology, 2001a). Critical habitat has been designated throughout tributaries of the Columbia and Snake Rivers (Figure 3.6) (NOAA, 2005b).

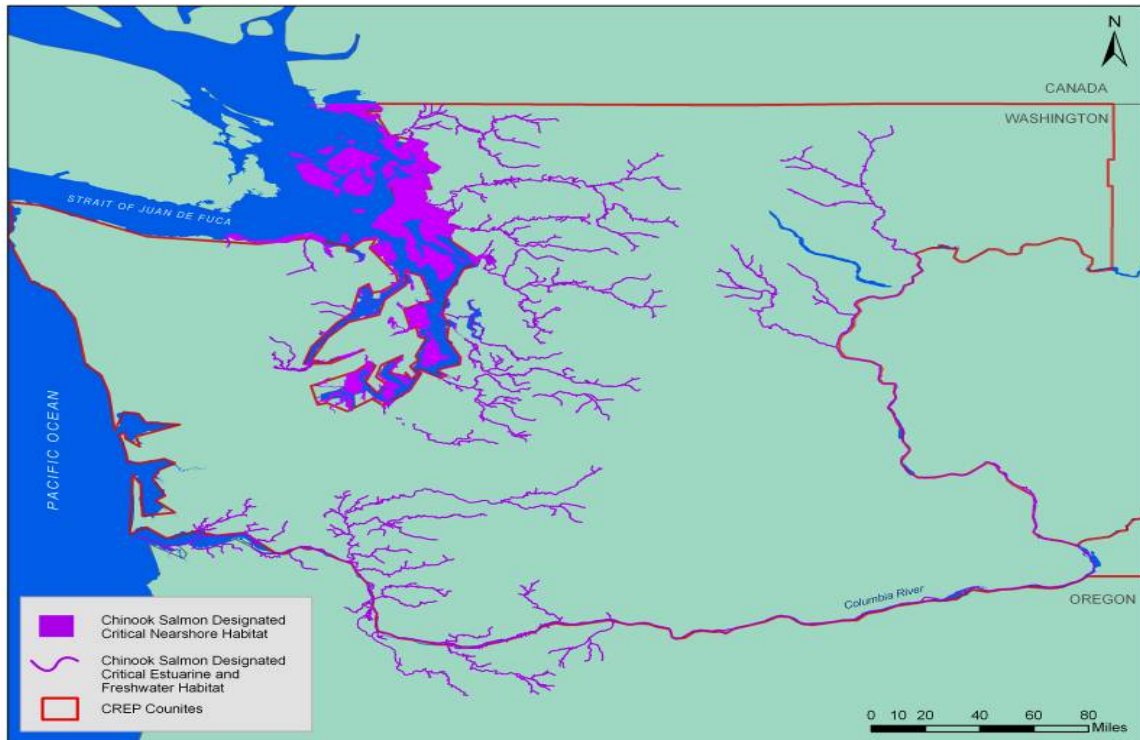


Figure 3.4. Designated nearshore, estuarine, and freshwater habitat for the Chinook Salmon.
Source: NOAA, 2005b.

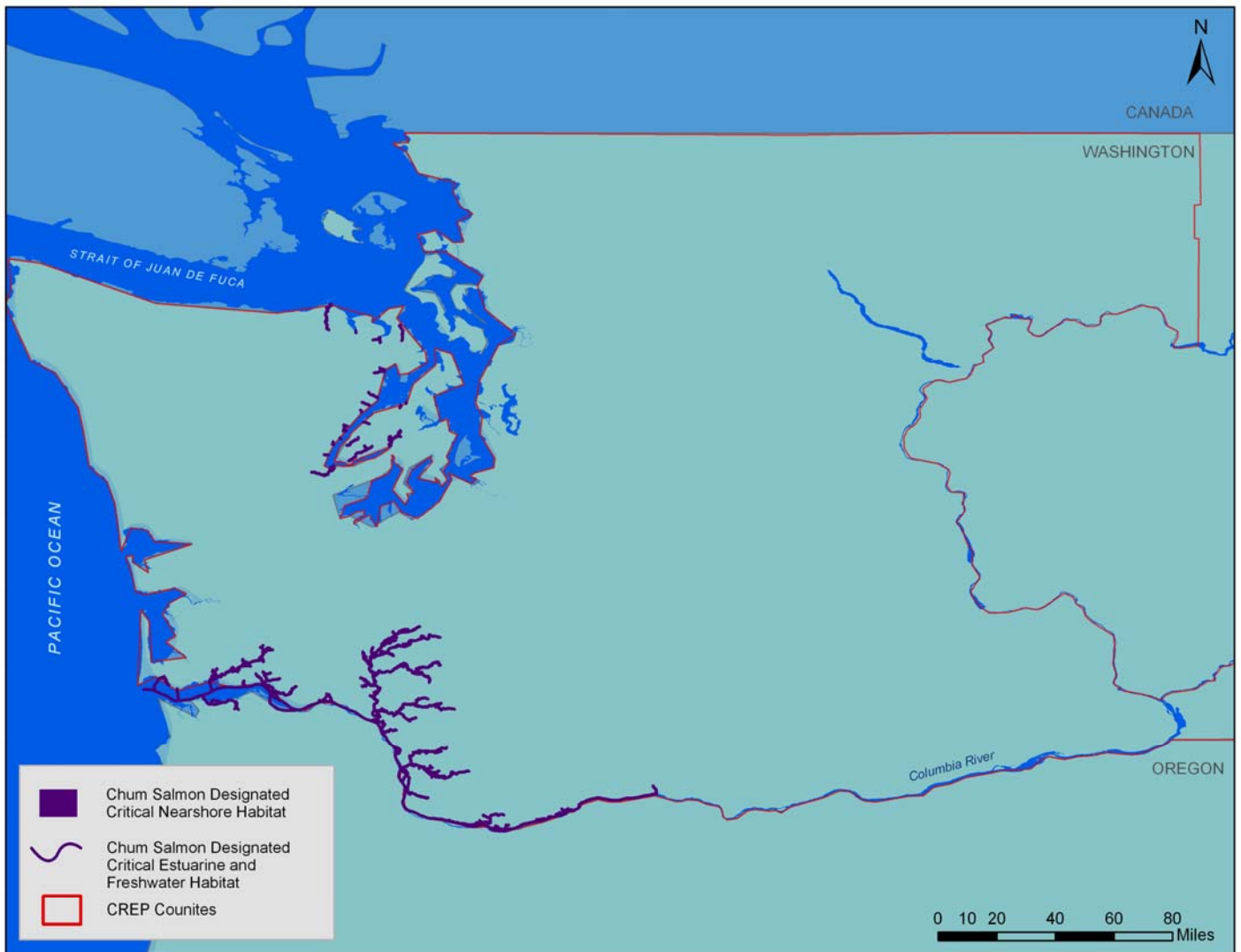


Figure 3.5. Designated critical nearshore, estuarine, and freshwater habitat for the Chum Salmon.
Source: NOAA, 2005b.

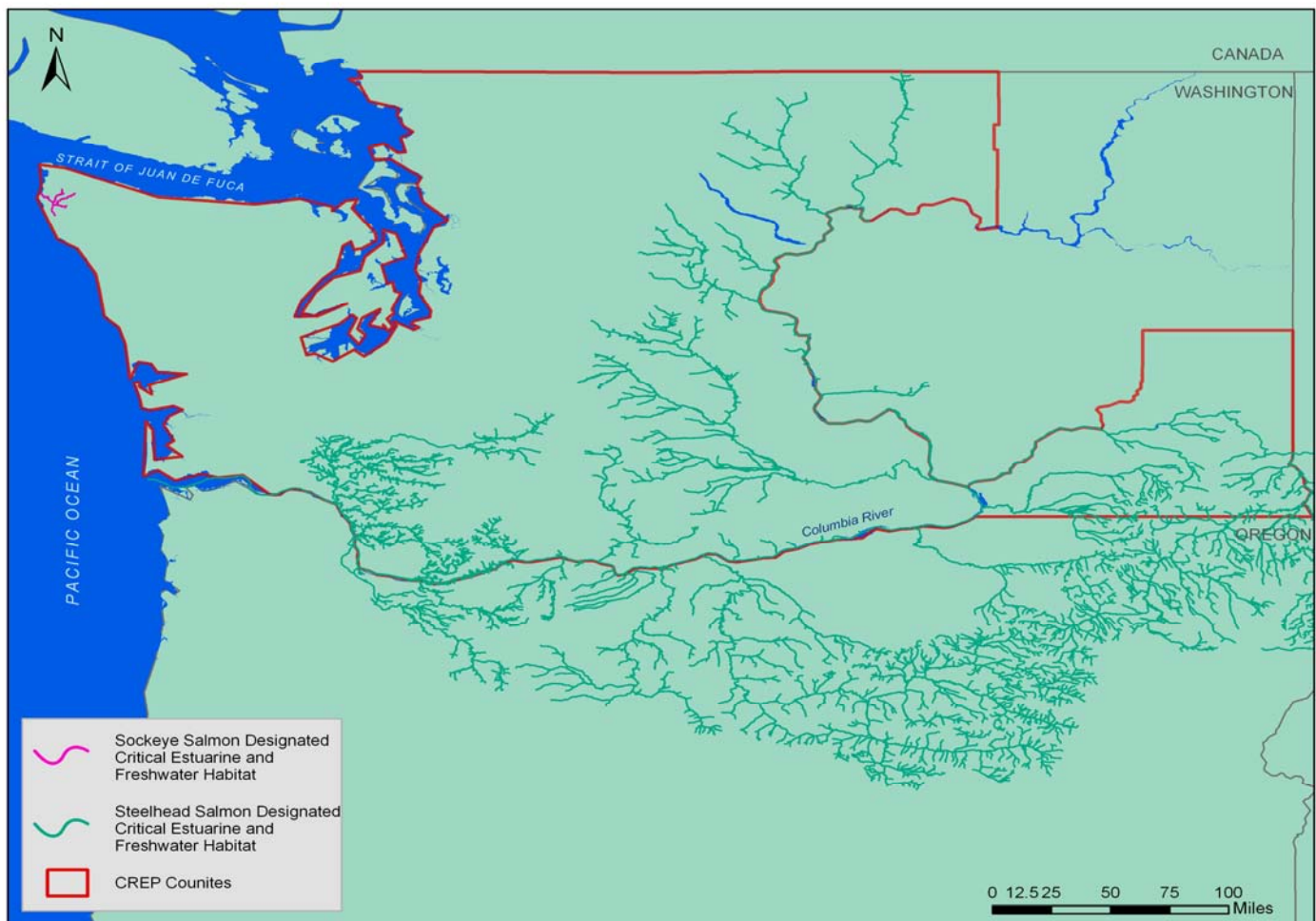


Figure 3.6. Designated estuarine and freshwater habitat for the Sockeye Salmon (pink) and the Steelhead Salmon (green). Source: NOAA, 2005b.

Wild steelhead runs have been depleted in a number of river systems because of habitat loss and other problems (Ecology, 2001a). A number of ESUs of steelhead are listed as threatened under ESA, including the Snake River Basin, Lower Columbia River, Middle Columbia River, and Upper Columbia River (NOAA, 2006a). Critical habitat has been designated for each of these ESUs (Figure 3.6) (NOAA, 2005b).

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 freshwater before migrating. Therefore, they are highly dependent on flow and freshwater habitat. They spawn in coastal, Puget Sound and Lower Columbia River tributary streams. The current population appears to be stable and is not protected by the ESA (FWS, 2002).

Ecological Significance

Many wildlife species depend on salmonid populations, either directly or indirectly, for their survival. Some species, like mink and turkey vultures, rely on salmonid carcasses as an important food source, and wintering sites for bald eagles are typically near the concentrated food sources of anadromous fish runs

(FWS and NMFS, 2000). Larger runs of salmonid returning to their watersheds to spawn leave behind carcasses that contribute levels of predominantly ocean-derived nutrients. These nutrient rich stream systems support a broader and healthier array of invertebrate life which support a healthier and more diverse aquatic system and associated wildlife populations. As the health of salmonid populations improves, it is likely the health of other wildlife species will also improve (Ecology, 2001a).

Human impacts and factors impacting salmonid recovery include habitat alterations, including the diversions and impoundments of rivers by hydropower dams, harvesting, and the impact of hatchery reared salmonid populations on wild salmon. Today, there are more than 125 large scale Federal, State, and Tribal hatcheries and many small scale incubator sites on many rivers and streams. In 1995, State facilities produced approximately 210 million salmon and steelhead; 12 Federal and 17 Tribal hatcheries added another 50 million salmonids. Hatcheries can contribute to the decline of wild salmon because (1) the presence of hatchery salmon leads to overfishing and (2) hatchery fish can spread disease and compete with wild fish for food and habitat in streams and in the ocean (Ecology, 2001a).

3.2 CULTURAL RESOURCES

3.2.1 DESCRIPTION

Cultural Resources, as defined by the Washington State Inventory of Cultural Resources, are resources associated with human manipulation of the environment (DAHP, 2005a). Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural properties.

Archeological resources are locations and objects from past human activities.

Architectural resources are those standing structures that are usually over 50 years of age and are of significant historic or aesthetic importance to be considered for inclusion in the National Register of Historic Places (NRHP).

A **traditional cultural property** is defined as a property that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community. Traditional cultural properties may be difficult to recognize and may include a location of a traditional ceremonial location, a mountaintop, a lake, or a stretch of river, plant sources, or a culturally important neighborhood (U.S. Department of the Interior, 1998).

The 1992 amendments to the NHPA strengthen the concept in several ways. The new Section 101(d) states specifically that properties of "traditional religious and cultural importance to Indian tribes may be determined eligible for inclusion on the National Register." New provisions also exist for establishing Tribal preservation offices which may, under certain circumstances, assume some or all of the responsibilities of SHPOs (Parker, 1993).

Under NEPA, federal or federally-assisted projects must take into account effects on historic and cultural resources. The significance of such resources relative to the American Indian Religious Freedom Act, the Archaeological Resources Protection Act, Native America Graves Protection and Repatriation Act, EO 13007, and/or eligibility for inclusion in the NRHP is considered part of the EA process. The regulations and procedures in 39 CFR 800, which implements Section 106 of the NHPA, requires Federal agencies to consider the effects on properties listed in or eligible for inclusion in the NRHP. Prior to approval of the proposed action, Section 106 requires that the Advisory Council on Historic Preservation be afforded the opportunity to comment.

3.2.2 AFFECTED ENVIRONMENT

Washington State has a rich cultural heritage that dates back over 12,000 years to the arrival of the first humans who may have migrated from Northeast Asia across an exposed land bridge over the Bering Sea. The lush landscape of mountains and valleys has supported game and fur-bearing species, the productive marine and freshwater resources have provided food and trade opportunities, and the rich soil has supported agricultural production for thousands of years. As a result of the opportunities afforded by the resources of the Pacific Northwest, the area has been inhabited by prehistoric natives, Native American tribes, and European and American settlers, each of whom have left behind a cultural history.

Archaeological Resources

The Department of Archaeology and Historic Preservation is the primary contact for the two historic registers (NRHP and the Washington Heritage Register) that track Washington's historic and cultural resources (DAHP, 2005b). There are currently 14,000 (both historic and prehistoric) sites on file, with an average of 20 new sites recorded each month (DAHP, 2005a).

Prehistoric Period

Approximately 25,000 to 12,000 years ago hunters moved into the Pacific Northwest. Archaeological evidence suggests that these early inhabitants lived throughout Washington, from the Pacific coast to the plains of Eastern Washington. The first dated culture in North America is the Clovis, a Paleoindian culture that used stone tools to hunt game animals as early as 13,500 years ago. Clovis points and tools have been found in East Wenatchee, in Chelan County along the Columbia River (Stilson et al., 2003).

Definitively dated village or habitation sites older than 4,300 years do not exist in Washington, although other archaeological evidence such as lithic sites and stone tools suggest that humans have been in the area for at least 10,000 years. Four thousand year old shell middens have been found Western Washington, but in British Columbia, Canada shell middens dating 10,000 years have been found. Archaeologists suggest that older shell middens in Washington may have been covered by rising sea levels. Additionally, evidence of trade routes from inland to coastal areas of Washington used as early as 7,000 years ago have been discovered (Stilson et al., 2003).

Washington's early coastal communities were likely nomadic, moving with the seasons from sheltered villages in the winter to spring root camps, summer fishing camps, and fall hunting camps. These communities were closely tied to the bounty of resources provided by the coast. Open seasonal camp sites have been discovered along rivers and streams with lithic artifacts, shells, and stone fragments. An extensive petroglyph complex was discovered in Southern Puget Sound. A village in Ozette and fishing weir in Wapato Creek, near Tacoma, provide evidence of perishable materials, such as wood, baskets, and fibers (Stilson et al., 2003).

Early Native Americans in Washington also inhabited Central Washington. Caves such as Judd Peak and Layser Cave suggest the use of the foothills of the Cascade Mountains from 6,700 to 400 years ago. Use of mountainous areas in Central Washington dating back 8,000 years is evident in lithic sites and quarries where stone was procured for tool making, such a Desolation Chert Quarry in Whatcom County. Residential camps and villages have been found along rivers and streams, as well as burial sites and rock structures, or cairns. At high elevations (3,000 to 5,000 feet), archaeologists have found huckleberry trenches, where berries were dried and processed (Stilson et al., 2003).

Archaeological sites dating 13,000 years have also been discovered in the Scablands and Plateaus of the Snake and Columbia Rivers in Eastern Washington. This region was supported by salmon fishing, evident in the number of nets, hooks, spears, and wooden platforms found. Dried salmon and game likely provided sustenance throughout the winter, and camas, a bulb similar to onion, was another diet staple. Residential sites, such as at the Rattlesnake Creek Site in Klickitat County, suggest that Paleoindians in this region lived in subterranean pithouses (Stilson et al., 2003). In 1996, a male skeleton was uncovered

in Kennewick, Washington along the Columbia River. The Kennewick Man, as the skeleton was named, is approximately 8,400 years old, making it the oldest and most complete skeleton ever found in the Americas (Burke, 2006).

Historic Period

From the prehistoric period until the late 16th century, Native Americans were the only inhabitants of Washington. In June, 1579, Sir Francis Drake first sighted the Pacific Northwest coast and claimed the region for England. Spanish, English, and American exploration continued over the next 200 years. In the early 1790s's, English Captain George Vancouver explored much of the Pacific Northwest Coast and named many of the geographical features in Washington, including Mt. Baker, Mt. Rainer, and Puget Sound (WSS, 2006).

Trading between Europeans and Native Americans is first documented in 1774, and throughout the late 1700's, trading between non-native explorers and Native Americans was common but was centered primarily along the coast. However, overland exploration in the early 1800's escalated trading throughout the region. An exploration led by David Thompson of the North West Company, a British fur-trading company, discovered the headwaters of the Columbia River in 1800. Soon after, in 1805, Lewis and Clark reached the Pacific Coast by traveling overland using ancient Native American trading routes, securing American claims to the Pacific Northwest and bringing news of the natural resources of the Pacific Northwest to the rest of the country (WSS, 2006).

The fur trade dominated the economy of the Pacific Northwest in the early to mid 1800's, bringing many white settlers to the Pacific Northwest in search of wealth. Several major trading companies existed, the largest of which was the Hudson Bay Company, which operated many satellite trading posts throughout the Washington Territory. Fixed trading posts and forts were established throughout the region, primarily along waterways. White settlers came to the region to take advantage of the abundance of timber, fish, farmland, and pastures. The Hudson Bay Company remained a dominant presence throughout the Pacific Northwest until 1846, when a treaty was signed which designated the United States-England boundary at the 49th parallel (WSS, 2006). Soon after, scarce sea otter populations and changing needs of the settlers caused traders to shift towards consumer goods and household products, and the emphasis on fur trade declined (Stilson et al., 2003).

Americans established a number of major settlements between 1850 and 1889, including modern-day Seattle, Tacoma, and Bellingham Bay. During this time, the Washington Territory was officially proclaimed for the U.S. and Isaac Stevens became the first governor. Counties were settled, and schools and courthouses established. Importantly, large tracts of land formerly owned by Native American tribes were transferred to the U.S. government during this time under several treaties, including the Medicine Creek Treaty, the Point Elliot Treaty, the Point-No-Point Treaty, the Treaty of Neah Bay, and the Walla Walla Indian Treaty. After many years as a territory, Washington finally entered the Union in 1889.

The treaties between Native American tribes and the U.S. transferred land to the government in exchange for the protection of the Tribal way of life and access to natural resources, but did not alter the rich cultural history of Washington's Native Americans (WSS, 2006). The Makah Tribe, which is still active in Washington, occupied five villages occupied year round, with an emphasis on the resources of the ocean, tidelands, forests, and rivers. The Makah built ocean-going canoes used to fish and hunt whales, which were a major resource for the Tribe. Ozette, one such whaling village, was buried by a mudslide, which preserved the artifacts at the site. Exploration of the site by Tribe members and archaeologists uncovered 55,000 artifacts, 40,000 structural remains, and over one million faunal remains, and provided the most complete picture of ancient northwest coastal native life anywhere (UW, 2006).

Several of the tribes of the Pacific Northwest used carved monuments, or "totem poles," to document family and tribal histories, which were linked to ceremonies called potlatches, when totem poles were raised. Once limited to only the wealthiest families, increased wealth from trading throughout the 19th

century resulted in a large numbers of totem poles commissioned by tribal families along the Pacific Coast. With the outlawing of potlatches by Canada in the late 19th century, most totem poles disappeared, but historical photographs documented this tradition and modern-day replicas continue to symbolize the culture of Northwest Coastal Native Americans (UW, 2006).

Architectural Resources

Washington has 1,258 National Register listings, 398 Washington Heritage Register listings, and 23 National Historic Landmark listings. These include 195 districts, 1,197 buildings, 193 structures, 180 sites, and 3 objects. Historic places serve a number of functions. The majority of listings in Washington were used as domestic structures, transportation-related structures such as bridges or highways, government properties such as post offices, military outposts, or courthouses, commerce/trade areas such as historic districts, and educational buildings, particularly historic schools (DAHP, 2005c). A complete list of the number of registered historic places by county in Washington is given in Appendix F.

Washington has dedicated a program to the preservation of historic school districts. The first schoolhouse in Washington opened in 1832. Early schools were log homes or wood-frame houses. Brick schools were began being constructed in the early 1900's, and the 1940's and 50's saw modern, single-story schools. Of the 3,500 schools constructed from 1832 to 1951, most have been demolished or the status is unknown. In fact, historic schools are in such decline that the National Trust for Historic Preservation has listed them as one of the top eleven most endangered historic places (Honegger, 2002).

Washington's historic buildings offer a unique perspective on the architectural influences during early settlement of the region and periods of population booms. Excellent examples of Victorian residences exist in Dayton, Port Townsend, and Olympia. The Queen Anne style is exemplified in historic housing in Yakima and Dayton, and Greek Revival residential architectural examples exist in Thurston County and Olympia. Many of the historic U.S. post offices in Washington exhibit the classic format of the 1890's, while others exemplify the era of federal relief building during the 1940s (DAHP, 2006).

Washington has 19 historic lighthouses established between 1856 and 1936 and primarily located in Puget Sound, the Columbia River, the Pacific Coast, and Grays Harbor. Cape Disappointment Light on North Point Island on the Columbia River, has been active since it was built in 1856 and is the oldest light in Washington. It is one of only three original lighthouses on the Pacific Coast (NPS, 2006).

Traditional Cultural Properties

There are currently 27 federally recognized Tribal entities located in the CREP area (GOIA, 2005) (Table 3.3). The DAHP does not maintain a list of traditional cultural properties within the State.

Table 3.3. Washington State Tribal entities located in the CREP area.

Tribe(s), Confederations, and Nations	Counties
Confederated Tribes of the Chehalis Reservation	Grays Harbor and Thurston
Colville Confederated Tribes Reservation	Okanogan
Cowlitz Indian Tribe	Cowlitz and Clark
Hoh Indian Tribe	Jefferson
Jamestown S'Klallam Tribe	Clallam
Lower Elwha Klallam Indian Tribe	Clallam
Lummi Nation	Whatcom
Makah Indian Tribe	Clallam
Muckleshoot Indian Tribe	King
Nisqually Indian Tribe	Thurston

Tribe(s), Confederations, and Nations	Counties
Nooksack Indian Tribe	Whatcom
Port Gamble S'Klallam Tribe	Kitsap
Puyallup Tribe of Indians	Pierce
Quileute Tribe	Clallam
Quinault Indian Nation	Grays Harbor
Samish Tribe	Skagit
Sauk-Suiattle Indian Tribe	Skagit
Shoalwater Bay Tribe	Pacific
Skokomish Tribe	Mason
Snoqualmie Tribe	King
Squaxin Island Indian Tribe	Mason
Stillaguamish Indian Tribe	Snohomish
Suquamish Tribe	Kitsap
Swinomish Indian Tribal Community	Skagit
The Tulalip Tribes	Snohomish
Upper Skagit Tribe	Skagit
Confederated Tribes of the Yakama Indian Reservation	Klickitat and Yakima

Source: GOIA, 2005.

3.3 WATER RESOURCES

3.3.1 SURFACE WATER

Description

According to statewide statistics, there are 73,886 miles of rivers and streams and 4,147 lakes in Washington (Ecology, 2005b). In 2000, surface water supplied 70 percent of the total water withdrawals (2.265 million gallons per day) in Washington. Uses of surface water include public supply, domestic use, industrial use, and irrigation, the latter of which accounted for nearly 60 percent of the total surface water use (USGS, 2004a). Surface waters also support a diverse biological community, including 13 Federally listed salmonid species, as well as numerous other commercially and recreationally important fisheries (Ecology, 2001a).

Clean Water Act , Water Quality Assessment Report

The Ecology Water Quality Program is responsible for administering Federal and State laws pertaining to water quality. The Clean Water Act of 1972 (CWA) requires States to report on the quality of waterbodies and their attainment of beneficial uses (e.g., recreation, aquatic life, agriculture). Under CWA's section 303(d), States are required to identify and establish a priority ranking of all waterbodies that do not meet State water quality standards and to biennially develop a Water Quality Limited Segments List (commonly called a 303(d) List).

In 2003, EPA issued guidance for the 2004 waterbody assessments and reporting requirements for section 303(d) and section 305(b) of the CWA and allowed States to combine these reports into one product. The final product is referred to as an integrated report and fulfills EPA's goal to provide the general public with a comprehensive summary of State and national water quality. Following these guidelines, Ecology prepared an integrated water quality report in June 2005 titled: *Washington State's Water Quality Assessment [303(d) & 305(b) Report]* (Integrated Report). The final 2004 submittal was approved by EPA in November 2005 (Ecology, 2005c).

In the Integrated Report, numerous waterbodies in the CREP area have been designated as not supporting their designated uses. These waterbodies will be discussed further under Affected Environment.

Watershed Management Plans

Nonpoint source water pollution is a growing threat to the environment and public health. Nonpoint source pollution is the accumulation of sediment, chemicals, toxics, nutrients, debris, and pathogens that are washed into the nearest waterbody by runoff from rainstorms, snow melt, or human practices. Nonpoint sources include runoff from agricultural lands, urban areas, and forest lands; subsurface or underground sources; and discharges from marine vessels (Ecology, 2000a).

Washington has been a leader in addressing nonpoint source pollution for many years. In 2000, Washington approved a statewide plan for protecting natural resources from nonpoint source pollution titled *Water Quality Management Plan to Control Nonpoint Source Pollution* (Ecology, 2000a). This report identifies gaps in existing programs, sets a strategy for improving those programs, recommends timelines, and outlines methods for evaluating our progress.

Salmonid recovery and water quality protection require more urgent efforts to control nonpoint source pollution (Ecology, 2000a). Declining water quality in the project area, particularly from agriculture-related land uses, has impacted surface waters and caused declines in habitat for coldwater fish species, especially salmonids (Agreement, 2003). Most of the more than 600 waterbodies currently on Washington's 303(d) List have nonpoint source pollution problems and are scheduled for TMDL development by 2013 (Ecology, 2000a).

Affected Environment

In Washington, Ecology manages surface and groundwater quality on a watershed, or water resource inventory area (WRIA), basis. This management includes coordinating monitoring, inspecting and permitting, prioritizing water quality concerns, improving water quality and agency service delivery through improved environmental coordination, and integrating nonpoint source controls on agriculture, forestry, stormwater, and other sources (Ecology, 1997a). CREP overlaps 48 of the WRIsAs in Washington and includes three major river systems: the Columbia River Basin, the Yakima River Basin, and the Snake River Basin (Figure 3.7).

The 2004 comprehensive assessment of water quality included over 30,000 assessed (water column and sediment) segments, compared to 2,362 segments in 1998, an increase of almost 13 times the number of assessments. Five categories were used to characterize and inventory waterbodies for the Integrated Report, including (Ecology, 2005c):

- **Category 1** waters meet tested standards for clean waters.
- **Category 2** waters are waters of concern.
- **Category 4** waters:
 - **Category 4A** waters have an approved TMDL.
 - **Category 4B** waters have a pollution control plan in place. While pollution control plans are not TMDLs, they must have many of the same features and there must be some legal or financial guarantee that they will be implemented.
 - **Category 4C** waters are impaired by a non-pollutant. These impairments include low water flow, stream channelization, and dams. These problems require complex solutions to help restore streams to more natural conditions.
- **Category 5** waters require a TMDL.

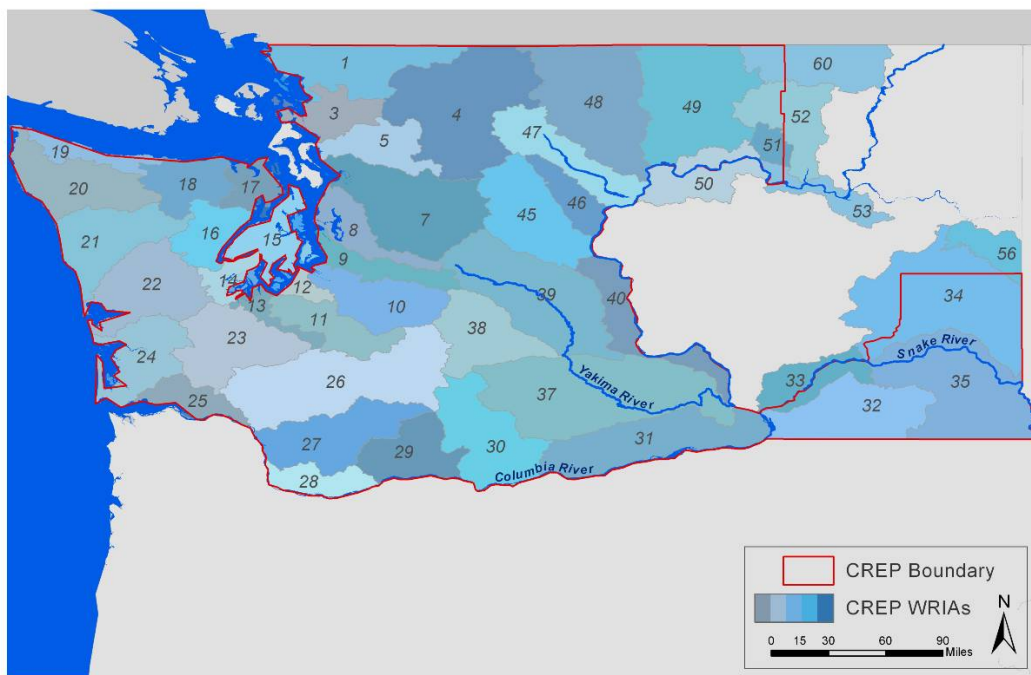


Figure 3.7. Water Resource Inventory Areas within the CREP project area.

The analysis for this PEA includes only category 4 and 5 waterbodies, or waters with one or more impaired uses.

Of the total number of assessed segments for water column data, a high percentage (about two thirds) appears to be adequate for the pollutant monitored. Percentage results for the assessed waters are summarized as follows (Ecology, 2005b):

- 62 percent meet the parameters for which they were tested;
- 17 percent are waters of concern, but not polluted;
- 4 percent have water cleanup plans to correct problems;

- 3 percent are impaired by a non-pollutant, such as habitat degradation; and
- 14 percent are on the polluted waters list (303(d) List).

There are approximately 166 more fresh water streams and lake segments on the 2004 303(d) List than were listed on the 1998 assessment. While over half of the 1998 303(d) listings moved off the list, new listings were added as the result of new monitoring data gathered in the intervening years (Ecology, 2005b).

The key elements affecting water quality in Washington include temperature, fecal coliform, dissolved oxygen (DO), pH, toxics, and total phosphorus. Of the total list of polluted waters, approximately 80 percent are affected by these elements. The other 20 percent include metals, chemicals, and other pollutant criteria (Ecology, 2005c).

Of the main pollutant parameters causing 303(d) listings, the most significant increase in listings occurs with temperature. This increase is the result of recent increases in temperature monitoring efforts, likely spurred by increased salmonid habitat protection efforts. The breakout of key pollutant parameters based on a total of 2,678 listings in the Polluted Waters category of the 303(d) List is summarized in Table 3.4 (Ecology, 2005c).

Table 3.4. Summary of pollutants impairing waters listed on the 2004 303(d) List.

Parameter	Number of Listings	Percent of Listings
Temperature	817	33
Fecal coliform	722	29
Dissolved oxygen	324	13
PH	162	6
Total phosphorus	37	1
Other (metals, toxics)	420	17

Source: Ecology, 2005c.

Streams and Rivers

More than 70,400 miles of stream flow through Washington's complex landscapes. Statewide, more than half the stream have fair to poor water quality and do not support the complete range of uses. This condition results mostly from surface or stormwater runoff, flow alteration, loss of riparian cover, and animal access. The primary causes of water quality problems in rivers and streams are fecal contamination, metals, temperature, pH, DO, and toxic chemicals. These problems affect the use of rivers and streams for swimming, support of aquatic life, and wildlife habitat (Ecology, 2000b).

In 2002, the statewide water quality assessment was conducted for over 98 percent of the State's streams. Overall, designated uses were fully supported in 47 percent of all rivers and streams and use impairments were more common in small streams than in larger streams or rivers. The Columbia Basin and Puget Lowland Ecoregions showed the highest rate of impaired uses. Aquatic life uses were fully supported in 86 percent of all streams and swimming was assessed as fully supported in 57 percent of streams. In 2002, fecal coliform was the primary indicator of use impairment in streams and rivers, but in 2004, the primary indicator was temperature (Ecology, 2002b; Ecology, 2005c). Waterbodies that have pollutant levels that exceed state water quality standards for a designated use are defined as nonattainment. Table 3.5 summarizes streams and rivers in CREP project watersheds that have been placed in nonattainment categories.

Table 3.5. Summary of nonattainment stream and river miles on the 2004 303(d) List in CREP project area.

	Stream and River Segments	
	Number	Primary Pollutants (> 80 percent of listings)
Category 4a	738	Fecal Coliform, Dissolved Oxygen, Temperature, Total Dissolved Gas
Category 4b	73,823	Fecal Coliform, Temperature
Category 4c	23,136	Instream Flow, Fish Habitat, Invasive Exotic Species
Category 5	1,742	Temperature, Fecal Coliform, pH, Dissolved Oxygen, Insecticide/Pesticide

Source: Ecology, 2005c

Information concerning the support of designated uses is not yet available for the 2004 Integrated Report (Ecology, 2005c), but based on the 2002 305(b) report, Washington's rivers and streams displayed support for aquatic life, fish migration, fish and salmonid spawning, fish consumption, and secondary contact recreational use (Table 3.6) (Ecology, 2002b). Wildlife habitat and primary contact recreational uses were the designated uses least supported in Washington streams and rivers.

Table 3.6. Support of designated uses in Washington's rivers and streams in 2002.

Use		Use Support of Streams		
		Good	Fair	Poor
Aquatic Life	Miles	59,617	5,392	4,194
	Percent	86	8	6
Fish Migration	Miles	63,072	3,796	2,336
	Percent	91	5	3
Fish Spawning	Miles	62,997	3,724	2,482
	Percent	91	5	4
Salmonid Spawning	Miles	69,034	4,364	2,806
	Percent	90	6	4
Wildlife Habitat	Miles	16,824	16,824	8,412
	Percent	40	40	20
Fish Consumption	Miles	32,484	3,609	5,414
	Percent	78	9	13
Recreation Use Primary Contact	Miles	39,638	13,971	15,595
	Percent	57	20	23
Recreation Use Secondary Contact	Miles	49,517	11,037	8,651
	Percent	72	16	13

Source: Ecology, 2002b.

The most common sources of impairment in Washington's rivers and streams are agriculture (30 percent), followed by hydromodification (18 percent) and natural sources (10 percent) (Ecology, 2002b). A summary of pollution sources is presented in Table 3.7.

Table 3.7. Possible pollution source of impairment of assessed waters (percent).

Source	No. Rivers and Streams
Agriculture	30
Hydromodification	18
Natural Sources	10
Septic Tanks	9
Municipal Point Sources	6
Stormwater Runoff	6
Sivlivculture	4
Construction	4
Unknown Sources	4
Resource Extraction	3
Industrial Point Sources	2
Other Sources	2
Combined Sewer Overflows	1
Land Disposal	1

Source: Ecology, 2002b.

Lakes and Reservoirs

Ecology monitored water quality in lakes from 1989 through 1997 annually. Parameters sampled included temperature, pH, conductivity, DO profiles, chlorophyll, total nitrogen, and total phosphorus. At selected lakes, Ecology also monitored hardness, turbidity, total suspended solids, and fecal coliform bacteria. However, because of lack of funding, there is currently no statewide monitoring or assessment of lake water quality (Ecology, 2005d).

In 2004, 239 lakes were included on the 303(d) List. Thirty-five percent of monitored lakes are in fair to poor condition—many of the lakes are in high-density housing areas (Ecology, 2005b). A summary of impaired lakes and reservoirs is listed in Table 3.8.

Table 3.8. Summary of impaired lakes and reservoirs in CREP watersheds.

	Lakes and Reservoirs	
	Number	Primary Pollutants (> 80 percent of listings)
Category 4a	11	Total Phosphorus, Dioxin, Insecticide/Pesticides
Category 4b	0	N/A
Category 4c	97	Invasive Exotic Species, Fish Habitat
Category 5	131	Fecal Coliform, Total Phosphorus, Industrial Pollutants, Insecticide/Pesticides

Source: Ecology, 2005c

Use impairments for Washington's inland lakes are most commonly caused by fecal coliform, total phosphorus, pesticides, and industrial pollutants (Table 3.9). Excessive loading of phosphorus, both external and internal, can cause high algal concentrations. In extreme cases, cyanobacteria (blue-green algae) can severely degrade water quality, causing noxious odors, surface scum, low DO, and high pH (Ecology, 2000b).

Table 3.9. Summary of fully supporting and impaired lakes.

Degree of Use Support	Size (acres)	Percent
Fully Supporting All Assessed Uses	172,037.6	62
Partly Supporting All Assessed Uses	103,204.0	37
Not Supporting All Assessed Uses	3,855.0	1

Source: Ecology, 2002c

Data concerning supported uses and source of impairments in lakes was not provided in 2002, but there is information from the 2001 305(b) list update. In 2001, most lakes (62 percent) fully supported assessed uses and only one percent did not support all uses. Unknown sources were the most common source of impairment in lakes, followed by agriculture, stormwater runoff, and other sources (Table 3.10) (Ecology, 2002c).

Table 3.10. Possible pollution source of impairment of assessed waters (percent).

Source	Lakes
Unknown Sources	77
Natural Sources	7
Agriculture	6
Stormwater Runoff	4
Other Sources	3
Hydromodification	1
Septic Tanks	1
Municipal Point Sources	1

Source: Ecology, 2002c.

Ecology conducts freshwater aquatic plant monitoring to track changes in the aquatic plant community, concentrating on invasive non-native species such as Eurasian milfoil (Ecology, 2005e). Invasive exotic species is the cause of the highest number of Category 4c impairments in Washington's lakes and rivers (96 listings) (Ecology, 2005c). Table 3.11 summarizes common invasive aquatic species in Washington's lakes in the CREP area

Table 3.11. Number of invasive aquatic plants identified during a survey of 436 sampling locations in Washington lakes within CREP area.

Common Name	Species Name	Number	CREP Counties
Fanwort	<i>Cabomba caroliniana</i>	2	Cowlitz
Brazilian elodea	<i>Egeria densa</i>	26	Clark, Cowlitz, Grays Harbor, Jefferson, King, Kitsap, Lewis, Mason, Pacific, Pierce, Skagit, Snohomish, Wahkiakum, Whatcom
Hairy willow herb	<i>Epilobium hirsutum</i>	3	Klickitat, Whatcom
Hydrilla	<i>Hydrilla verticillata</i>	1	Cowlitz
Water primrose	<i>Ludwigia hexapetala</i>	1	Cowlitz
Garden loosestrife	<i>Lysimachia vulgaris</i>	8	King, Kitsap, Mason, Thurston, Whatcom
Purple loosestrife	<i>Lythrum salicaria</i>	87	Benton, Clark, Cowlitz, Grays Harbor, King, Kitsap, Kittitas, Lewis, Mason, Okanogan, Pierce, Skagit, Snohomish, Thurston, Wahkiakum, Walla Walla, Whatcom, Yakima
Parrotfeather	<i>Myriophyllum aquaticum</i>	15	Cowlitz, Grays Harbor, King, Lewis, Pacific, Pierce, Snohomish, Wahkiakum, Yakima
Eurasian milfoil	<i>Myriophyllum spicatum</i>	139	Chelan, Clallam, Clark, Columbia, Cowlitz, Grays Harbor, King, Kitsap, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Pierce, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, Whitman, Yakima
Fragrant waterlily	<i>Nymphaeodes odorata</i>	130	Chelan, Clark, Cowlitz, Grays Harbor, Jefferson, King, Kistap, Mason, Pacific, Pierce, Skagit, Snohomish, Thurston, Whatcom, Yakima

Common Name	Species Name	Number	CREP Counties
Yellow floating heart	<i>Nymphoides peltata</i>	2	Whatcom
Grass leaf arrowhead	<i>Sagittaria graminea</i>	6	Mason, Snohomish
Bladderwort	<i>Utricularia inflata</i>	13	Cowlitz, Kitsap, Mason, Pierce, Thurston

Source: Ecology, 2005e.

Approved TMDLs

The TMDL or Water Cleanup Plan process is established by section 303(d) of the CWA. Federal law requires States to identify sources of pollution in waters that fail to meet state water quality standards, and to develop Water Cleanup Plans to address those pollutants. The Water Cleanup Plan (TMDL) establishes limits on pollutants that can be discharged to the waterbody and still allow State standards to be met. TMDLs describe the type, amount and sources of water pollution in a particular waterbody; they analyze how much the pollution needs to be reduced or eliminated to meet water quality standards; and they provide targets and strategies to control the pollution (Ecology, 2002a).

Ecology organizes water cleanup efforts through geographic areas called Water Quality Management Areas (WQMAs), made up of one or more WRIAs. With the help of local communities, each year Ecology selects WRIAs where TMDLs will be developed. As a result of a 1998 legal settlement, Ecology has until 2013 to develop and implement plans to clean up 643 polluted waterbodies. Most listed waterbodies are affected by more than one pollutant. Ecology will be working with local governments, Tribes, businesses, and citizens to develop plans or solutions to improve water quality (Ecology, 2002a).

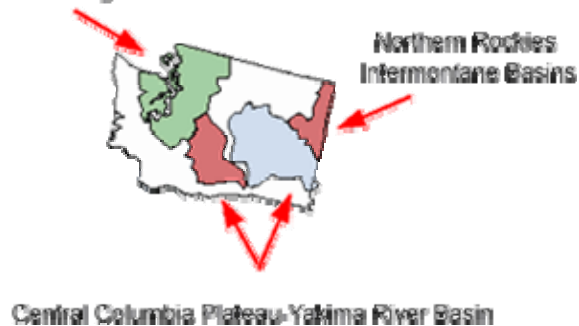
Today nonpoint pollution sources represent the biggest impact on water quality. Therefore, Ecology relies on positive working relationships with local governments, Tribes, watershed groups, and private landowners to ensure that BMPs are implemented and managed. Since 1992, EPA has approved 671 TMDLs in 104 waterbodies (Ecology, 2005f). In the CREP area, 30 WRIAs and the Columbia River currently have approved TMDLs (see Appendix G) and 21 WRIAs have TMDLs under development.

National Water Quality Assessment Program

In 1991, the U.S. Congress appropriated funds for the U.S. Geological Survey (USGS) to begin the National Water Quality Assessment Program (NAWQA) to help meet the continuing need for sound, scientific information on the extent of water-quality problems, how these problems are changing with time, and an understanding of the effects of human actions and natural factors on water quality conditions (USGS, 2004b). These studies assessed groundwater and surface water in a large part of Washington State, including the Central Columbia Plateau, Yakima River Basin, Puget Sound Drainages, and the Northern Rockies Intermontane Basins (Figure 3.8). These areas cover agricultural lands as well as major urban centers in and around Seattle. Among the issues addressed by NAWQA are:

- high levels of nitrogen and phosphorus which may result in human health concerns as well as excessive algal growth and other nuisance plants;
- elevated concentrations of urban and agricultural pesticides that pose a threat to aquatic life;

Puget Sound Drainages



Central Columbia Plateau-Yakima River Basin
Figure 3.8. Basins and drainages assessed in NAWQA.
Source: USGS, 2005.

- continued occurrence of dichlorodiphenyltrichloroethane (DDT) and other legacy organochlorine pesticides in stream sediments and fish tissue; and
- the effects of habitat disturbance and water-quality degradation on aquatic communities (USGS, 2005).

This section reviews the results of NAWQA studies on areas eligible for CREP enrollment, including the Puget Sound Basin, Yakima River Basin, and the Central Columbia Plateau.

Puget Sound Basin

The Puget Sound Basin encompasses the 13,700 square mile area that drains to Puget Sound and adjacent marine waters. In addition to all or part of 13 counties, the basin includes the Skagit River, Nooksack River, and three physiographic provinces: the Olympic Mountains, the Cascade Range, and the Puget Lowlands. Nearly 70 percent of the population of Washington State lives within the Puget Sound Basin. Forestry is the dominant land use, but urban and agricultural land uses are also common (USGS, 2000).

Agricultural and urban land uses contribute to surface water quality impairments in the Puget Sound Basin. Runoff from these land types can include pesticides, sediment, bacteria, and fertilizers, and can contribute to high concentrations of nitrogen and phosphorus.

Developed areas and agricultural land uses are enriched with nitrogen and phosphorus compared to forested or undeveloped areas. Agriculture contributes the highest concentration of nitrogen to streams and rivers (Figure 3.9). In some streams in the Puget Sound Basin, phosphorus concentrations exceed EPA standards, which may lead to excessive plant growth. However, long term monitoring of nutrients in this watershed does not indicate any trends in nutrient loading (USGS, 2005).

Pesticides in the Puget Sound Basin are indicative of upstream land uses. For example: herbicides present in agricultural drainages, such as atrazine and metolachor, are commonly used in agricultural practices and herbicides present in urban drainages, such as dicholbeinil and prometon, are commonly used for lawn and garden care. Small streams tend to have higher concentrations of pesticides than larger rivers, which may indicate dilution in high volumes, lowering detection frequencies (USGS, 2000).

The most common insecticide was diazinon, which is heavily used in urban areas. Finally, there is evidence that historical organochlorine compounds, such as DDT and polychlorinated biphenyls (PCBs), are still

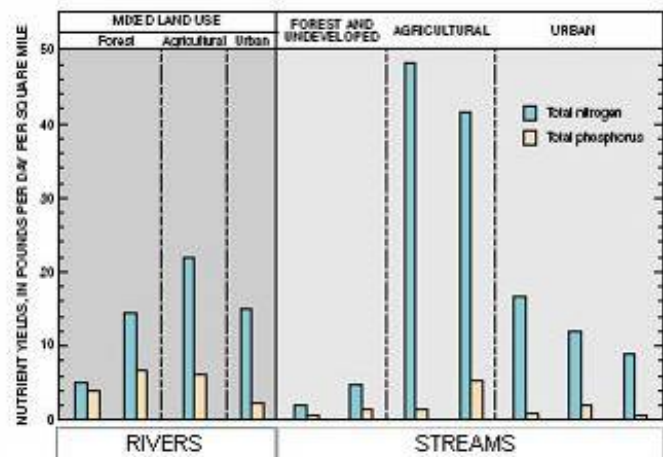


Figure 3.9. Nutrient yields at sampling sites in Puget Sound Basin.
Source: USGS, 2000.

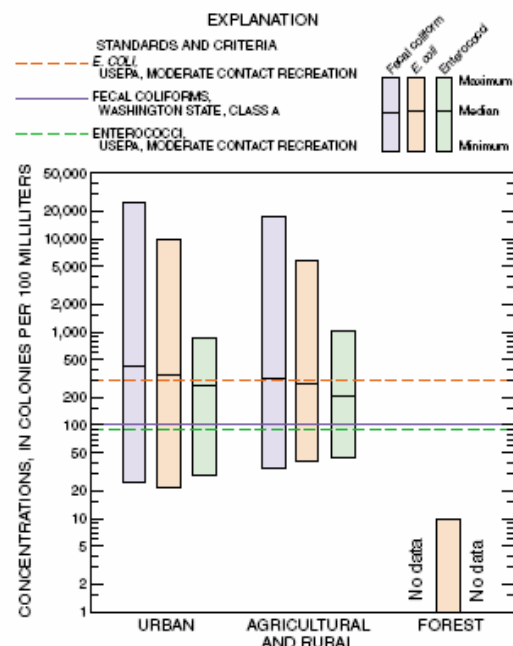


Figure 3.10. Fecal coliform concentrations by land use category in Puget Sound Basin.
Source: USGS, 2000.

present in sediment and in the tissues of fish (USGS, 2000).

High concentrations of bacteria indicate the presence of fecal coliform in many streams in the Puget Sound Basin (Figure 3.10). Over 80 percent of sampling sites had fecal coliform concentrations that exceeded the Washington State standards. Urban and agricultural areas had higher concentrations of *E. coli* than did forested areas. In agricultural and rural streams, fecal coliform contamination is most likely from animals, but septic system input and wildlife are other possible sources. Urban areas contribute fecal coliform via leaking sewer systems, direct inputs from pets and wildlife, and failing septic systems (USGS, 2000).

Trends in habitat quality in urban and agricultural drainages in the Puget Sound Basin indicate stream ecosystem degradation when compared to stream habitat quality in forested or undeveloped areas. Undeveloped areas have higher percentage of cobble and lower percentage of sand in stream bottoms, indicating favorable salmonid conditions (Figure 3.11). Also, undeveloped stream drainages have a higher invertebrate community diversity, indicating a higher quality habitat in these streams. Streams in urban and agricultural drainages have altered stream flows, increased chemical concentrations, and higher temperatures, which reflect upon habitat quality (USGS, 2000).

Yakima River Basin

The Yakima River Basin drains 6,155 square miles of forest, rangeland, and agricultural land in south-central Washington. Many residents rely on agriculture for their livelihood, and the basin is one of the most intensively irrigated regions in the U.S. . Water withdrawals in the Yakima River Basin are primarily from surface water sources, with 95 percent of surface water withdrawals used for irrigation (USGS, 2004b).

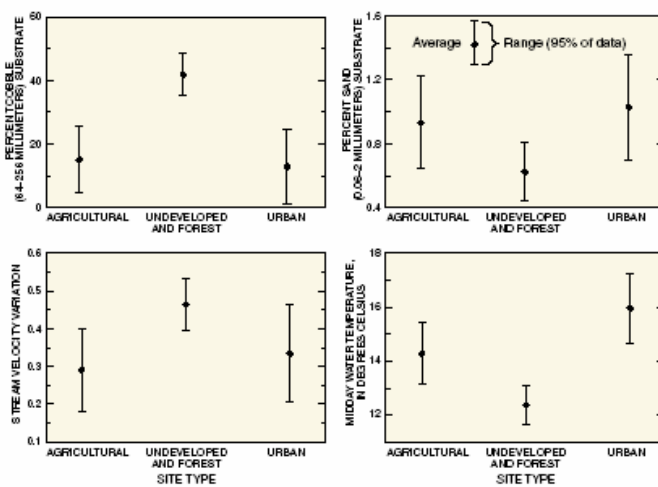


Figure 3.11. Values of selected habitat variables in Puget Sound Basin streams.

Source: USGS, 2000.

Concentrations of nutrients (nitrogen and phosphorus) in the river reflect the influx of agricultural chemicals. Nitrate and orthophosphate were the dominant forms of nitrogen and phosphorus found in the river and its tributaries. Concentrations of nutrients in some drains were high enough to support growth of nuisance algae. Following the implementation of BMPs such as the use of polyacrylamide (PAM) to improve tailwater quality in rill-irrigated fields, the conversion of outdated irrigation practices (such as

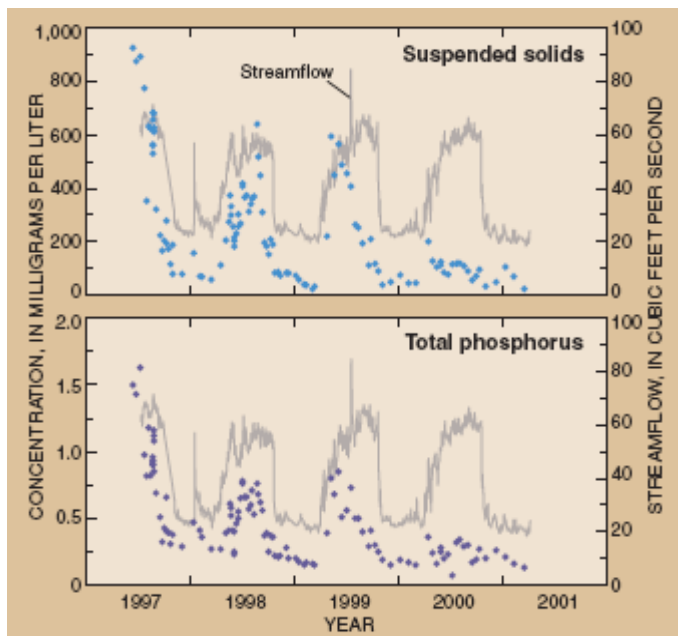


Figure 3.12. Concentration of suspended solids and total phosphorus in the Granger Drain from 1997 to 2000.
Source: USGS, 2004b.

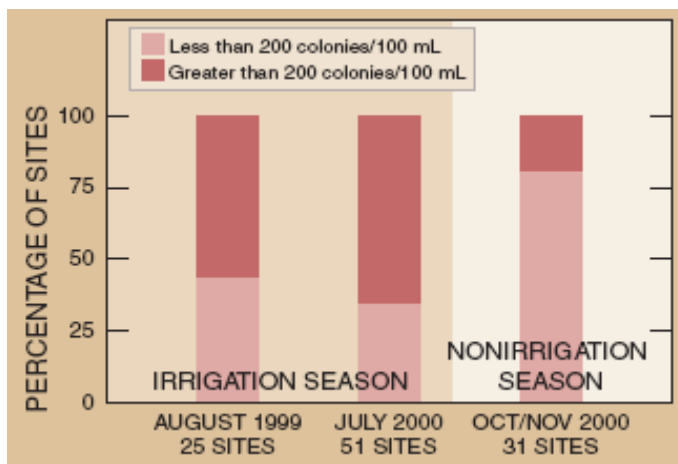


Figure 3.13. Percentage of sites in the Yakima River Basin that exceeded Washington State water quality standards.
Source: USGS, 2004b.

rill irrigation) to more conservative methods, and the implementation of riparian fencing and constructed wetlands, concentrations of suspended sediment and total phosphorus in two drainages in the Yakima River Basin have decreased (Figure 3.12) (USGS, 2004b).

During the summer, concentrations of fecal coliform bacteria in streams and drains in the Yakima River Basin commonly exceed the Washington State Water Quality Standards for multiple water uses (Figure

3.13). The highest concentrations were measured in tributaries draining predominantly agriculture or urban areas, and the percentage of sites that exceeded the standard was higher during irrigation than during non-irrigation season (USGS, 2004b).

Concentrations of arsenic in the Yakima River Basin exceeded the maximum contaminant level (MCL). Arsenic, historically used as pest control agent and more recently used in commercial fertilizers, is a human carcinogen. In two agricultural drains, (the Granger Drain and Moxee Drain), concentrations of arsenic were highest during the nonirrigation season in 1999 and 2000, while concentrations in the Yakima River were highest during the irrigation season (Figure 3.14) (USGS, 2004b). The increase in the concentration of arsenic in the drains during the nonirrigation season suggests elevated concentrations in the shallow groundwater system, because most of the water in the drains in the nonirrigation season is

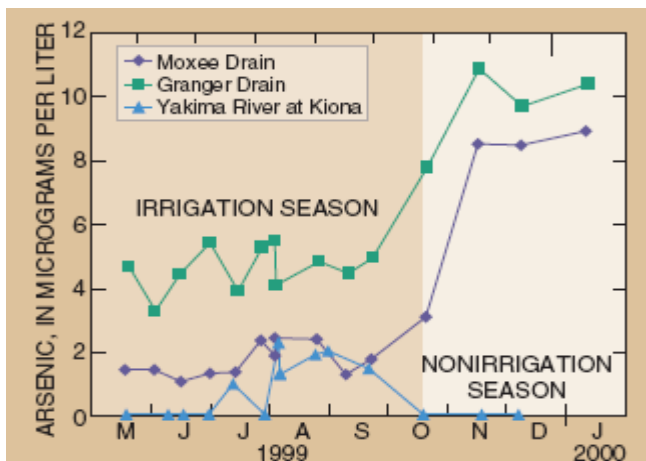


Figure 3.14. Concentrations of arsenic in two agricultural drains and the Yakima River during irrigation and nonirrigation seasons. Source: USGS 2004b.

discharge from the shallow groundwater system. Observations of arsenic concentrations in these drains are a concern because many rural residents rely on shallow groundwater for drinking water (USGS, 2004b).

Organochlorines, such as DDT, were used nationwide in the mid-1900s for pest control. The use of these pesticides was discontinued in the 1970s because they are known carcinogens, accumulate in the food chain, and are hazardous to wildlife. However, these compounds are persistent in the environment and continue to impair waterbodies throughout the Nation, including Washington State. In the Yakima River Basin, the most common organochlorine insecticides are total DDT (DDT and its breakdown products, dichlorodiphenyldichloroethylene [DDE] and dichlorodiphenyldichloroethane [DDD]), and dieldrin (USGS, 2004b).

These organochlorine insecticides are the cause of impairment for 31 waterbody segments in the Yakima River listed on the 2004 303(d) List (Ecology, 2005c). Twelve of 23 organochlorine compounds analyzed in unfiltered water samples in August 1999 were detected in agricultural areas throughout the basin. DDT, DDE, DDD, dieldrin, and heptachlor epoxide exceeded the EPA chronic water quality criteria for the protection of freshwater aquatic life (USGS, 2004b).

Although organochlorines continue to impair waterbodies in the Yakima River Basin, concentrations of total DDT have decreased in agricultural tributaries of the Yakima River since the 1989-1990 sampling years (Figure 3.15). DDT primarily is attached to soil particles and enters the streams via erosion. The implementation of BMPs to control irrigation-induced erosion, such as drip and sprinkler irrigation practices, cover crops, ground cover, and the use of PAM, may be associated with decreases in

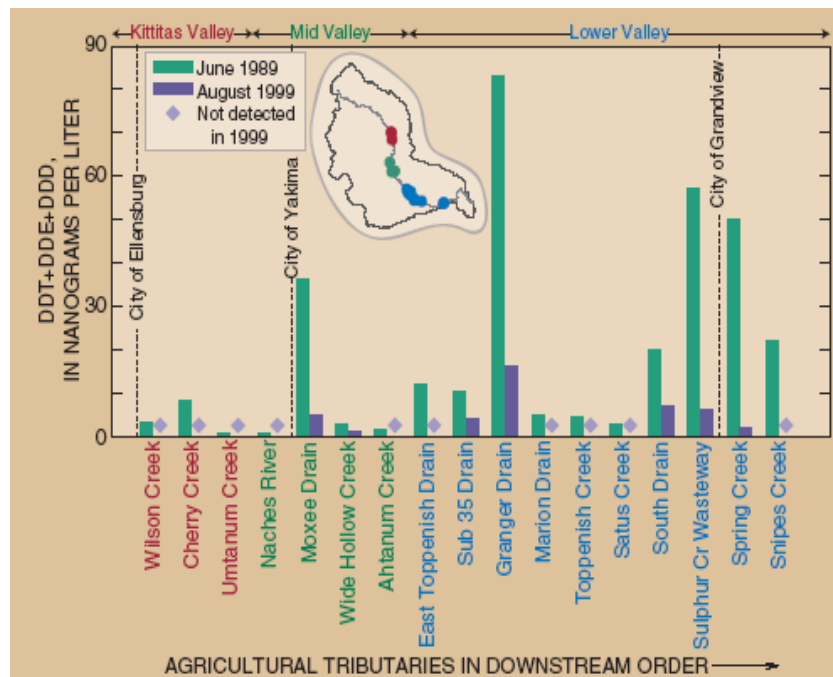


Figure 3.15. Comparison of total DDT concentration in agricultural tributaries of the Yakima River between June 1989 and June 1999.
Source: USGS, 2004b.

concentrations of suspended sediment and sorbed DDT, resulting in decreased concentrations of organochlorines in the Yakima River tributaries and improved water quality (USGS, 2004b).

Pesticides were detected in 98 percent or more of the samples from streams and drains in the Yakima River (USGS, 2004b). Agricultural crops receive the largest application of pesticides in the Yakima River Basin, but several detected compounds also are used for weed and pest control in urban areas and along roadsides, fences, and canals.

Insecticides were detected more frequently in agricultural drains and streams in the Yakima River Basin than in other agricultural areas across the Nation. Pesticides were detected more frequently and generally

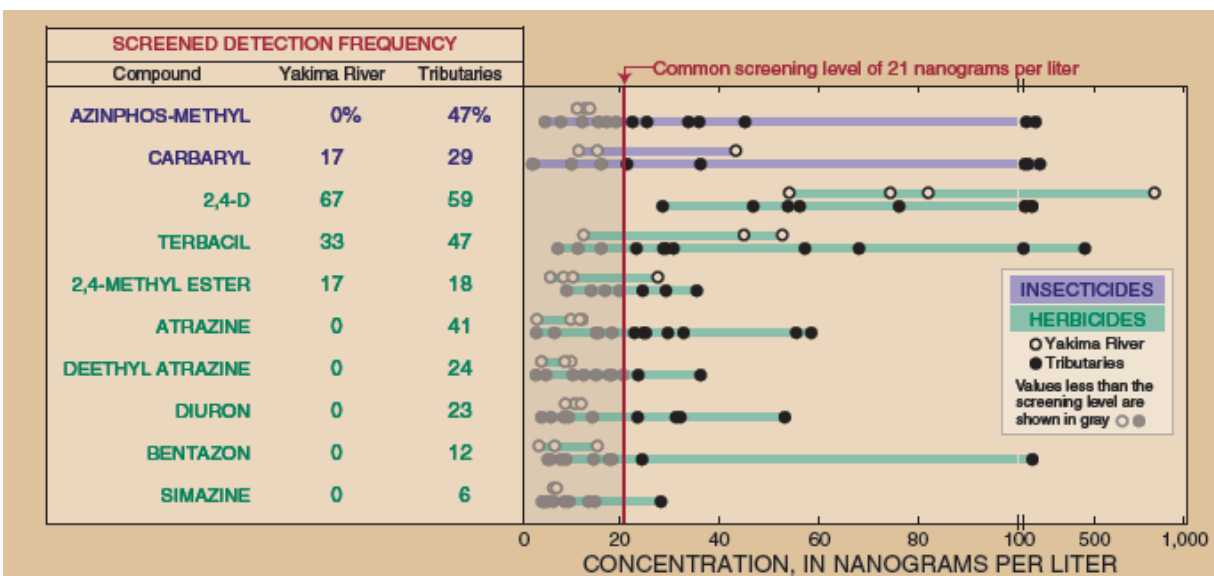


Figure 3.16. Detection levels of herbicides in the Yakima River and its tributaries.
Source: USGS, 2004b.

at higher concentrations in the agricultural tributaries than in the Yakima River (Figure 3.16) (USGS, 2004b).

Pesticides were generally detected more frequently and at higher concentrations during the irrigation season than during the nonirrigation season. Insecticides were rarely detected during the nonirrigation season, whereas some herbicides were detected year round, although concentrations were lower during the nonirrigation season. The most commonly detected herbicides during the nonirrigation season were atrazine and its breakdown product deethylatrazine.

Ninety-one percent of the samples collected from the small agricultural watersheds contained at least two pesticides or pesticide breakdown products (Figure 3.17). The herbicide 2,4-D occurred most often in the mixtures because of its widespread use on agricultural land, and along roads, irrigation canals, and agricultural drains to control weeds. Azinphos-methyl, the most heavily applied pesticide, and atrazine, the most mobile pesticide in water, also occurred often in the mixtures (USGS, 2004b).

Agricultural activities in the Yakima River Basin have the potential to degrade water quality through the inputs of sediment, nutrients, and pesticides to streams. Habitat conditions in streams draining agricultural land may not be of sufficient quality to support diverse aquatic communities (USGS, 2004b).

In agricultural areas, aquatic communities are affected by poor water quality and habitat conditions. USGS developed a stream condition index (SCI) to characterize the overall water quality and habitat conditions at a site. The SCI provides an overall measure of stream quality using four measures of water quality—turbidity and the concentrations of total nitrogen, total phosphorus, and total pesticides—and four measures of habitat quality—substrate size, habitat complexity, stream shading, and the percentage of run habitat (USGS, 2004b).

In general, streams and drains with higher SCI scores support more diverse and complex aquatic communities with fewer pollution tolerant species and indicate sites in good condition. Sites with high SCI scores in the Yakima River Basin are associated with little or no agricultural use. At sites with low SCI scores, benthic invertebrate assemblages are less diverse and increasingly composed of pollution tolerant species and algal assemblages are dominated by species which indicate high nutrient concentrations. The poor condition sites in the Yakima River Basin are associated with intensive agriculture (USGS, 2004b).

Benthic invertebrates are good indicators of overall stream conditions due to the large number of organisms with widely diverse environmental requirements. In the Yakima River Basin, average

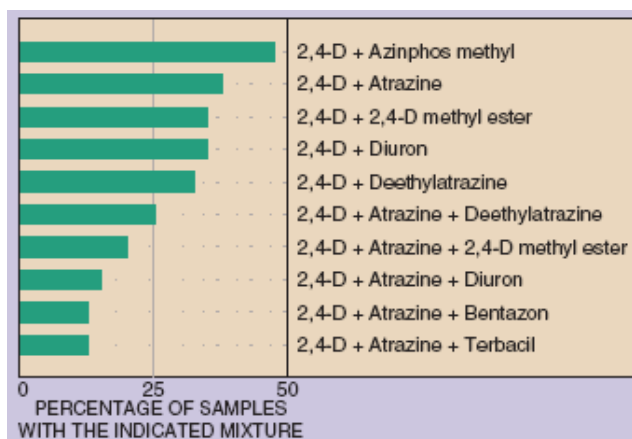


Figure 3.17. The most frequent mixtures of pesticides exceeding the screening level of 21 ng/L in July 2000. Source: USGS, 2004b.

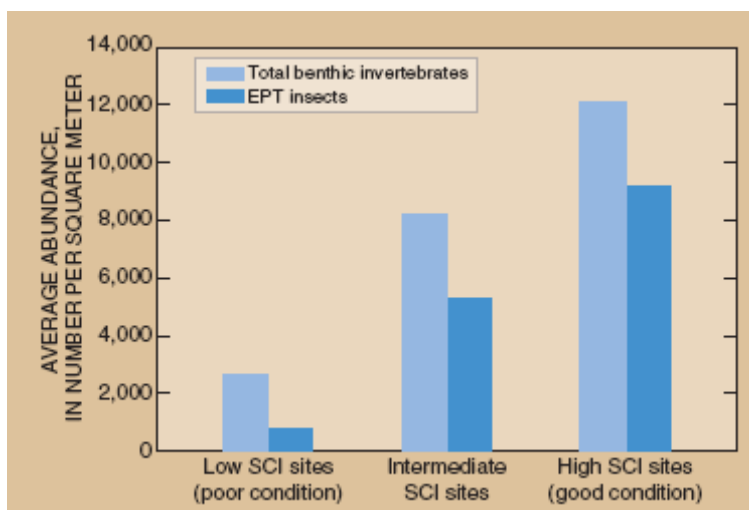


Figure 3.18. Average abundance of algal indicator species and benthic invertebrates in sites assigned a stream condition index in the Yakima River Basin.

Source: USGS, 2004b.

total benthic invertebrates were more abundant at high SCI sites than at sites with low SCI scores (Figure 3.18). Insects in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), or EPT insects, are generally considered intolerant of poor habitat or water quality conditions. These insects were also more abundant at sites with high SCI scores, or sites associated with little to no agriculture (Figure 3.18). In fact, EPT insects were 12 times more abundant at sites with high SCI scores than at low SCI sites (USGS, 2004b).

Central Columbia Plateau

The Central Columbia Plateau is an area of national agricultural importance and is one of the Nation's top two producers of potatoes and wheat, is a significant producer of apples and many other crops, and supports much rangeland grazing. The plateau is divided into three subunits, the Palouse subunit, characterized by dry land farming, the Quincy-Pasco subunit, and the North-Central subunit, which supports rangeland grazing in addition to irrigated and dry land farming. Irrigation withdrawals account for approximately 94 percent of combined surface and groundwater withdrawals (USGS, 1998).

In streams of the Central Columbia Plateau, naturally occurring levels of essential nutrients have been increased as a result of land use practices. Inorganic nitrogen enters surface waters via agricultural runoff and phosphorus enters streams primarily through erosion. The primary source of both nutrients is fertilizers used on agricultural lands (USGS, 1998).

Nitrogen and phosphorus concentrations vary among land uses and over time (Figure 3.19). Farmland, both dry land and irrigated, as well as urban land uses are the largest contributors of nitrogen, and nitrogen concentrations vary widely through time at sites associated with these land uses. Phosphorus concentrations at agricultural sites are less variable, while temporal variation in phosphorus concentrations at sites associated with urban land use is high (Figure 3.19). Forested land contributes little

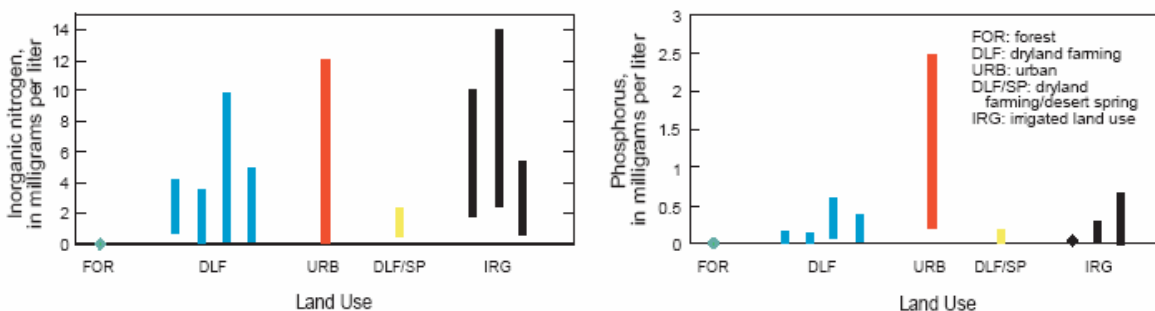


Figure 3.19. Inorganic nitrogen concentrations (left) and phosphorus concentrations (right) associated with various land uses. Each bar represents the range of nutrient concentrations at a single site throughout the year.

Source: USGS, 1998.

nutrient input (USGS, 1998).

From 1992 to 1995, 31 surface water sites representing agricultural land use with different crops, irrigation methods, and other agricultural practices were sampled for pesticides. Concentrations of six pesticides in one or more samples exceeded freshwater chronic criteria for the protection of aquatic life (Figure 3.20). Although surface water is not a drinking water source in the Central Columbia Plateau, no concentrations exceeded drinking water standards (USGS, 1998).

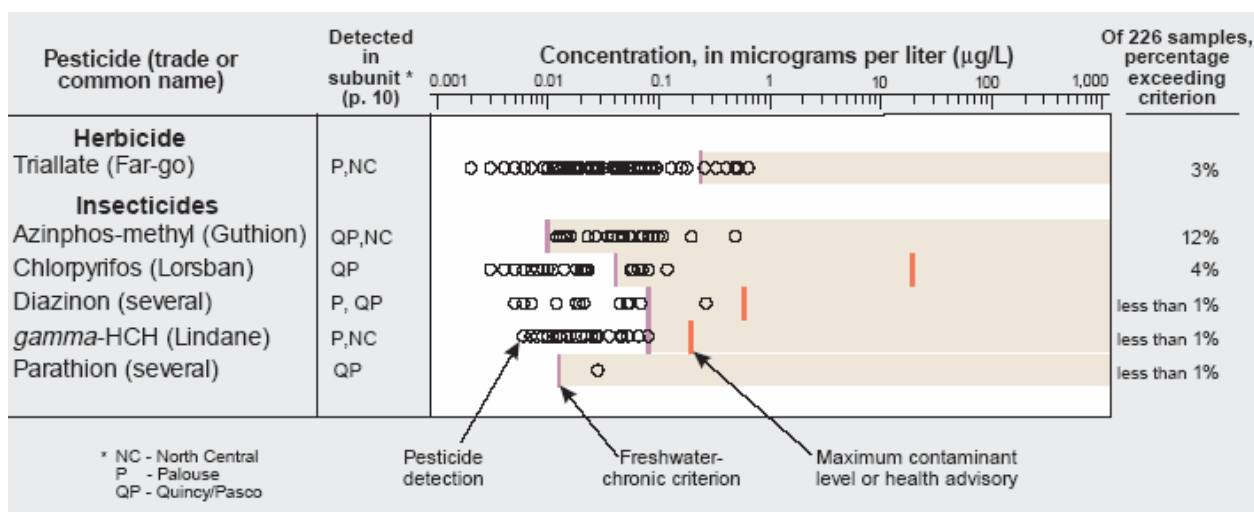


Figure 3.20. Concentrations of six pesticides exceeding guidelines for the protection of aquatic life.
Source: USGS, 1998.

The most persistent breakdown product of DDT- p,p'-DDE, was found in nearly all parts of the study unit. Concentrations of p,p'-DDE exceeded guidelines for the protection of aquatic life at 22 percent of the sites sampled. Other organochlorine pesticides found in streambed sediments at concentrations exceeding guidelines were heptachlor epoxide, dieldrin, and lindane (Figure 3.21). DDT is carried with eroded soils and the highest concentrations of DDT in streambed sediment and fish tissue were detected in watersheds with more furrow irrigation (USGS, 1998).

Biological communities in streams of the Central Colombia Plateau are influenced by cumulative impacts from land use activities, leading to three dominant water resource issues: eutrophication from excessive nutrient inputs, physical habitat alteration, and pesticides (USGS, 1998).

Eutrophication, caused by the increased input of nutrients to surface waters, can lead to excessive growth of aquatic plants. This growth alters physical habitat by slowing water flow, reducing sunlight penetration, and impacting DO levels. DO levels in the Palouse River decreased below the level required for many fish species in both wastewater dominated and dry land dominated streams (USGS, 1998).

Excessive nutrients can also change the composition of algal communities in streams. In forested streams where nutrient concentrations are low, algal species that fix their own nitrogen (nutrient poor) dominate (Figure 3.22). In streams with high nutrient levels, such as in agricultural and urban areas, nutrient-rich algae dominate. Urban streams had the highest percentage of nutrient rich algal species. Agricultural

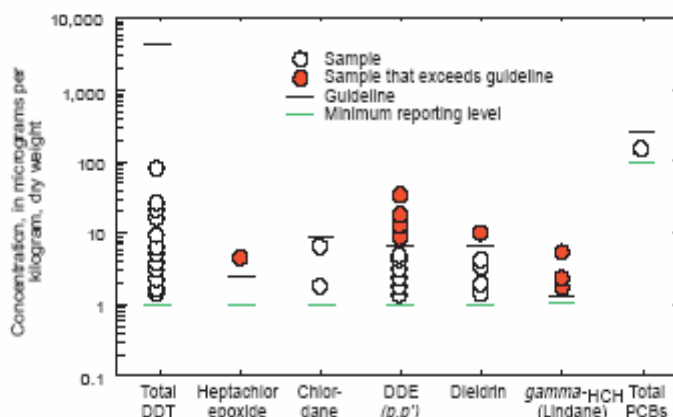


Figure 3.21. Concentrations of organochlorine pesticides in streambed sediments exceeding guideline for protection of aquatic life in the Columbia River Plateau.
Source: USGS, 1998.

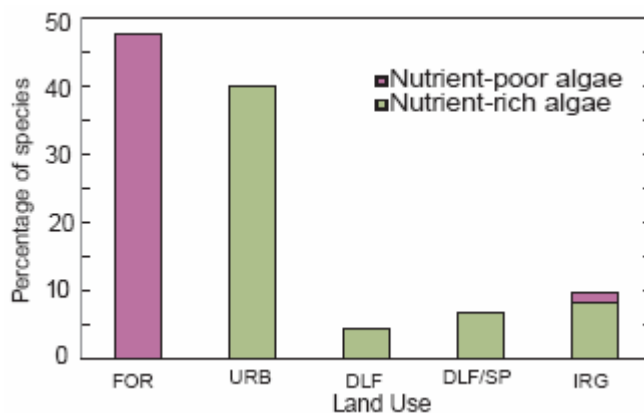


Figure 3.22. Algal communities in streams associated with various land uses in the Central Colombia Plateau.
Source: USGS, 1998.

streams had lower percentages of nutrient-rich algae than urban areas, but also did not have high percentages of nutrient-poor algae (USGS, 1998).

In the Central Columbia Plateau, agriculture, grazing, and urban practices have altered the physical habitat by impairing riparian vegetation and bank stability while increasing sediment erosion. Most streams lack a riparian community and average canopy cover is less than 20 percent and is primarily in isolated reaches. The lack of a riparian community results in higher water temperatures (Figure 3.23). Urban and dry-land agriculture had streams with the greatest fluctuation in stream temperature. The maximum temperature for the protection of aquatic life was exceeded in streams associated with urban and dry-land and irrigated agricultural uses (USGS, 1998).

Fish communities in the Central Columbia Basin have been impacted by altered stream habitat. For example, populations of rainbow trout in the Palouse River have decreased and the river is now dominated by minnow. Likely causes of changes in fish communities are elevated stream temperatures, extensive soil erosion, and eutrophication (USGS, 1998).

Based on NAWAQ studies, nutrient loading, pesticide contamination, and habitat degradation are widespread in Washington's streams and rivers. Poor water quality negatively impacts aquatic biological communities dependent upon the freshwater network, such as salmonid species. Salmonid recovery in Washington State emphasizes improving water quality and riparian habitat (Ecology, 2000b). The effects of CREP on surface water resources will be discussed in Chapter 4.

3.3.2 GROUNDWATER

Description

Groundwater is defined as water that occurs in the open spaces and geologic layers below the surface of the earth. These layers are called aquifers where such geologic units yield sufficient water for human use. The three major aquifer systems in the State include the basalts and overlying unconsolidated deposits of the Central Columbia Plateau in southeastern Washington, the unconsolidated glacial deposits of the Puget Sound Lowland, and the glacial outwash deposits of the Spokane-Rathdrum Prairie Aquifer in northeast Washington. Figure 3.24 shows the location of these aquifers.

The larger State aquifer systems are typically composed of multiple water-bearing units that underlie the surface, often extending many hundreds of feet below ground. A number of smaller, surficial aquifer systems also exist throughout the State, commonly located within river valleys (Ecology, 2005g). In contrast to the State's stream and river network, the large extent and three-dimensional character of the groundwater resource greatly complicate the ability to cost-effectively monitor statewide conditions (Ecology, 2005g).

Groundwater supplies 30 percent of the total water withdrawals (739 million gallons per day) in Washington State (USGS, 2004a) and supplies more than 60 percent of the State's drinking water (Ecology, 1997a). As a fundamental component of the hydrologic cycle, groundwater also plays a critical role in sustaining stream and river baseflow and maintaining the quality of riparian and wetland

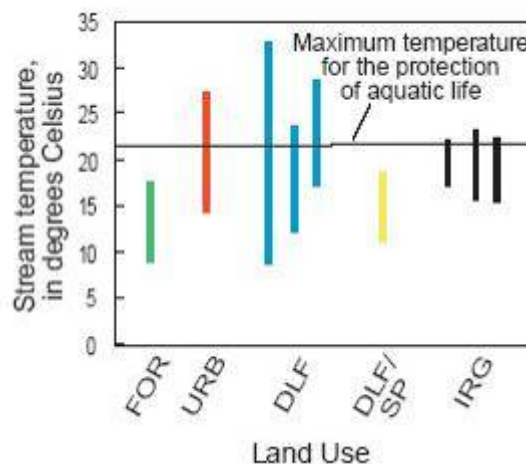


Figure 3.23. Stream temperature ranges (indicated by the height of the bar) in the Palouse subunit in August 1994 and 1995.
Source: USGS, 1998.

ecosystems. Finally, because surface waters in Washington are already fully appropriated, groundwater will likely supply an increasing percentage of water as the population grows (Ecology, 2000a).

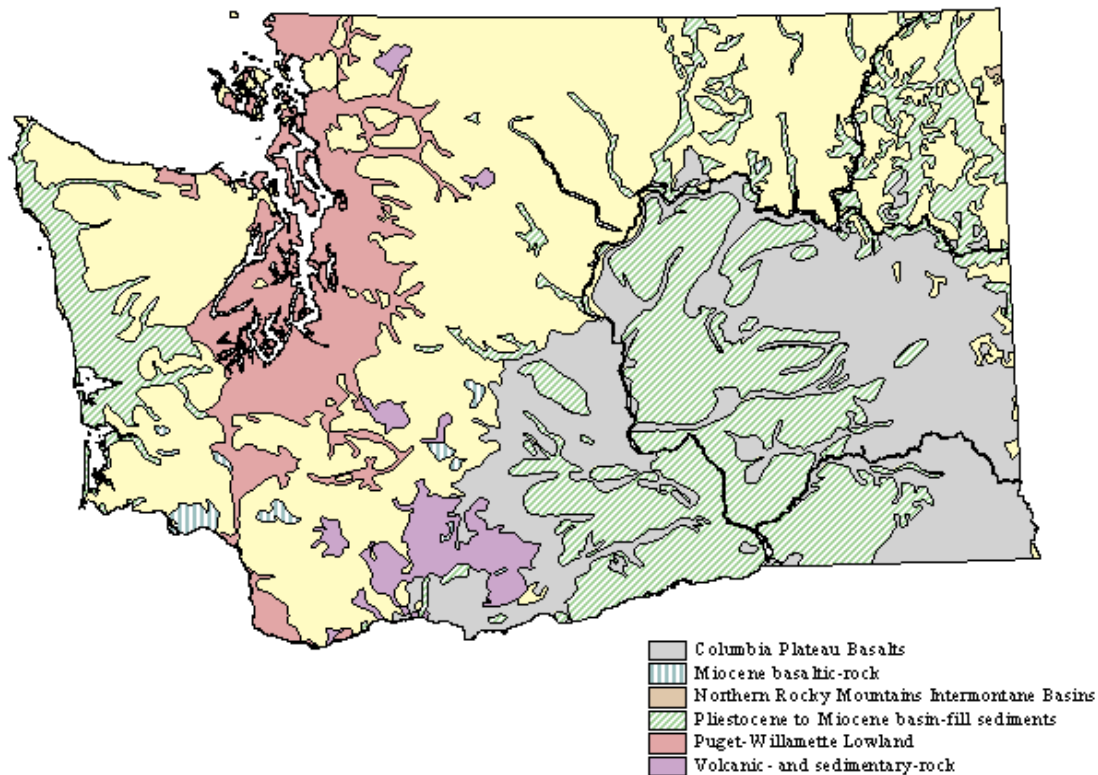


Figure 3.24. Location and characteristics of aquifers in Washington.
Source: Ecology, 2005g.

Washington State Laws

Groundwater quality and quantity are important to the physical and economic health of the State. Planning is an important first step in protecting the groundwater resource. There are numerous policies dedicated to preserving the integrity of the State's groundwater resources:

- Growth Management Act (Chapter 36.70a.070 RCW);
- Regulation of Public Groundwater (Chapter 90.44 RCW);
- Water Pollution Control (Chapter 90.48 RCW);
- Water Resources Act Of 1971 (Chapter 90.54 RCW); and
- Public Water Supplies (Chapter 246-290 WAC).

These policies protect the quality and quantity of groundwater used for public water supplies and beneficial use, defined as “uses of waters of the state which include but are not limited to use for domestic, stock watering, industrial, commercial, agricultural, irrigation, mining, fish and wildlife maintenance and enhancement, recreation, generation of electric power and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state” (Ecology, 1997a). These regulations also include comprehensive planning and management of both surface and groundwater, as well as the protection of sole source groundwater aquifers, small water systems, and wellheads (Ecology, 1997a).

The Water Quality Standards for Ground Waters of the State of Washington (Chapter 173-200 WAC), specifies groundwater quality criteria designed to maintain the highest quality of the State's groundwater and protect existing and future beneficial uses of the groundwater by reducing or eliminating contaminant discharge. To implement this goal, these standards establish groundwater quality standards which, together with the State's technology based treatment requirements, protect the environment and human health, as well as existing and future beneficial uses of groundwater. Activities which are regulated by these standards include municipal wastewater treatment facilities, surface impoundments, industrial facilities, groundwater recharge projects, land application projects, mines, landfills, injection wells, agricultural activities, and septic systems (Ecology, 1990).

Washington State's antidegradation policy, implemented in the groundwater quality standards, promotes protection of the State's groundwater and natural environment. The purpose of the antidegradation policy is to maintain and protect groundwater quality for existing and future beneficial uses. The policy preserves background water quality (the quality of the water before human influence), and prevents groundwater quality from being degraded past certain levels. Criteria are contamination concentration levels of the State's groundwater that cannot be exceeded (Ecology, 1997a).

Affected Environment

Washington contains some of the most productive aquifers in the Nation, and more than 60 percent of the State's population uses groundwater. Groundwater is the primary drinking water source of many communities around the State. The largest aquifer in Washington is the Columbia River Basalt Aquifer System located in the central portion of the State. Two smaller, but vital, systems, the Spokane-Rathdrum Prairie Aquifer and the Puget Sound Aquifer System, serve areas in eastern and western Washington, respectively (Ecology, 2005g).

Approximately 95 percent of public water supply systems (PWSS) use groundwater as their source (Ecology, 1997a). Approximately 16,000 public drinking water systems send groundwater to most of the population, while more than 400,000 private wells pump water for another 1,000,000 residences (Ecology, 2000b).

Half of the total groundwater withdrawals are used for irrigation, and public supply accounts for 32 percent of total withdrawals. Self-supplied domestic and industrial uses account for the remainder of groundwater withdrawals (Figure 3.25) (USGS, 2004a).

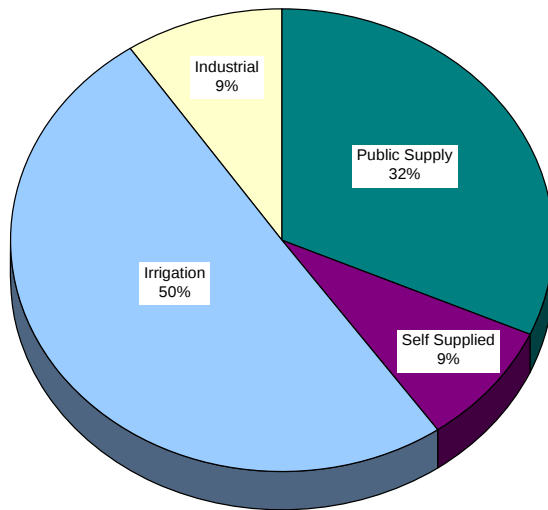


Figure 3.25. Percent of total groundwater withdrawals attributed to primary uses.
Source: USGS, 2004a.

Groundwater Quality

For most water uses, groundwater quality is as important as quantity. As groundwater development proceeds, the possibility of altering the quality of groundwater increases. The quality of groundwater can be altered when water levels are drawn below the layer that confines the aquifer or by introducing water of lesser quality into an aquifer.

Generally, groundwater quality in Washington is good. Contamination resulting from nonpoint sources appears to be the most significant threat, due primarily to nitrates, pesticides, metals and other nonpoint source pollution (Ecology, 2000b). Nitrate contamination is the most widespread problem. Statewide, exceedances of 10 milligrams per liter nitrate-nitrogen (the drinking water standard) in private/domestic wells are estimated at 10 to 15 percent, with a few areas as high as 20 to 25 percent. Low levels of pesticides have also been detected in a small percentage of wells (Ecology, 2000b).

In the Puget Sound Basin, groundwater is generally of high quality. However, there are areas of elevated concentrations of nitrate and the presence of pesticides and other organic compounds in shallow groundwater. At depths tapped for drinking water supply, nitrate concentrations commonly exceeded the drinking water standard in groundwater wells associated with agricultural land use (Figure 3.26). Persistently high nitrate concentrations in these wells suggest that fertilizer applications are contributing nitrate to this aquifer at a sufficient rate to sustain these

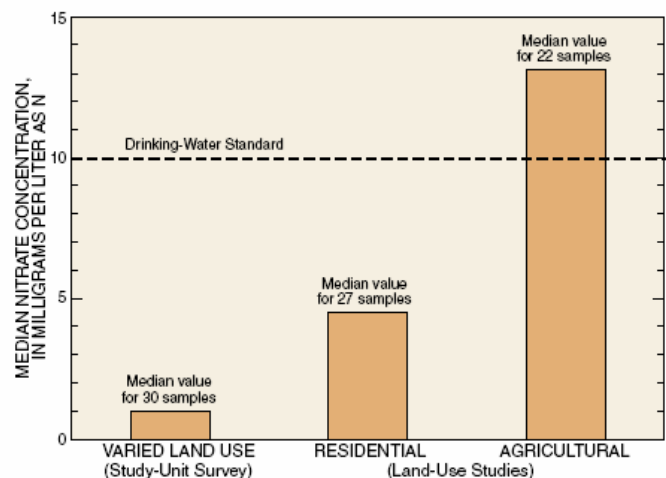


Figure 3.26. Median nitrate concentrations in shallow groundwater samples in Puget Sound Basin.
Source: USGS 2000.

levels. Pesticides were detected in 20 percent of study-unit survey wells, but concentrations were well below drinking water standards (USGS, 2000).

In the Central Columbia Plateau region, groundwater, the main source of drinking water, is substantially affected by agricultural land use. Nitrate concentrations in 20 percent of all wells exceeded the drinking water standard, particularly in areas where fertilizer use and irrigation are greatest. From 1992 to 1995, nitrate concentrations in shallow wells in this area were among the highest in the Nation (USGS, 1998).

Pesticides were detected in 60 percent of shallow wells and 46 percent of public supply wells in the Central Columbia Plateau region, although these concentrations were typically below drinking water criteria. The herbicide atrazine and its breakdown products were most commonly detected (USGS, 2000). Agricultural drains in the Yakima River Basin have arsenic levels that exceed EPA standard during the nonirrigation season. This is a concern for rural residents who rely on shallow groundwater wells for their drinking water supply (USGS, 2004b).

Groundwater Monitoring Programs

Ecology's EA Program recently conducted a survey of the status of active ambient groundwater monitoring programs for water quality or water levels across the State. Where it is occurring, the monitoring of ambient groundwater quality and water levels is primarily being conducted at the local level. Local monitoring programs are often designed in response to specific groundwater issues such as known degradation of groundwater quality due to nonpoint pollution sources or declining water table elevations due to heavy groundwater withdrawals. Because these programs are primarily run by an array of local government departments, the reasons for monitoring, the parameters measured, the frequency of measurement and the quality of the data vary widely (Ecology, 2005g). Table 3.12 summarizes the status of active groundwater monitoring programs in the CREP project area as of 2002.

Table 3.12. Groundwater monitoring programs active in Washington State in 2002.

	GWMA ¹	No. of Wells	Water Level	Nitrate	Bacteria	General Chemistry	Metals	Organics
Clark County	X	29	X	X				X
Columbia GWMA	X	550		X				
Franklin County		93		X				
Island County		50	X	X		X	X	
King County	X	59	X	X	X	X	X	
Okanogan County		14		X		X		
Pacific County		24	X	X		X		
Spokane County		41		X		X	X	
		26	X					
Thurston County	X	42	X	X			X	
City of Lacey		6	X	X				X
City of Olympia		20	X	X	X	X	X	X
City of Tumwater		16	X	X				X
Kitsap County		175	X					

	GWMA ¹	No. of Wells	Water Level	Nitrate	Bacteria	General Chemistry	Metals	Organics
Pierce County		190	X					
Ecology Central Regional Office		244	X					
Ecology Eastern Regional Office		70	X					
Ecology Northwest Regional Office		22	X					
Ecology Southwest Regional Office		33	X					
Whitman County		20	X					
Yakama Nation		50	X					

¹ GWMA = Groundwater Management Area.
Source: Ecology, 2005g.

In addition to the programs listed in Table 3.13, the Washington Department of Health (WDOH) is responsible for overseeing water quality monitoring of public drinking water supply wells. WDOH requires monitoring of about 5,000 Group A and 12,000 Group B groundwater derived public water supplies across the state (WDH, 2005a):

Group A systems are required to monitor annually for nitrate, and periodically for bacteria, organic and inorganic chemicals, and other select parameters. Certain parameter groups (pesticides, synthetic organic compounds) may be waived depending on past monitoring results and the likelihood of contamination.

Group B wells are required to monitor once for inorganics, and every three years for nitrate. While the WDOH data have not often been evaluated on an area wide scale, an increasing number of county governments are assembling and analyzing the data for their areas of concern.

State Groundwater Quality Programs

Private groundwater wells do not have to be monitored like community wells, but can still become contaminated from agricultural or other sources. The Home-A-Syst and Farm-A-Syst programs provide voluntary and confidential water quality and environmental risk assessments to evaluate private property for pollution and health risks. Although emphasizing drinking water resources, following the BMPs, the program also helps protect the entire watershed's water quality. Programs like Home-A-Syst and Farm-A-Syst educate the State's citizens to handle fertilizers, pesticides, cleaners, lubricants, etc., so that their use does not contribute to groundwater contamination (WSU, 2005).

3.3.3 DRINKING WATER

Description

The SDWA was originally passed in 1974 to regulate public drinking water supplies. SDWA established standards for various contaminants to ensure that water is safe for human consumption. The Office of Drinking Water (ODW) regulates PWSSs under State law and under a formal agreement with EPA to carrying out the SDWA (WDH, 2005c).

Through programs that rely on preventing potentially health threatening and costly problems, ODW helps ensure that drinking water is safe and reliable. Water system inspections or sanitary surveys look at all

aspects of water plant operations, including water sources, pumps, storage tanks, treatment units, filtration plants, water monitoring records, and future needs. Water system operator certification and training ensures that qualified, capable people are operating PWSSs. Enforcement strategies and on-going surveillance allows contamination and other problems to be addressed quickly. Finally, technical assistance programs, grant and loan programs, and construction plan reviews ensure that water systems are designed and operated properly (WDH, 2005c).

About 5 million of the State's 6 million residents are served by 16,900 regulated PWSSs. Single family domestic wells provide the principal source of drinking water to approximately one million Washington residents (Ecology, 1997a).

Wellhead Protection Program

Amendments to SDWA in 1986 requested States to establish a Wellhead Protection Program (WHPP) for groundwater-based public water supplies. For local communities using groundwater for their municipal drinking water supply systems, this program helps protect their water source. A WHPP minimizes the potential for contamination by identifying and protecting the area that contributes water to municipal water supply wells and avoids costly groundwater clean-ups (WDH, 2005b).

With public participation, each State was directed to develop a WHPP Plan to be reviewed and approved by EPA. Unlike many programs throughout the country, wellhead protection is a voluntary program implemented on a local level through the coordination of activities by local, county, regional, and State agencies (WDH, 2005b). The current status of Washington's WHPP will be discussed under Affected Environment.

Source Water Assessment Program

Reauthorization of the SDWA in 1996 required states to develop programs that assessed drinking water sources and encouraged the establishment of protection programs. States must develop a Source Water Assessment Program (SWAP) that (1) identifies significant potential sources of contamination and (2) determines a drinking water source's vulnerability to contamination. Each state is to ensure the following requirements have been met for each federally regulated public drinking water system (WDH, 2005b):

1. Delineate Source Water Protection Area(s) (SWPAs) for each source (well, spring, surface water intake);
2. Inventory each SWPA for potential contaminant sources;
3. Conduct a susceptibility assessment for each drinking water source; and
4. Make the findings of requirements 1-3 readily available to interested parties.

Washington's SWAP will be discussed in more detail in the Affected Environment section.

Affected Environment

Public Water Supply Systems (PWSSs) provide drinking water for approximately 5 million of Washington's residents, with domestic well systems providing drinking water for the remaining residents (Ecology, 1997a). As of August 1995, there were an estimated 404,000 single family domestic wells, serving approximately one million people (Ecology, 1997a).

Public Water Supply Systems

A PWSS is a system providing piped water for human consumption. It includes any collection or pre-treatment facilities used in water delivery. SDWA standards require that a PWSS have a minimum of 15 service connections or regularly serve at least 25 people. Washington State classifies its PWSS systems according to the population served and size (Ecology, 1997b). These classifications are described below:

- **Group A** systems are those serving 25 or more people, 15 or more connections, for 60 or more days per year.
- **Group B** systems are smaller PWSS that serve less than 25 persons or 15 connections.
- **Single family domestic wells** are typically shallow and easily contaminated. Groundwater is also used for household, livestock watering, industrial (e.g., noncontact cooling water), hydropower, commercial, irrigated agriculture, mining, and other purposes.

Groundwater also supplies water to many streams and rivers, especially during the dry part of the year. This is called base flow. Base flow is important to preserve wildlife, fish, scenic, aesthetic, and other environmental and navigational values in streams and rivers. Groundwater may also help to regulate in-stream temperatures. In Washington, there are approximately 13,908 groundwater dependent drinking water systems (Ecology, 1997a). Statewide, approximately 4.9 million people are served by a Group A system, the remaining 0.99 million people are either self-supplied (0.89 million) or are served by a Group B system (USGS, 2004a). Table 3.13 summarizes Washington's PWSSs.

Table 3.13. Number of Washington State Group A and Group B water systems

Group A Water Systems by Type:	Number	Totals
NTNC (Non-Transient Non-Community)	321	
TNC (Transient Non-Community)	1,549	
Community	2,265	
Total Group A Water Systems		4,135
Total Group B Water Systems		13,027
Total Group A and Group B Water Systems		17,162

Source: WDH, 2005a.

Wellhead Protection Program

The State developed the WHPP to prevent contamination of sensitive groundwater sources of drinking water (wellheads). Administered by the WDOH, it applies to Group A PWSSs using groundwater or springs as their supply source. The WHPP protects drinking water source supplies by requiring public water supply purveyors to develop (Ecology, 1997b):

- Susceptibility assessments;
- Protection area delineations based on the hydrogeology of the wellhead area;
- Inventories of potential contaminants within the Wellhead Protection Area (WHPA);
- Contingency plans for substitute drinking water supplies should the current supply become contaminated;
- Notification about potential contamination sources sent to the proper regulatory agencies and the producers and/or operators of the potential sources; and
- Coordination with spill response teams on emergency response plans.

The agencies may then use the information about potential contaminants in the WHPA to prioritize their regulatory activities. Under existing State rules (WAC 246-290-135), Washington's federally regulated PWSSs (Group A systems) are already conducting WHPPs and/or watershed control programs. All "groundwater using" Group A systems are also required to submit a susceptibility assessment to ODW as part of their WHPP (WDH, 2005b). As of August 1995, approximately 1,952 PWSSs in the State of Washington, or 89 percent, are currently implementing a WHPP for their water supplies. As new Group A PWSSs come on line, they are required to develop a WHPP (Ecology, 1997b).

Source Water Assessment Program

State rule WAC 246-290-135 requires all Group A systems (including, community, non-transient, non-community, and transient non-community types) to conduct an inventory for potential contaminant sources within their SWPA. This constitutes part of State wellhead protection and watershed control requirements.

The inventory area for wells and springs are 1-, 5-, and 10-year boundaries defining the wellhead protection areas. Inventories occur in the surface water area that will be supplying drinking water in the relatively near term. Based on this, the following watershed subsets will be inventoried in this program:

- 500 feet along surface waters (lakes, rivers, streams of up-gradient intake) up to 24 hours upstream based on stream flow velocities associated with a 10-year flood event.
- A general land use survey in proximity of the intake point (1,000-foot radius).

Initial SWAP inventory concentrated on comparing potential contaminant sources in SWAP “inventory areas” such as WPAs and watershed control inventory areas to geo-coded datasets of potential contaminant sources in Ecology databases (Superfund sites, known illegal dump sites, generators of hazardous waste, permitted underground storage tanks). Based on the inventory approach, potential contaminant sources are not defined as specific chemicals, but rather facilities, activities, or generalized chemical user profiles (WDH, 2005b).

Sole Source Aquifers

Groundwater which is found in a permeable rock layer is called an aquifer. Aquifers are valuable as a source of drinking water, irrigation water, and to base flow to streams, rivers, and lakes. The SSA Protection Program is authorized by section 1424(e) of the SDWA, which states:

If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register. After the publication of any such notice, no commitment for Federal financial assistance (through a grant, contract, loan guarantee, or otherwise) may be entered into for any project which the Administrator determines may contaminate such aquifer through a recharge zone so as to create a significant hazard to public health, but a commitment for Federal assistance may, if authorized under another provision of law, be entered into to plan or design the project to assure that it will not so contaminate the aquifer.

EPA defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. EPA guidelines also stipulate that these areas can have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water (EPA, 2005a). For convenience, all designated sole or principal source aquifers are usually referred to simply as “sole source aquifers.”

SSA designations help increase public awareness on the nature and value of local groundwater resources by demonstrating the link between an aquifer and a community's drinking water supply. Often, the realization that an area's drinking water originates from a vulnerable underground supply can lead to an increased willingness to protect it. The public also has an opportunity to participate in the SSA designation process by providing written comments to EPA or by participating in an EPA sponsored public hearing prior to a designation decision (EPA, 2005a).

Washington has several SSAs (Figure 3.27), 10 of which are located within CREP boundaries:

- Camano Island Aquifer
- Whidbey Island Aquifer

- Cross Valley Aquifer
- Newberg Area Aquifer
- Cedar Valley (Renton Aquifer)
- Lewiston Basin Aquifer
- Central Pierce City Aquifer System
- Marrowstone Island Aquifer System
- Vashon-Maury Island Aquifer System
- Guemes Island Aquifer System

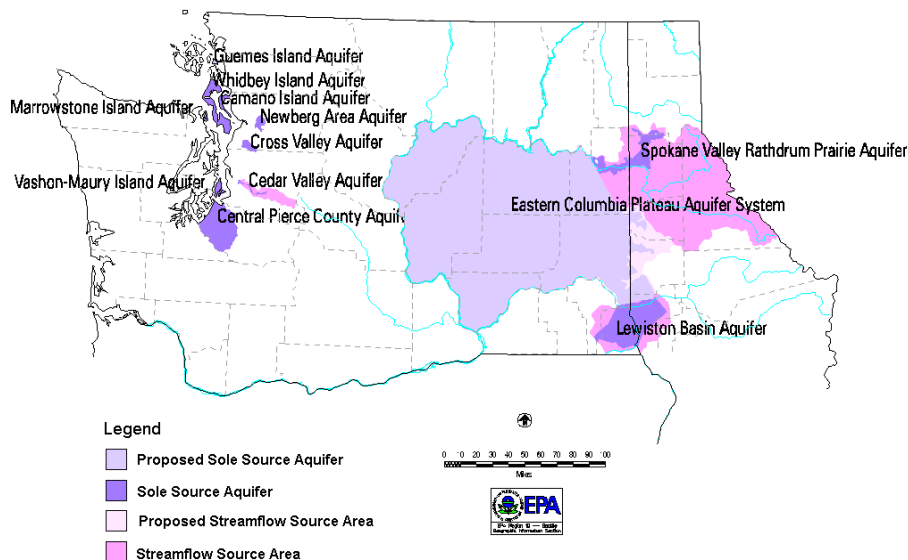


Figure 3.27. Sole Source Aquifers in Washington State.
Source: EPA, 2005a.

Public Water Supply System Violations

PWSSs are required to regularly monitor for a variety of contaminants harmful to human health. In compliance with SDWA's 1996 amendments, violations must be reported and made available to the public.

According to the EPA, there were a total of 4,214 violations in 2,226 systems during fiscal year 2004 (EPA, 2005b). Unspecified violation types ("other") were the most common violation type, followed by monitoring or reporting (MR), MCL, and treatment technique violations (TT) (Table 3.14).

Of these violations, 65 percent (1,390 violations) were violations of the total coliform rule, 24 percent (512 violations) were violations of the lead and copper rule, 7 percent (160 violations) were nitrate contaminations, and 4 percent (79 violations) were total trihalomethane contaminations (Table 3.15) (EPA, 2005b).

Table 3.14. Drinking water violations reported in Washington State during fiscal year 2004.

Violation Type	Violations	Systems in Violation	Population Served
MCL	667	418	412,751
TT	59	34	21,957
MR	2,781	1,787	2,252,937
Other	707	443	479,184
Total	4,214	2,226	2,853,523

Source: EPA, 2005b.

Table 3.15. Number of systems with drinking water violations by contaminant type/rule in Washington State during fiscal year 2004.

Contaminant	Systems in Violation							
	Number of Systems				Population Served			
	MCL	MR	TT	Total	MCL	MR	TT	Total
Total Coliform Rule	365	579	-	944	403,332	132,732	-	536,064
Total Trihalomethanes	-	6	33	39	-	2,836	21,847	24,683
Nitrates	61	-	-	61	9,977	-	-	9,977
Lead and Copper Rule	-	469	1	470	-	680,975	110	681,085

Source: EPA, 2005b

3.3.4 COASTAL ZONES

Description

Coastal zones include the coastal waters and the adjacent shore land strongly influenced by each other and in proximity to the shorelines of the coastal states (NOAA, 2005c). Coastal ecosystems are ecologically significant areas of high biodiversity containing some of the Nation's most productive wildlife habitats, valuable fisheries, and recreational opportunities (FWS, 2005b). These diverse ecosystems include shorelands, dunes, offshore islands, barrier islands, headlands, estuaries, and freshwater wetlands (FWS, 2005b). Coastal zones comprise less than 10 percent of U.S. land area but support a significant portion of the Nation's migratory songbirds (85 percent), fish and shellfish (77 percent), waterfowl (75 percent), shorebirds (92 percent) and T&E species (45 percent) (FWS, 2005b). The coastal zone is also home to two-thirds of Washington's human population, and this figure is expected to increase approximately 40 percent by the year 2010. Development, increased demands for public access, and heavier use of the coastal zone will accompany this growth (Ecology, 2001a).

The Coastal Zone Management Act (CZMA) of 1972 established the planning and management program for U.S. coastal land and water resources. CZMA directs Federal agencies to preserve, protect, and develop, and, where possible, to restore or enhance the resources of the nation's coastal zone (NOAA, 2005c).

The Coastal Zone Management Program (CZMP), authorized by the CZMA, leaves day-to-day management decisions at the State level in the 34 States and territories with federally approved coastal management programs. Currently, 95,376 national shoreline miles (99.9 percent) are managed by the program. State and Federal coastal zone management efforts are guided by CZMP's strategic framework, which is organized around three major themes: Sustain Coastal Communities, Sustain Coastal Ecosystems, and Improve Government Efficiency (NOAA, 2005c).

In Washington, the CZMP is directed by Ecology, and is considered a “networked program” because it is based on a set of six environmental laws: the Shoreline Management Act (SMA), CWA, the Clean Air Act (CAA), the State Environmental Policy Act (SEPA), the Energy Facility Site Evaluation Council law, and the Ocean Resources Management Act. The CZMP is housed in Ecology's Shorelands and Environmental Assistance (SEA) program, which is the main body assigned to protect and preserve Washington's coastal ecosystems. The SEA program goals are to:

- Ensure healthy watersheds through careful management of our shorelines, wetlands, marine waters, and waterways;
- Reduce hazards to people, property, and the environment;
- Ensure efficient and environmentally sound land-use decisions; and
- Provide a high level of public service by being effective, efficient, and responsive.

Some broad areas of involvement by Ecology's SEA program staff are administering and enforcing policies, administering CZMA grant and local grants, implementing the shoreline permit program, conducting SEPA review and section 401 Water Quality Certifications, and coordinating coastal zone consistency review (Ecology, 2001a).



The Olympic Coastline.
Photo Credit: Photo: NOAA, 2006c.

Affected Environment

Washington boasts 2,337 miles of marine shoreline, of which 73 percent is beaches and 27 percent includes rocky headlands, marsh areas, and other shoreline types. This coastal zone can be broadly characterized into three geographic regions (1) the Pacific Ocean coastal area, (2) the Lower Columbia River estuary, and (3) the Puget Sound Basin or marine inlet. Numerous freshwater rivers and streams empty into these waterbodies creating estuarine environments at their mouths (Ecology, 2005h).

Pacific Coast

The Pacific Ocean coastal area includes the Pacific Ocean and the coastal strip of rocky shores and sandy beaches. Washington's Pacific Coast extends south from Cape Flattery to the mouth of the Columbia River. The north coast is characterized by narrow, rocky beaches backed by high, forested bluffs. The south coast represents a broad coastal plain with wide, sandy beaches, dunes, and extensive lowlands. In the southern portion of the coast, the union of rivers and the sea form intertidal estuaries that support a diverse assemblage of birds and other wildlife. Three large coastal estuaries in this area are Grays Harbor, Willapa Bay, and the Lower Columbia River. Grays Harbor and Willapa Bay are shallow estuaries extensively used for shellfish culture (Ecology, 2005h).

Dominant land uses on the Pacific Coast are forestry, recreation, and conservation within national park areas. Immediate threats to biodiversity in this region include incompatibility of some timber management activities, low to medium density development in coastal areas, and non-native species invasion (Ecology, 2005h).

The Lower Columbia River

The Columbia River is an interstate and international river. From its origins in the Canadian Rockies, the Columbia travels over 1,200 miles before reaching the estuary on the Pacific coast. It is the largest watershed in the U.S., draining 259,000 square miles and receiving waters from seven states and two Canadian provinces. It has the second largest water flow of any river in the U.S. supports hundreds of fish and wildlife species (Ecology, 2005h).

The Lower Columbia River suffers from a variety of human induced problems that have adversely affected the ecosystem. The estuary is dominated by the international commerce of Portland and Vancouver, Oregon. Degradation is evidenced by habitat loss and modification and toxic contamination (Ecology, 2005h).

Puget Sound Basin

The Strait of Juan de Fuca, which links the Pacific Ocean with the Puget Sound Basin, is backed by the Olympic Mountains, home to the only temperate rainforest in the world. The basin covers more than 16,000 square miles of land and water, including the Strait of Juan de Fuca, the straits and bays in the San Juan Archipelago, and all of Puget Sound. Puget Sound supports a diversity of landscapes, including rocky shores, forests, floodplains, and tidal mudflats. The Puget Sound Basin watershed provides an annual flow of about 39 million acre feet of freshwater to the basin through a drainage network of more than 10,000 streams and rivers (Ecology, 2001a).

Puget Sound is dominated by industrial, urban, and suburban development; military bases; and agriculture. Along with extensive farmland, land between Puget Sound and the foothills of the Cascade Range sustains a large metropolitan population (Ecology, 2005h). Development has resulted in the conversion of more than 50 percent of the area from native vegetation to other types of ground cover (concrete/asphalt, non-native vegetation, etc.). Immediate threats to the region include continued rapid development, water quality impacts, and non-native species invasion (Ecology, 2001a).

Marine Water Quality

Estuaries, the intersection of fresh water from inland rivers and saline water from the ocean, are important coastal habitat areas, and play a unique role in the life cycle of anadromous salmonid species (EPA, 2005c). Estuarine water quality is assessed as one component in the Integrated 303(d) and 305(b) report in compliance with the CWA. Because estuarine waters are a coastal resource, the water quality of Washington's estuaries is presented in Coastal Resources.

The Marine Waters Monitoring program assesses conventional water quality as indicated by DO, nutrients, and fecal coliform bacteria (Ecology, 2002). In 2004, there were 209 estuaries listed on the 303(d) List and 128 category 4 waters, 96 percent of which were impaired by a non-pollutant (category 4C) (Ecology, 2005c). In 2002, DO was one of the indicators of use impairment in 72 percent of estuaries, temperature was indicated in 65 percent of estuaries, and fecal coliform was indicated in 29 percent of estuaries (Table 3.16) (Ecology, 2002b).

The most common impairments of listed waterbodies in 2004 were fecal coliform (48 percent), DO (27 percent), industrial pollutants (13 percent), and polycyclic aromatic hydrocarbons (8 percent). Category 4C waters included exotic invasive species (76 percent) and degraded fish habitat (24 percent) (Ecology, 2005c).

Table 3.16. Indicators of use impairment in estuaries in Washington State.

Impairment	Impaired Size (mi)	Percent of Total Assessed
Dissolved Oxygen	2,654	72
Temperature	2,282	65
Fecal Coliform	811	29
pH	678	19

Source: Ecology, 2002b

Information regarding impaired uses and sources of impairment were not available for 2004, but this information was included in the 2002 305(b) report. Most designated uses were well supported by Washington's estuaries, including fish migration, fish and shellfish spawning, and recreational uses (Table 3.17). Aquatic life is the most impaired designated use, with only 28 percent of estuaries listed under the highest support category, and 24 percent of estuaries indicate poor support of shellfish harvesting (Ecology, 2002b).

Table 3.17. Size and percent of estuaries supporting designated uses in Washington State.

Use		Use Support of Estuaries		
		Good	Fair	Poor
Aquatic Life	Size (mi ²)	818.0	1,145.2	940.7
	Percent	28	39	32
Fish Migration	Size (mi ²)	2,746.9	0	157.0
	Percent	95	0	5
Fish Spawning	Size (mi ²)	2,386.7	278.5	238.7
	Percent	82	10	8
Shellfish Spawning	Size (mi ²)	2,148.1	517.1	238.7
	Percent	74	18	8
Shellfish Harvesting	Size (mi ²)	1,825.3	373.4	705.2
	Percent	63	13	24
Recreation Use Primary Contact	Size (mi ²)	2,840.7	63.1	0
	Percent	98	2	0
Recreation Use Secondary Contact	Size (mi ²)	2,844.6	59.3	0
	Percent	98	2	0

Source: Ecology, 2002b.

Water quality sensitive areas are typically near urban areas and near rivers, where high runoff, low mixing, and anthropogenic inputs of nutrients and sewage occur. The monitoring data and indicators showed this pattern was true for Washington State marine waters.

Monitoring of water quality parameters was performed on stations in Puget Sound, Grays Harbor, and Willapa Bay from October 1997 to December 2000. Water quality for the Puget Sound region appeared to be reasonably good; however, there are several specific locations where water quality appeared reduced due to low DO, fecal coliform bacteria contamination, or an indication of sensitivity to eutrophication based on stratification or nutrient conditions. Areas of highest concern include Southern Hood Canal,

Budd Inlet, Penn Cove, Commencement Bay, Elliott Bay, Possession Sound, Saratoga Passage, and Sinclair Inlet. For the coastal estuaries in Grays Harbor and Willapa Bay, the primary water quality issue was chronic fecal coliform bacteria contamination (Ecology, 2002b).

Low DO concentrations result when organic material is decomposed (oxidized) in waters that do not mix to the surface where aeration with atmospheric oxygen can occur. In all, 71 percent of the stations monitored display either low DO concentrations or susceptibility to eutrophication. Of the 41 stations in Puget Sound, 15 percent show hypoxia and another 20 percent illustrate biological stress concentrations because of low DO at some point during the year (Ecology, 2002d). Areas showing near-hypoxia during 1998-2000 were Hood Canal, Penn Cove and, to a much less extent, Saratoga Passage, Bellingham Bay, Discovery Bay, Elliott Bay, Strait of Georgia, and West Point. Additional areas showing near-hypoxia from previous years are Budd Inlet and East Sound Orcas Island (Ecology, 2002d).

Dissolved inorganic nutrients, primarily forms of nitrogen and phosphorus, are an important component of marine ecosystems since nutrients are required for the growth of phytoplankton, the primary trophic level of the marine environment. High concentrations of nitrogen can be an indicator of eutrophication, which may cause DO concentrations to decline and harm aquatic life. (Ecology, 2002d).

High ammonia-based nitrogen concentrations (greater than 10 micrometers [μM]) and ammonium concentrations (greater than 5 μM) were seen throughout South Puget Sound. Nitrate+nitrite-N analysis for 2000 monitoring data indicated that 12 percent of the 797 samples were below the recommended level, including 9 percent of samples in Puget Sound and 20 percent in the coastal estuaries (Ecology, 2002d). Areas potentially sensitive to eutrophication include Budd, Case, and Carr Inlets, Southern Hood Canal, Sinclair Inlet, Possession Sound, Saratoga Passage, and Willapa Bay (Ecology, 2002d).

Fecal coliform bacteria counts greater than 14 organisms/100 milliliter (mL) were found at 16 Puget Sound stations and seven coastal estuary stations from October 1998 to December 2000. Of these, contamination in Grays Harbor, Willapa Bay, Commencement Bay, and inner Budd Inlet appeared chronically persistent. High fecal coliform counts in Puget Sound typically occurred between October and March, indicating that high runoff transports bacteria to marine waters. Both Grays Harbor and Willapa Bay appear to have strong fecal coliform contamination in the inner portions of these estuaries (Ecology, 2002d).

Water quality concern was assessed using five indicators of marine water quality: strong stratification, low DO, limiting nutrients, high fecal coliform bacteria concentrations, and high ammonium concentrations. Areas of Puget Sound with highest water quality concern for the stations assessed during 1998 to 2000 are illustrated in Figure 3.28 (Ecology, 2002d).

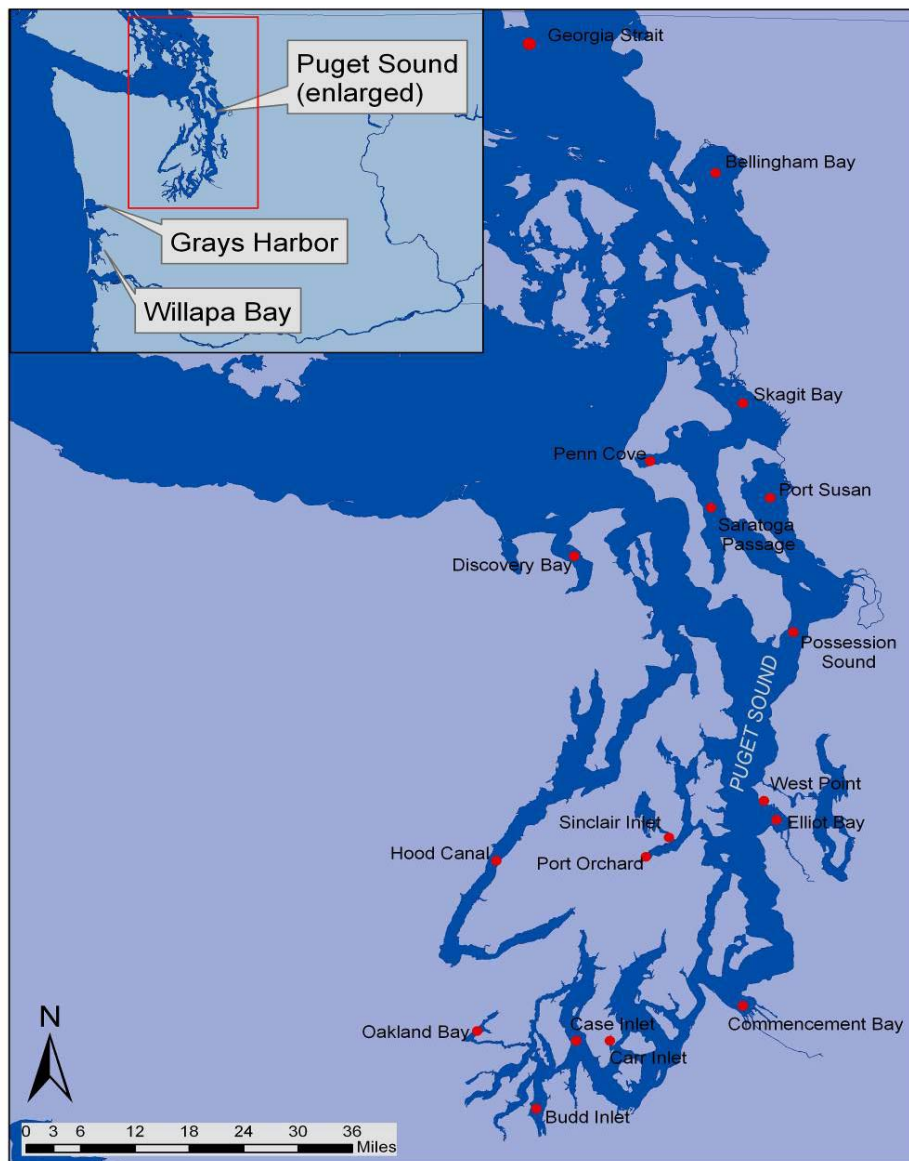


Figure 3.28. Marine waters of concern for water quality in Washington State.
Source: Ecology, 2002d.

3.3.5 WETLANDS

Description

Wetlands are lands transitional between terrestrial and deep water habitats, where the water table is at or near the land surface or the land is covered by shallow water. Inland wetlands are most common on along rivers and streams (riparian wetlands), in isolated depressions surrounded by dry land, along the margins

of lakes and ponds, and in other low-lying areas where the groundwater intercepts the soil surface or where precipitation sufficiently saturates the soil (Ecology, 2001b).

Section (a) (16) of the Food Security Act, Public Law 99-198, December 23, 1985 defines a wetland as:

The term “wetland,” except when such term is part of the term “converted wetland,” means land that has a predominance of hydric soils and that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

In addition to the Food Security Act, Executive Order (EO) 11990: Protection of Wetlands and CWA also govern FSA program actions in relation to wetlands.

The SMA, Washington Administrative Code 173-158-080 (wetlands management), and CWA section 401 drive Ecology’s wetland management activities. SEA program staff provide wetland technical assistance to local governments, other agencies, Tribes, and public groups. Such assistance include: (1) confirming wetland boundaries, (2) reviewing wetland reports, (3) evaluating mitigation proposals, and (4) testifying at local hearings on wetland projects. Activities involving wetlands in Washington include the Wetlands Function Assessment Project, wetlands mitigation banking, the Wetlands Mitigation Evaluation Project, the Wetlands Stewardship Project, wetlands restoration, and river basin characterization (Ecology, 2001b).

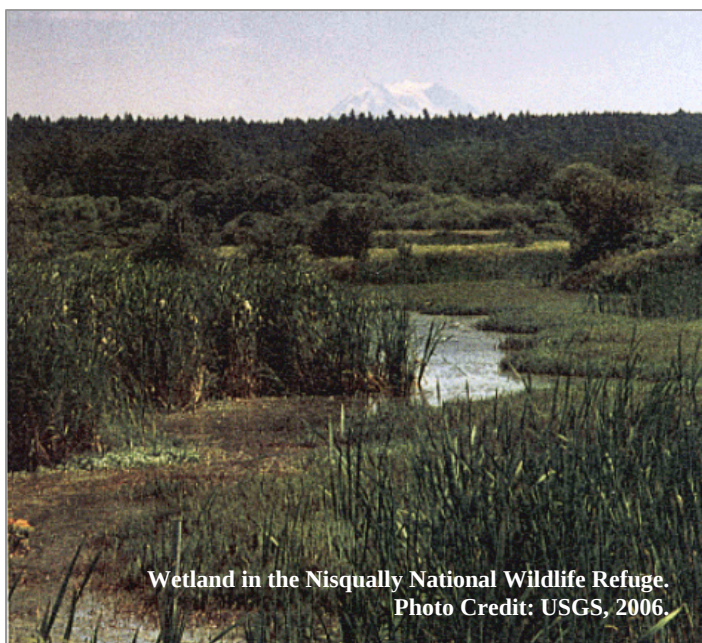
Wetlands serve important roles ecologically, economically, and socially to the overall health and maintenance of the coastal ecosystem. They improve water quality by removing nutrients, sediment, toxic organic compounds and metals, and pathogens. Wetlands can

improve hydrologic functions by reducing peak flows, decreasing downstream erosion, and recharging groundwater. Wetlands also support food webs and high plant species richness, and provide valuable wildlife habitat, including habitat for invertebrates, amphibians, anadromous fish, resident fish, and wetland associated birds and mammals. Additionally, they provide economic benefits and opportunities for recreation, education, and research (Ecology, 2005i).

Wetland functions defined in Washington fall into three general groups: functions related to improving water quality, functions related to the water regime in a watershed (hydrologic functions), and functions related to habitat (Ecology, 2005i).

Affected Environment

According to a 1998 FWS survey, wetlands cover approximately 939,000 acres of Washington. Although this comprises only about 2 percent of Washington State (Figure 3.29), wetlands play an important ecological and economic role. More than 315 species of wildlife use wetlands for breeding or feeding habitat and they provide vital nursery and feeding grounds for anadromous salmon and steelhead populations (USGS, 1996).



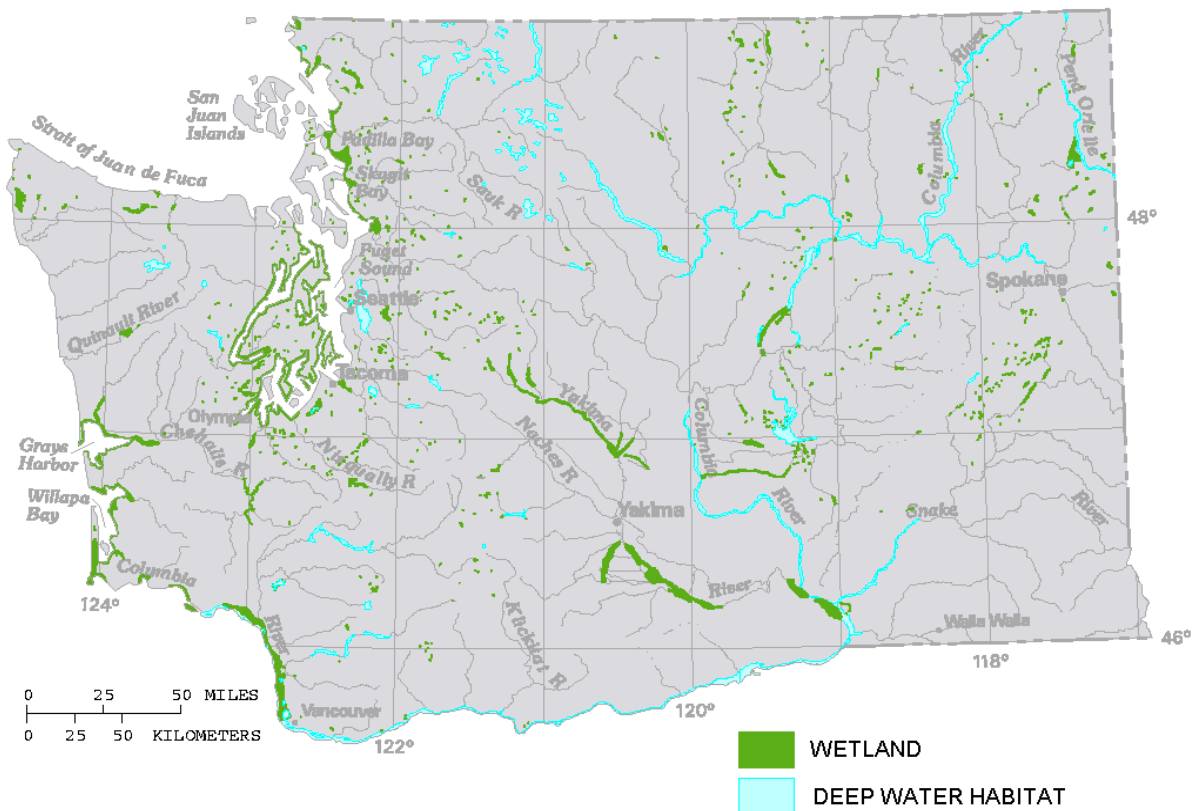


Figure 3.29. Wetland and deepwater habitat distribution in Washington State.
Source: USGS, 1996.

In Washington, wetlands come in diverse forms, with most of the intertidal estuarine wetlands within the Puget Sound lost. Therefore, those remaining are essential areas to preserve. In the Puget Sound, freshwater wetlands often will grade into estuarine systems offering a mix of environments. Freshwater wetlands behind barriers are often found in agricultural areas along the Puget Sound. Many of these wetlands, if restored to intertidal influence, would offer rare “intertidal” freshwater or brackish systems important to migratory salmon and marine biota (Ecology, 2005i).

The wetlands in Washington are divided into two ecological domains, East and West, and subdivided into five regions, including three regions in the eastern domain and two in the western domain (Ecology, 2005i):

- Eastern domain: Montane, Columbia Basin, Lowlands of Eastern Washington
- Western domain: Montane, Lowlands of Western Washington

Estimates of coastal and estuarine wetland loss along Washington shorelines vary, but are especially significant within the Puget Sound. Figures for Puget Sound estimate that 70 percent of the tidally influenced emergent wetlands have been lost due to diking, dredging, and filling, while urbanized areas have suffered 90 to 98 percent loss (Ecology, 2001b). Wetlands associated with other Washington estuaries have been reduced by 50 to 95 percent due to conversion for agricultural and urban use (Ecology, 2001b).

Development in the Puget Sound has resulted in a loss of salt marshes, mudflats, and deltas and their subsequent vegetation and vertebrate/invertebrate communities which sustain entire ecosystems for fish populations, shorebirds, marine mammals, and other plants and animals.

In the Lower Columbia River, the estuary is lacking floodplain wetlands, emergent wetlands, and tidal swamps because of the upstream dams. Lower Columbia River historic wetland types, such as emergent and forested wetlands, have been greatly diminished. The habitat undergoing the most dramatic decrease is tidal swamps, with over 77 percent lost between 1870 and 1980 (Thomas, 1983).

Along the outer coast, interdunal wetland systems are threatened because of development impacts. Coastal wetland lagoons are essential habitats for a diversity of shorebirds and wildlife. The remains of extremely unique and rare forested wetland bog systems are along Washington's southern coast peninsulas. Here freshwater is perched in long, linear, sandy interdunal areas above a salt water environment. Many of these old spruce bogs have been lost to cranberry production or broken up by development. The younger interdunal areas support shrubby wetland systems, often with fledgling sphagnum colonies (Ecology, 2001a).

3.3.6 FLOODPLAINS

Description

All Federal actions must meet the standards of EO 11988: Floodplain Management. The purpose of the EO is to avoid incompatible development in floodplain areas. In part, it states that:

Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Affected Environment

Flooding occurs throughout Washington on floodplains of rivers, streams, lakes, wetlands, closed depressions, and tidal areas. Flooding often results in considerable damage to personal property, loss of lives, and damage to public facilities such as roads, bridges, and levees (WDOT, 2001).

Flooding causes extensive damage in Washington. Damage estimates for the floods of 1990 reached approximately \$250 million, while regionwide (Washington, Oregon, Idaho) damage estimates from the February 1996 flood reached approximately \$800 million. Current floodplain management in Washington State is based primarily on relatively old floodplain maps developed by FEMA for implementing a flood insurance program (WDOT, 2001).

A statewide effort led by the State Department of Transportation, WDFW, Ecology, and WDNR is currently underway to improve floodplain mapping accuracy. Tier one improvements involve using readily available digital aerial photos and digital files of floodplain areas to enable computer rectification of stream alignments and approximate 100-and 500-year floodplain boundaries. Tier two improvements involve thoroughly updating the floodplain maps, including data collection, hydraulic modeling, and generating new maps. A complete data level assessment was designed by the Floodplain Management Task Force (WDOT, 2001). Further information on this project can be found in *White Paper: Floodplain Mapping in Washington State: Current Status, Alternatives for Improvement, and Recommendations* (WDOT, 2001).

3.4 HUMAN HEALTH AND SAFETY

3.4.1 DESCRIPTION

NEPA, and its implementing regulations and guidelines, requires consideration of the health effects of Federal actions in preparation of environmental documents. Section 1508.8 of the CEQ's "Regulations for Implementing NEPA" states that:

Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or *health*...

This PEA will present regional and local information on the socioeconomic conditions in Washington State that are relevant to the implementation of CREP and the potential impacts of the proposed project on these conditions.

3.4.2 AFFECTED ENVIRONMENT

Farm Worker Health

The nature of farm work is physically and emotionally demanding with hazardous working conditions, with exposure to chemicals and risks for injury from accidents. Skin, eye, and respiratory problems are common occurrences. Additional occupational health hazards of farm work include tuberculosis, diabetes, and cancer.

EPA estimates that 300,000 farm workers in the U.S. suffer acute pesticide poisoning each year. Many of these workers do not seek treatment or are misdiagnosed because symptoms can mimic a viral infection (NCFH, 2005). Pesticide exposure can occur from a number of sources, such as contaminated soil, dust, work clothing, water, food, or through pesticide drift- the deposition of a pesticide off its target. Because of the nature of agriculture and the proximity of homes to the fields, family members could be exposed to hazardous chemicals through pesticide drift. Agricultural workers can inadvertently expose family members to hazardous materials by carrying materials home from work on their clothes, skin, hair, and tools, and in their vehicles (McCauley et al., 2000).

In addition, many farm workers' lack of education and economic desperation can also contribute to health concerns. For example, a Washington State University study of 460 hired farm workers found that 89 percent did not know the name of a single pesticide to which they had been exposed, and 76 percent had not received any information on appropriate protective measures (NCFH, 2005).

Migrant Farm Worker Health

The health conditions associated with farm labor are more problematic for migrant farm workers because many lack access to health care providers because of economic circumstances and the mobility of the population. In addition, many migrant workers are fearful of losing their jobs, and therefore do not ask for the necessary medical attention. Combined with the physical health issues, migrant farm working families have psychological and social concerns. The challenges present in their daily lives pose serious structural constraints to cultural assimilation and the family's ability to manage stress and improve long term overall social and economic well-being (Kossek et al., 2005).

3.5 SOCIOECONOMICS

3.5.1 DESCRIPTION

NEPA, and its implementing regulations and guidelines, requires consideration of the socioeconomic effects of Federal actions in preparation of environmental documents. Section 1508.8 of the CEQ's "Regulations for Implementing NEPA" states that:

Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, *economic*, *social*, or health...

For this analysis, socioeconomic includes investigations of farm and nonfarm employment and income, farm production expenses and returns, agricultural land use, and recreation spending. Each year the U.S. Census Bureau (USCB) defines the national poverty thresholds, which are measured in terms of household income and are dependent upon the number of persons within the household. Individuals falling below the poverty threshold are considered low-income individuals. USCB census tracts (or areas) where at least 20 percent of the residents are considered poor are known as poverty areas (USCB, 1995). When the percentage of residents considered poor is greater than 40 percent, the census tract is considered an extreme poverty area.

This PEA will present regional and local information on the socioeconomic conditions in Washington State that are relevant to the implementation of CREP and the potential impacts of the proposed project on these conditions.

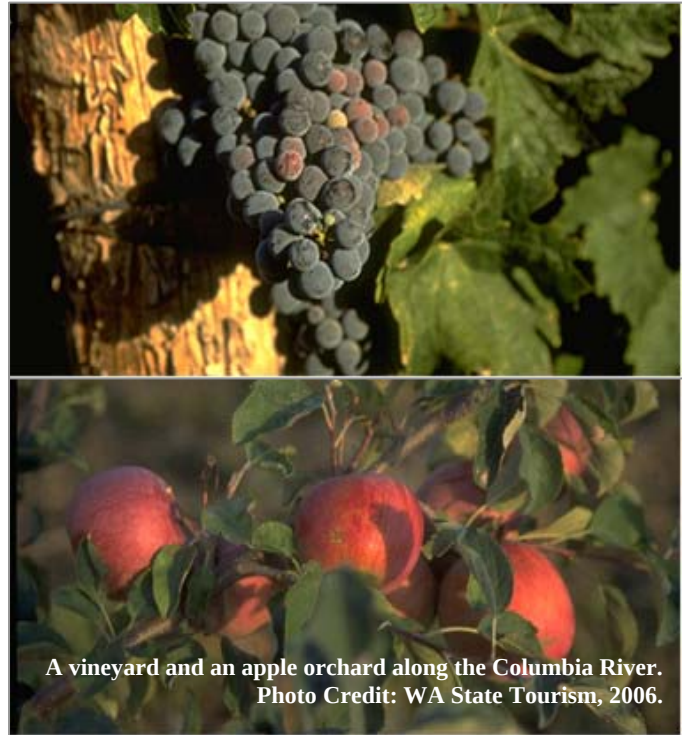
3.5.2 AFFECTED ENVIRONMENT

State Economy

Agriculture accounts for 13 percent of Washington State's \$223 billion economy (WASS, 2003). The farmgate production value for Washington's agricultural products has been estimated at \$5.79 billion, ranking Washington as 11th in the Nation for total agricultural cash receipts in 2003 (WASS, 2005).

Export markets are extremely important to Washington agriculture. Approximately 80 percent of Washington's agricultural products in 2002 were exported. In 2001, the State ranked eighth in the Nation for the value of agricultural exports and was the second largest exporter of vegetables and the third largest exporter of fruits (Jaksich, 2003).

In addition to direct economic benefit of agricultural production, processing, transporting, and selling agricultural products also contributes to the State's economy. For every one dollar of agricultural raw product, an additional four to six dollars are generated as the products move through processing and



A vineyard and an apple orchard along the Columbia River.
Photo Credit: WA State Tourism, 2006.

marketing channels to reach the consumer (WASS, 2003). It is estimated that these businesses (agribusiness) contributed almost \$29 billion to the State Domestic Product in 2001 (Jaksich, 2003).

The State of Washington has the second most diverse agricultural sector in the Nation behind California. Nationally, Washington is the top producer of a number of agricultural products and ranks in the top 10 in 33 different commodity groups (Table 3.20) (NASS, 2005b). Nearly half of the Nation's apple crop is produced in Washington. Milk, wheat, potatoes, and cattle and calves round out the top five commodities.

Despite this productivity, many producers have recently gone out of business because of weather, increasing debt, and changing market forces. In the latter part of the 1990s, some of Washington's crops became less economically viable. As a result, some producers changed their crops to products such as wine grapes, cherries, and more desirable varieties of apples. However, these crops can take many years to reach optimal production maturity (Jaksich, 2003).

Table 3.18. Rank and percent of U.S. production for each of Washington's major agricultural commodities.

Rank	Commodity	Percent of U.S. Production
First	Red Raspberries	87.8
	Hops	74.4
	Spearmint Oil	74.4
	Wrinkled Seed Peas	66.6
	Apples	60.2
	Concord Grapes	51.8
	Sweet Cherries	48.0
	Pears	44.9
	Lentils	41.9
	Peppermint Oil	35.2
	Processing Carrots	34.5
	Tart Cherries	32.8
	Niagara Grapes	32.4
	Processing Sweet Corn	29.2
Second	Asparagus	33.7
	Dry Edible Peas	31.4
	Fall Potatoes	22.3
	Processing Green Peas	21.6
	Apricots	5.4
	All Grapes	4.5
Third	Dry Onions	16.2
	All Wheat	8.0
	Butter Production	7.9
	Trout Sales	7.7
	Prunes & Plums	1.4
Fourth	Barley	8.1
	Strawberries	0.8
	Peaches	2.6

Source: NASS, 2005b.

3.5.2.1 Agricultural Employment

Washington's agricultural employment was documented in *Agricultural Workforce in Washington State 2002* for the year 2002 (Jaksich, 2003). In this report, it was estimated that more than 87,000 people were employed in agriculture in Washington State, representing three percent of all State employment. An additional, 33,067, or 1.2 percent of the State's total employment, were employed in food processing. Finally, if all the businesses connected to agriculture were counted, almost 170,000 people work in agriculture or businesses necessary for agriculture (Jaksich, 2003).

Agricultural employment is much more important to the economy of the Central and Eastern Washington, with 80 percent of all agricultural employment located in this area. Yakima County alone accounts for 24 percent of the entire statewide agricultural employment (WDOT, 2005) (Figure 3.30). The value of agricultural output, as well as the employment of seasonal and permanent farm workers, is critical to Washington's rural counties. The well-irrigated farms in the State often employ the most farm workers (Jaksich, 2003).

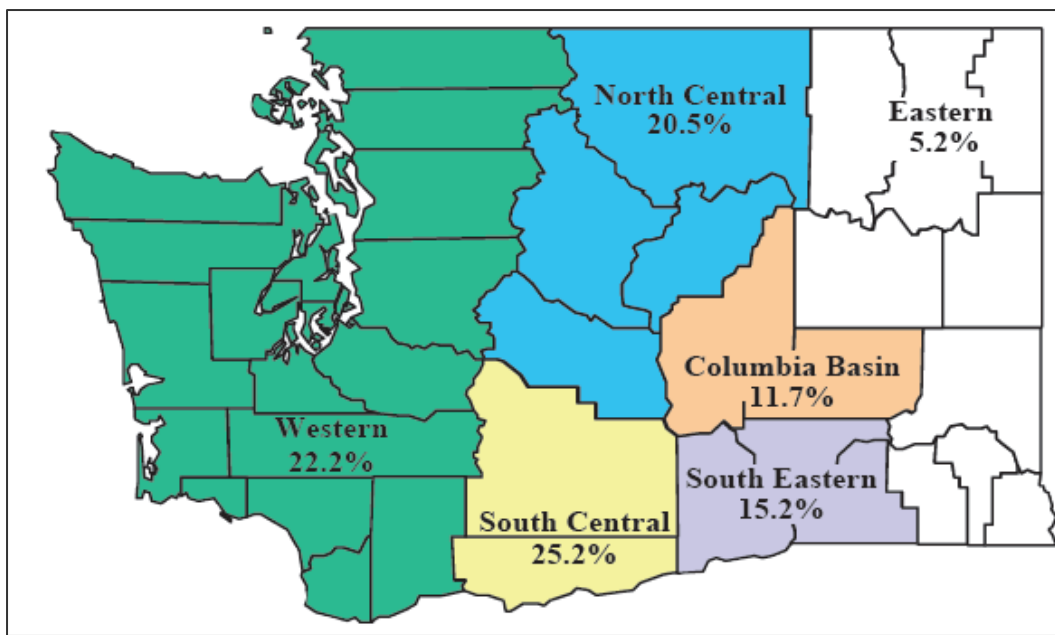


Figure 3.30. The distribution of agricultural employment in Washington State in 2004.
Source: Moore and Krebill-Prather, 2005.

Average annual earnings in agriculture tend to be below that of most other industries in the State. In 2002, the earnings of all agricultural workers in Washington averaged \$16,791. This was 43.8 percent of the statewide average for all workers covered for unemployment insurance of \$38,252. The main reason for this disparity is that most farm workers, especially the seasonal ones, do not work the entire year. Many of these covered seasonal employees do not even work the 680 hours needed to be eligible for the Unemployment Insurance program. During 2002, about 27.9 percent of all workers supplemented their income with nonagricultural work (Jaksich, 2003).

Recreation and Tourism

In addition to agriculture, recreation and tourism contribute revenue to the local economy that could be impacted by CREP implementation. In the CREP area, there are eight National Parks, Recreational Areas, or Historic Sites in the NPS system that offer backcountry and vehicle access camping, picnicking, hiking, mountain climbing, fishing, horseback riding, wildlife and bird watching, boating, historical site

visits, and other activities (NPS, 2005b). There are also many State Parks the offer both summer and winter activities (WSPRC, 2005).

In 2001, nearly three million Washington residents and nonresidents 16 years old and older fished, hunted, or watched wildlife in the State, with 2.5 million participating in wildlife-watching activities, including observing, feeding, and photographing wildlife. In addition, State residents and nonresidents spent \$2.4 billion on wildlife recreation in Washington (FWS et al., 2001).

Poverty

The biggest constraint facing all farm workers, including Migrant and Seasonal Farm Workers (MSFW), is extreme poverty, with household incomes often far below U.S. Federal poverty guidelines. National data shows that one-half of all farm working families earn less than \$10,000 per year. This income is well below the 2002 U.S. poverty guidelines for a family of four of \$18,100 (Kossek et al., 2005).

For the State of Washington, the poverty rate in 2002 was 10.3 percent, almost two percent less than the national average. Within the counties in the project area, the average poverty rate was 12.4 percent. In Eastern Washington, where agriculture is more important to the economy, the average poverty rate of CREP counties was 14.5 percent. Okanogan County had the highest poverty rate in the State at 19.6 percent (USCB, 2005b). Table 3.19 outlines the poverty rate and the total number of individuals below the poverty line in 2002 for each county in the CREP area.

Table 3.19. Poverty information for counties in the CREP project area for 2002.

	County	Estimated Poverty Rate Percent	Estimated Poverty Rate Number
Western WA	Clallam	12.1	7,943
	Clark	9.6	36,406
	Cowlitz	12.5	11,793
	Grays Harbor	15.2	10,159
	Jefferson	11.4	3,110
	King	8.3	144,069
	Kitsap	8.2	18,986
	Lewis	13.4	9,307
	Mason	11.9	5,944
	Pacific	15	3,142
	Pierce	9.8	70,735
	Skagit	11.1	12,023
	Skamania	11.6	1,187
	Snohomish	8.5	53,972
	Thurston	8.6	18,924
	Wahkiakum	9.7	358
	Whatcom	12.5	21,577
	Average	11.1	
Eastern WA	Asotin	13.9	2,848
	Benton	9.4	14,369
	Chelan	12.7	8,538
	Columbia	12.9	522

	Garfield	13.3	311
	Kittitas	13.6	4,443
	Klickitat	14.6	2,850
	Okanogan	19.6	7,613
	Walla Walla	14.3	7,442
	Whitman	16.4	5,936
	Yakima	18.3	40,939
	Average	14.5	
	CREP area average	12.4	
	Total in CREP area		525,446
	Washington State	10.3	623,019

Source: USCB, 2005b.

3.6 ENVIRONMENTAL JUSTICE

3.6.1 DESCRIPTION

All Federal programs, including CREP, must comply with EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The EO, issued February 11, 1994, requires each Federal agency to make environmental justice a part of its mission. Agencies are to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The EO details that all people, regardless of race, color, national origin, or income, receive the following treatment:

- Are provided with fair treatment and meaningful involvement with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies
- Have the opportunity to express comments or concerns before decisions are rendered on the Federal programs, policies, procedures, or activities affecting them
- Share in the benefits of, are not excluded from, and are not adversely or disproportionately affected by Federal programs, procedures, policies, or activities

The President issued a Memorandum to the heads of all departments and agencies to underscore that certain provisions of the existing civil rights and environmental laws (Title VI of the Civil Rights Act of 1964, NEPA, CAA, and the Freedom of Information Act), the Government in the Sunshine Act, and the Emergency Planning and Community Right-to-Know Act, help ensure that all persons in the community live in a safe and healthy environment.

Environmental justice considerations ensure that all populations are provided the opportunity to comment on issues before decisions are rendered. Environmental justice allows all people to share in the benefits of, and not be excluded from or affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment. Departmental Regulation 5600-2, issued December 15, 1997, provides direction to agencies for integrating environmental justice considerations into USDA programs and activities in compliance with EO 12898.

3.6.2 AFFECTED ENVIRONMENT

Minority Populations

Historically, Washington has been a predominately white, non-Hispanic, state. In 2000, the State's population was approximately 5.9 million, almost 82 percent of which is white, non-Hispanic (USCB, 2005a). Following the trend of the general population, approximately 94 percent of Washington's farm operators are white, non-Hispanic (NASS, 2005b). Table 3.20 summarizes farm operator characteristics in Washington.

Table 3.20. Farm operators by race.

All Operators By Race	Number of Farm Operators
White	53,209
Spanish / Hispanic or Latino Origin	1,821
American Indian / Alaska Native	755
Asian	493
Black / African American	67
Native Hawaiian / Pacific Islander	50
More than one race	307

Source: NASS, 2005b.

Migrant Farm Labor

A migrant farm worker is defined as a person who moves from outside or within the State to perform agricultural labor. A seasonal farm worker is defined as a person who has permanent housing in the State and lives and works there throughout the year. Because of its seasonal nature, the labor intensive agriculture of Washington State (such as tree fruits, cherries, and asparagus) is highly dependent on MSFW (Jaksich, 2003).

In Washington State, most seasonal workers originate from Mexico. An estimated 289,235 MSFWs were in Washington in 2000 (NCFH, 2005). Additional information on MSFW was collected for the 2002 Census of Agriculture. Farm operators were asked whether any hired or contract workers were migrant workers, defined as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." For this study, 3,460 farm operators in the State reported employing migrant farm labor and 130 farms reported using migrant farm labor on a contract basis. The 2002 Census of Agriculture did not report the number of workers on those farms (NASS, 2005a).

3.7 WILD AND SCENIC RIVERS

3.7.1 DESCRIPTION

Congress created the National Wild and Scenic Rivers System with the passage of the Wild and Scenic Rivers Act in October of 1968. The goal is to create a system of protected rivers in order to preserve the character of a river while allowing use and appropriate development. The states in the Pacific Northwest contain well over half of the rivers in the National Wild and Scenic Rivers System, including three in the CREP area (Figure 3.31).

3.7.2 AFFECTED ENVIRONMENT

The Skagit River, including its Cascade, Sauk, and Suiattle tributaries, is designated for scenic (99 miles) and recreational (58.5 miles) benefits. The area features one of the largest bald eagles concentrations and is renowned for its substantial fishery (NPS, 2005c).

The Klickitat River is designated as a Wild and Scenic River from the confluence with Wheeler Creek to the Columbia River (10 miles). This reach is designated for recreational benefits, particularly a salmon and steelhead trout sport fishery (NPS, 2005c).

The White Salmon River is designated from its confluence with Gilmer Creek to Buck Creek (9 miles). This reach has a high scenic value and is a popular spot for rafting enthusiasts (NPS, 2005c).

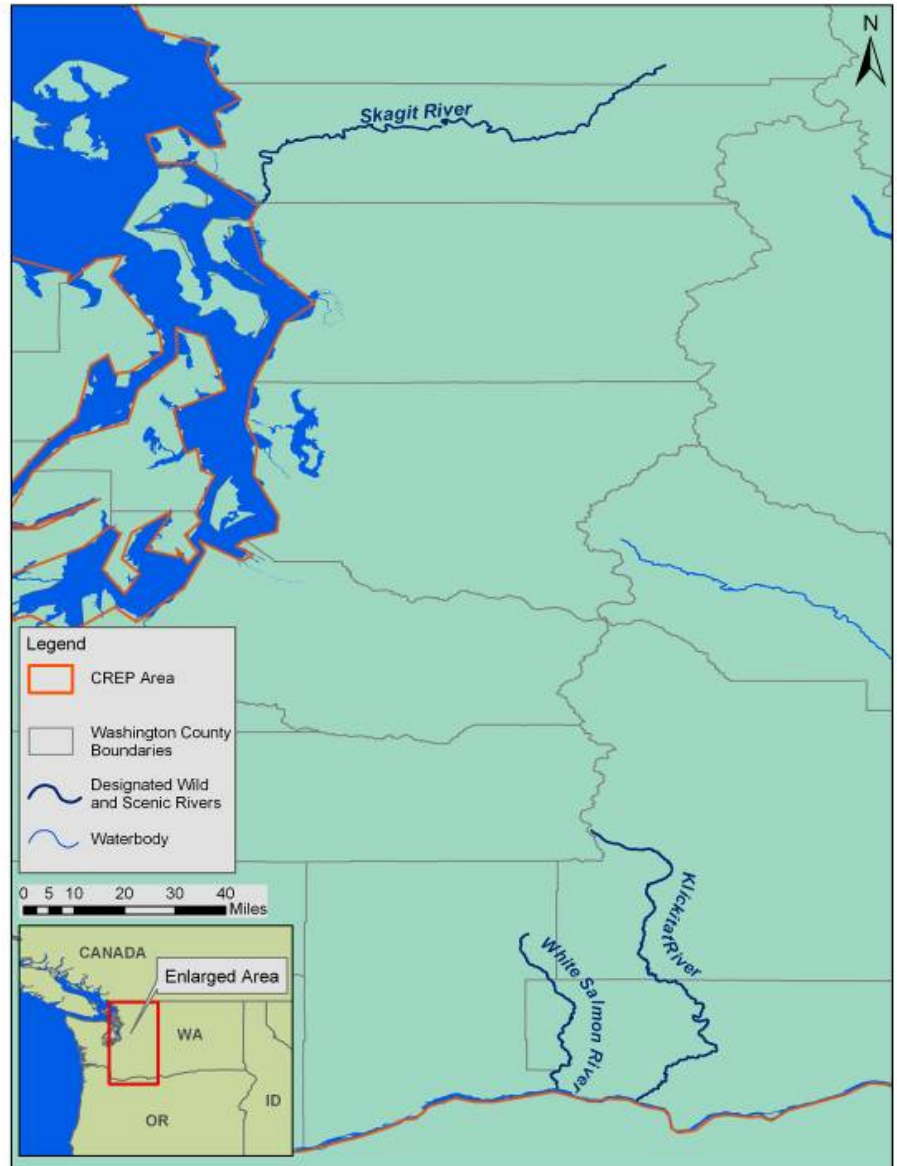


Figure 3.31. Designated Wild and Scenic Rivers in the CREP area.

CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

The purpose of the CREP program is to contribute to the natural habitat restoration (i.e., riparian and wetland areas) on private agricultural lands in Washington to benefit T&E salmonids. If implemented properly, it is expected that the program will successfully meet this goal. Although the CPs will eventually provide important long term benefits, implementation of certain restoration practices and specific projects may cause some short- and long term adverse effects and may result in the take of some individuals,. Most of these potential adverse effects have been eliminated or minimized through application of the BMPs. Where necessary, RPMs and Terms and Conditions to further minimize the potential for take have been developed (FWS and NMFS, 2000).

Among the potential project activities associated with the implementation of CREP CPs are (FWS and NMFS, 2000):

- Shaping and revegetating stream banks;
- Grading/leveling/filling/seedbed preparing riparian areas;
- Planting grass, trees, and shrubs;
- Controlling or removing invasive plants species outside of stream bank areas; and
- Installing livestock exclusion fencing, off-channel livestock watering facilities, and livestock stream crossings.

4.1 BIOLOGICAL RESOURCES

Farming and agricultural practices result in massive landscape alterations, frequently resulting in long term impacts to the aquatic and riparian ecosystems. Changes in physical structure and habitat complexity within streams results from the combined effects of modified hydrologic and sediment transport processes in uplands and the removal of vegetation within the riparian zone (FWS and NMFS, 2000). Nonpoint sources of nutrient and physical habitat degradation have been identified as causes of biological degradation, and loss of riparian vegetation has been shown to impact stream temperatures and dissolved oxygen concentrations. Modified physical habitat structures have been linked with changes in aquatic biota in streams draining agricultural lands.

CREP is designed to alleviate the negative impacts of agricultural practices on biological resources through CP implementation, including installing riparian habitat. In this section, the potential short- and long term impacts of each CREP alternative on wildlife and fisheries, vegetation, and T&E species is discussed.

4.1.1 WILDLIFE AND FISHERIES

Level of Impact

Site specific environmental reviews will be completed for each CREP contract and will tier to this PEA. Specific indicators used to measure the effects of the alternatives during the environmental review process would include the quality of restored or enhanced riparian and wetland habitat, water quality, salmonid recovery impacts, and the number of wildlife and aquatic species affected in and around the enrolled acreage.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Improvements in riparian and vegetation and, consequently, stream habitat conditions will likely lead to long term benefits for both terrestrial and aquatic wildlife. Benefits to wildlife and fisheries species would be minimal in the short term as vegetative communities develop and water quality improves, and CP installation may generate temporary negative impacts. However, positive benefits to wildlife and fisheries would be expected to increase in the long term.

Stream bank shaping could result in a small but unquantifiable level of harm to listed aquatic species due to stream sediment impacts. On projects that propose more than 30 linear feet of stream bank shaping, FSA will carry out an additional site specific consultation with the FWS and NMFS to determine the project's effect and any form of take resulting from the action (FWS and NMFS, 2000).

The preparation of riparian areas during the installation of riparian buffers and hedgerows may result in a small but unquantifiable level of harm to listed aquatic species due to stream sediment impacts. However, revegetation activity is not likely to result in the take of listed species (FWS and NMFS, 2000).

If pesticides do enter the waterbody or are not used in accordance to label specifications, this activity could result in adverse effects to listed species. However, if FSA ensures that pesticides and other chemicals do not enter the waterbody, herbicide application related to removal of invasive species will not result in adverse effects to listed species (FWS and NMFS, 2000).

Installation of livestock crossing facilities may cause harm to a small but unquantifiable number of listed fish species if installation activities increase sediment inputs into the stream. However, relevant BMPs should minimize, but may not entirely eliminate, this potential impact. The increased sediments would have the same downstream effects as described for stream bank shaping above (FWS and NMFS, 2000).

Reestablishing riparian vegetation and hedgerow plantings will provide stream bank stabilization, reduce adjacent stream sedimentation, increase stream shading, improve wildlife habitat, reduce nutrient inflow from adjacent agricultural lands, and provide a future woody debris source (FWS and NMFS, 2000).

On a large scale, habitat and reach diversity must be great enough to provide refugia for fishes during temperature extremes, drought, and floods. Improved wildlife habitat and stream conditions on 100,000 acres throughout the project area will establish refugia, allowing fishes in agricultural streams to recolonize disturbed habitats and reaches (FWS and NMFS, 2000).

The direct impacts of CPs on wildlife and fisheries would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.1.2 VEGETATION

Level of Impact

Riparian areas play a major role in regulating the transportation and transformation of nutrients and other chemicals. Riparian vegetation provides shade streams which regulates stream temperatures. Deciduous tree species such as black cottonwood, quaking aspen, and big leaf maple, as well as shrubby vegetation such as willows, are important sources of shade along streams in Washington. The removal of riparian vegetation along agricultural streams has resulted in increased solar radiation and thus increased summer temperatures. Riparian vegetation can also inhibit energy losses from evaporation, convection, and long-wave radiation during winter (FWS and NMFS, 2000).

Site specific environmental reviews will be completed for each CREP contract and will tier to this PEA. Specific indicators used to measure the effects of the alternatives during the environmental review process would include the quality of restored or enhanced riparian habitat, percent cover, and the number of vegetative species, particularly native vegetation, affected in and around the enrolled acreage.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Improvements in riparian and vegetation and, consequently, stream habitat conditions will likely lead to long term improvement in vegetation. Although CP installation may incur short term adverse effects on riparian vegetation and stream banks, these adverse effects will be outweighed by the long term benefits of CREP.

The shaping of stream banks may include the construction of small (less than 3 feet) mounds for tree planting in wet sites or areas of dense competing vegetation. Revegetation of disturbed sites will ensure that any impacts are of limited duration.

Revegetation activities will cause only minor disturbance to soils, since nearly all plantings will be done by hand. Plant growth in these disturbed sites will be rapid because planting activities will only occur during optimal seasonal growth periods for the respective plant species involved.

Every CP proposed for WA CREP would contribute to vegetation diversity in the area. In addition, establishing native plant communities would help to reduce exotic plant species. Vegetation restoration would increase biodiversity and improve water quality throughout the 100,000 acres proposed for enrollment.

Reestablishing riparian vegetation and establishing native grasses through filter strips and hedgerow planting will provide stream bank stabilization, reduce adjacent stream sedimentation, increase stream shading, improve wildlife habitat, reduce nutrient inflow from adjacent agricultural lands, and provide a future woody debris source (FWS and NMFS, 2000).

A well-established vegetative community along stream banks will also play an important role in reducing sediment and nutrient loading and filtering runoff, enhancing the water quality of adjacent streams (FWS and NMFS, 2000).

The direct impacts of CPs on vegetation would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.1.3 PROTECTED SPECIES AND HABITAT

Level of Impact

Site specific environmental reviews for protected species and habitat would tier to this PEA. Specific indicators used to measure the effects upon T&E or State protected species during the environmental review process would include (1) the quality and amount of critical habitat, including that surrounding riparian resources in need of restoration or enhancement, (2) the number of protected species in and around enrolled acreages, and (2) the water quality within critical habitat areas.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Improvements in riparian and vegetation and, consequently, stream habitat conditions will likely lead to long term benefits for protected species and habitat.

One of the primary goals for Washington State is to recover salmonid species, of which 7 species and 26 ESUs are listed as T&E (NOAA, 2006a). The installation of CREP CPs on agricultural lands may improve the salmonid population by (1) increasing availability of suitable rearing habitat, (2) improving water quality, and (3) providing clean spawning gravels,. One of the primary objectives of CREP is to improve habitat quality in order to increase salmonid populations (FWS and NMFS, 2000).

The direct impacts of CPs on protected species would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.2 CULTURAL RESOURCES

4.2.1 ARCHAEOLOGICAL RESOURCES

Level of Impact

The level of impact for assessing the effects of the alternatives upon cultural resources should be a quantitative analysis of the number and type of archaeological resources affected and the degree to which they are affected. However, such analysis awaits the site specific environmental reviews tiering to this

PEA executed when an area is enrolled in WA CREP. Therefore, for the comparisons of the impact of the alternatives on archaeological resources, the relative impacts of the alternatives are compared.

Alternative A – Proposed Action

Due to the rich cultural history of the CREP area, the potential for encountering archaeological resources during implementation of CREP contracts is considered high. Native American artifacts are often associated with rivers and streams, particularly those areas associated with salmon runs due to the strong ties between salmon and Native American culture. Because WA CREP targets rivers used by salmon, there is considerable potential to impact both known and unknown archaeological resources during CP installation. However, installation is unlikely to disturb the area beyond what is normally disturbed from agricultural plowing.

In order to determine whether proposed CPs would impact archaeological resources listed in or eligible for listing in the NRHP prior to implementing the contract, part of the environmental review will include an appropriate archaeological review. Results and recommendations from the review should receive concurrence for the Washington SHPO prior to project implementation.

Alternative B – Proposed Action minus perennial cropland

Alternative B would impact archaeological resources similar to alternative A.

Alternative C – No Action

Alternative C would impact archaeological resources similar to alternative A.

4.2.2 ARCHITECTURAL RESOURCES

Level of Impact

The level of impact for assessing the effects of the alternatives upon architectural resources should be a quantitative analysis of the number of architectural resources affected and the ways in which and degrees by which they are affected. However, such analysis hinges upon the site specific environmental reviews that would be carried out when a particular acreage is enrolled in WA CREP. Therefore, at this PEA's analysis level, the impacts of the alternatives on architectural resources are primarily qualitatively assessed and include (1) the viewshed of architectural resources, (2) the potential of the alternatives to change erosional processes around the architectural resources, and (3) the consequences of the process of Federal involvement leading to the identification of historic architectural resources.

Alternative A – Preferred

The CREP agreement area contains a rich architectural history related to early settlement, industrial, and agricultural themes of Washington's history. Should proposed CPs include removing or modifying historic architectural resources included in or eligible for the NRHP, a consultation with Washington SHPO would be required to determine whether such resources are present.

Alternative B – Proposed Action minus perennial cropland

Alternative B would impact architectural resources similar to alternative A.

Alternative C – No Action

Alternative C would impact architectural resources similar to alternative A.

4.2.3 TRADITIONAL CULTURAL PROPERTIES

Level of Impact

Alternative A – Proposed Action

When lands enrolled in CREP are defined as potential TCPs, consultation with American Indian Tribes that have traditional ties to the lands may be needed to determine whether such properties exist on affected lands.

Federally recognized Tribes that have responded to previous CREP projects include the Nooksack, Lummi, Yakama, Spokane, and Nez Perce Tribes. Many site specific surveys have been completed in Whatcom County and in Yakima County, FSA has contracted with the Yakama Tribe to have an archaeologist on site during any excavations. Involving the appropriate Tribe(s) early on in the consultation process ensures that TCPs are protected. When appropriate, Tribal consultation will be initiated for all future enrollments in WA CREP.

Alternative B – Proposed Action minus perennial cropland

Alternative B would impact architectural resources similar to alternative A.

Alternative C – No Action

Alternative C would impact architectural resources similar to alternative A.

4.3 WATER RESOURCES

Agricultural practices substantially modify the water quality of streams. Stream channel modification, loss of riparian vegetation, and introduction of pesticides and fertilizers all lead to water quality degradation along agricultural stream channels, which can contribute to poor water quality in wetlands and coastal zones.

4.3.1 SURFACE WATER

4.3.1.1 Level of Impact

Site specific environmental reviews would be completed for each CREP contract and would tier to this PEA. Specific indicators used to measure the effects of the alternatives upon surface water during the environmental review process should include an analysis of the number of impaired stream miles or acres enrolled and the levels of point and nonpoint source pollution within the affected area.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Although CP installation may initially have some adverse impacts on surface water quality, improvements in riparian and vegetation will likely improve water quality and, consequently, habitat for aquatic species in the project area.

Stream bank shaping activities of less than 30 linear feet could cause temporary increases in sedimentation and turbidity and may impact existing riparian and upland vegetation. However, any such impacts will be temporary and eliminated through various stabilization techniques and follow-up vegetation planting. Any excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in streams (FWS and NMFS, 2000).

Site preparation work will result in temporary removal of vegetation in marginal pastureland areas. Soil disturbances will occur on some sites, but BMPs, distance of these practices to streams, and the limited nature of earth-moving activities will avoid most potential impacts to water quality. BMPs related to handling and application of chemicals are likely adequate to minimize any water quality impacts related to removal of invasive species and herbicide application.

Short term impacts associated with activities such as vegetation clearing and soil disturbance may occur during CP installation. These installation activities could result in temporary and minor impacts to surface water quality resulting from runoff of sediment. However, use of BMPs will minimize temporary impacts from the CP installation.

CREP would likely reduce the miles of impaired streams in Washington. Reestablishing vegetation will provide stream bank stabilization, reduce sedimentation of adjacent streams, increase stream shading, improve wildlife habitat, reduce nutrient inflow from adjacent agricultural lands, and provide a future woody debris source (FWS and NMFS, 2000). Nutrient loading will be reduced as a result of CREP and enhanced stream bank vegetation will reduce contamination of streams from pesticides by filtering runoff.

The direct impacts of CPs on surface water would likely be positive and would contribute to achieving the CREP objectives in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.3.2 GROUNDWATER

Level of Impact

For site specific environmental reviews that are to tier to this PEA, the indicators used to measure the effects of the alternatives upon groundwater should include an analysis of the number of impaired stream miles or acres enrolled, the level of point and nonpoint source pollution within the proposed project area, and the quality of surface waters in and around wellhead recharge areas.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Similar to surface water, implementing the proposed CPs is expected to have positive long term impacts on groundwater quality in the CREP area. Agricultural acreages would be reduced, decreasing the amount of nutrients leaching into groundwater and surface water sources. Reducing sediments by stabilizing stream banks will allow greater surface water infiltration through interstitial spaces. Because aquifers are recharged from surface waters, improving surface water quality would indirectly improve groundwater quality. This would improve drinking water as aquifers are the State's primary source of drinking water (FWS and NMFS, 2000).

The direct and indirect impacts of CPs on groundwater would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.3.3 SOLE SOURCE AQUIFERS

Level of Impact

Site specific environmental reviews would be completed for each CREP contact and would tier to this PEA. The indicators used to measure the effects of the alternatives upon groundwater may be applied to the analysis of SSA impacts. Further site specific reviews by EPA will not be necessary beyond the initial scoping as it was concluded through programmatic consultation that CREP will not adversely affect SSAs.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. CREP would remove agricultural land from production, reducing the amount of agricultural chemicals applied to the land. This chemical reduction may improve the quality of water recharging SSAs. Improvements to groundwater and surface waters will also improve the quality of water recharging SSAs.

The indirect impacts of CPs on SSAs would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.3.4 COASTAL ZONES

Level of Impact

Site specific environmental reviews would be completed for each CREP contact and would tier to this PEA. Specific indicators use to measure the effects of the alternatives upon coastal zones during the review process should include an analysis of the number of impaired stream miles or acres enrolled throughout the project, the level of point and nonpoint source pollution throughout the project area, and the impacts of these pollutants on estuarine and other habitat in the coastal zone.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. These CPs will likely have long term beneficial impacts on coastal zones by improving habitat and water quality in Washington's freshwater streams and rivers.

As a result of CPs, reduced nutrient loads may decrease the potential for eutrophication and improve DO concentrations. Additionally, a substantial amount of agricultural land will be removed from production, lowering the amount of fertilizers and pesticides entering streams and eventually coastal areas.

Finally, improvement in water quality will establish suitable habitat for aquatic species, including salmonids, which spawn in freshwater environments and spend much of their lives in coastal areas. These species are integral to community dynamics in coastal zones and their increased numbers will improve the quality of coastal zones.

The indirect impacts of CPs on coastal zones would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.3.5 WETLANDS

Level of Impact

Site specific environmental reviews would be completed for each CREP contract and will tier to this PEA. Specific indicators used to measure the effects of the alternatives upon wetlands during the environmental review should include an analysis of the number of impaired acres of wetlands enrolled, the level of point and nonpoint source pollution within enrolled acres and in the project area, and the improvement of wildlife habitat and species numbers.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. CREP may offer minimal benefit to wetlands through improved water quality and wildlife habitat. However, Washington's urban development is the primary threat to wetlands and CREP will not impact the rate of urban development in coastal zones.

The minimal indirect impacts of CPs on wetlands would likely be positive and may contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.3.6 FLOODPLAINS

Level of Impact

Changes in soils and vegetation on agricultural lands typically result in lower infiltration rates and yield greater and more rapid runoff. Loss of vegetation and soil compaction also increase runoff, peak flows, and flooding during wet seasons. Reduced infiltration and increased surface runoff results in a stream's more rapid hydrologic response to rainfall (FWS and NMFS, 2000).

Site specific environmental reviews would be completed for each CREP contract and will tier to this PEA. Specific indicators used to measure the effects of the alternatives upon floodplains during the review process should include an analysis of the number of acres within the 100-year floodplain enrolled and the storage capacity and integrity of restored floodplains.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. CREP will likely have a long term beneficial impact on floodplains by lowering the risk of flooding and increasing the natural function of floodplains to store excess surface waters.

In naturally functioning systems, riparian vegetation stabilizes stream banks, slowing water flow during high flow events and allowing waters to spread out over the floodplain and recharge subsurface aquifers. Moreover, riparian vegetation facilitates sediment deposition and stream bank building, increasing the capacity of the floodplain to store water. This water is then slowly released as baseflow during the drier seasons. Filter strips and hedgerow plantings would provide flood damage protection during major flooding events.

The direct impacts of CPs on floodplains would likely be positive and would contribute to achieving the CREP objectives discussed in section 1.3.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although hedgerow plantings and filter strips would not be included and fewer lands would be eligible for enrollment.

4.4 HUMAN HEALTH AND SAFETY

4.4.1 LEVEL OF IMPACT

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Implementation of Alternative A would result in long term minor beneficial effects to the human health and safety. Because of the decrease of harmful chemicals applied to CREP-enrolled land, human exposure to these chemicals will likely decrease. Therefore, the health of farm workers (including MSFWs) and their families could marginally improve.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment.

4.5 SOCIOECONOMICS

4.5.1 LEVEL OF IMPACT

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Implementing the proposed action would result in positive net present values for land rentals within the CREP area and substantial financial benefits for producers. Under CREP, producers would be compensated for removing land from production and installing CPs. Producers would receive irrigated rental rates, currently \$80 to \$200 per acre, for acreage enrolled in the program, as well as providing financial incentive for producers to enroll in the program. Under CREP, producers would receive an annual rental payment calculated for irrigated land, as well as reimbursement up to 50 percent for eligible costs associated with CPs. Producers may also receive an additional annual incentive payment equal to a percentage of the base CRP contract annual rental rate.

Enrollment in the CREP would improve habitat for terrestrial and aquatic species, particularly for sport fish. Due to large scale and opportunity for wide-ranging improvements in water quality, this improved and expanded wildlife habitat would be likely to increase wildlife-related recreation prospects statewide. This increased/improved habitat would be likely to improve wildlife based recreation generated economic activity within Washington State.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although filter strips and hedgerow plantings would not be included and fewer lands would be eligible for enrollment. Under alternative C, producers in the program would receive annual non-irrigated rental rates, which would be less than irrigated rental rates provided under alternatives A and B.

4.6 ENVIRONMENTAL JUSTICE

4.6.1 LEVEL OF IMPACT

Site specific environmental reviews would be completed for each CREP contract and would tier to this PEA. Specific indicators used to measure the effects of alternatives on environmental justice would include the number of displaced minority or disadvantaged farm workers and number of affected minority producers.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. Since the CREP area would not be considered an area of concentrated minority population or a poverty area, there would be no adverse impacts from selecting the proposed action.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative, like alternative A, would not likely affect environmental justice issues.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative, like alternative A, would not likely affect environmental justice issues.

4.7 OTHER PROTECTED RESOURCES

4.7.1 WILD AND SCENIC RIVERS

Level of Impact

Site specific environmental reviews would be completed for CREP contracts and would tier to this PEA. Specific indicators used to measure the effects of alternatives on wild and scenic rivers would include the quality of surface water and adjacent upland habitat.

Alternative A – Proposed Action

Alternative A (the Proposed Action) would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual and perennial cropland. CREP will likely have a long term beneficial impact on wild and scenic rivers by improving water quality and wildlife habitat as described in section 4.3.1.

Alternative B – Proposed Action with Alterations

Alternative B would allow for the installation of riparian buffers, filter strips, and hedgerow planting on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although fewer lands would be eligible for enrollment.

Alternative C – No Action

Alternative C would allow for the installation of riparian buffers on 100,000 acres of annual cropland. This alternative would provide many of the same long term benefits as alternative A, although hedgerow plantings and filter strips would not be included and fewer lands would be eligible for enrollment.

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CHAPTER 5.0 CUMULATIVE EFFECTS

5.1 INTRODUCTION

CEQ stipulates that the cumulative impacts analysis within an EA should consider the potential environmental impacts resulting from “the incremental impacts of the action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such other actions” (CEQ, 2006). CEQ guidance in *Considering Cumulative Effects* affirms this requirement, stating that the first steps in assessing cumulative effects involve defining the scope of the other actions and their interrelationship with the proposed action (CEQ, 2006). The scope must consider geographic and temporal overlaps among the proposed action and other actions. It must also evaluate the nature of interactions among these actions.

Cumulative impacts most likely arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time tend to have potential for cumulative effects.

For this PEA, the geographic boundary for cumulative impacts analysis is the CREP area. For the purposes of this analysis, the goals and plans of Federal programs designed to mitigate the risks of natural resource degradation are the primary sources of information used in identifying past, present, and reasonably foreseeable actions.

5.2 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

In addition to FSA’s CRP and CREP, NRCS maintains many programs in the State of Washington to conserve and enhance the natural resources of the area. These programs include, but are not limited to, the Wildlife Habitat Incentives Program (WHIP), Grassland Reserve Program, Environmental Quality Incentives Program, Grazing Lands Conservation Initiative, and the Wetlands Reserve Program (WRP). Although these programs are required to be implemented on separate lands (i.e., a particular tract of land cannot be used for acquiring funding on more than one government program), the cumulative impacts from their implementation would provide an overall beneficial cumulative impact on water, soil, biological, and other natural resources.

5.3 CUMULATIVE EFFECTS MATRIX

Table 5.1. Cumulative effects of NRCS and other conservation programs with CREP CPs.

Resource Issues	NRCS Programs	Other State and Federal Programs	Ongoing Agricultural Practices	CREP Alternatives
Biological Resources	Protection and restoration of natural habitats through NRCS programs provides benefits to Washington's biological resources, including protected species. Specifically, WHIP is designed to improve wildlife habitat on private land.	Existing State and Federal conservation programs protect and enhance natural habitats that are important for protected species and other wildlife. The Landproducer Incentive Program, a FWS program, specifically targets habitat of T&E species on private land for protection and restoration.	Conversion of land for agricultural purposes has resulted in a decreased amount of quality habitat available to wildlife. Sediment and nutrient loads in agricultural runoff impact aquatic species. Land disturbance or fallow agricultural land encourages the establishment of invasive species that out-compete native species and degrade native habitats.	CREP would complement other conservation programs that are designed to preserve and protect biological species, particularly salmonids. Through CREP, additional acres would be added to those already protected by existing State and Federal programs, increasing the amount of quality aquatic and riparian habitat.
Cultural Resources	Consultation with SHPO concerning NRCS programs ensures the protection of cultural resources and historic properties on private land enrolled in these programs.	Programs receiving Federal funds need to comply with section 106 of the NHPA. Compliance with NHPA protects cultural resources located on private land that participates in these programs, protecting cultural resources that might not otherwise be protected.	Earth moving activities associated with agricultural activities has the potential to disturb historic and prehistoric cultural properties. Discovery and/or disturbance of cultural resources may go unreported by private landproducers.	Under CREP, private land enrolled in contracts would be surveyed for cultural properties increasing the number of historic and cultural properties discovered and, therefore, protected or preserved on private land.
Water Resources	By removing the land from active agriculture, NRCS conservation programs improve water quality in both freshwater and marine systems. CPs in NRCS programs are designed to filter sediments and nutrients from agricultural runoff and improve the quality of water recharging groundwater and SSAs. Specifically, WRP restores, enhances, and protects wetlands. NRCS programs also include improvement of wildlife habitat	The preservation of natural habitats through various coastal and freshwater protection programs, particularly those involved with salmonid recovery, have positive impacts on water quality, including reducing soil erosion and decreasing sediments in surface water. Improving surface water quality, groundwater recharge, and reducing groundwater contamination through conservation programs improves water quality. Native habitat in wetlands, floodplains,	In the Central Columbia Plateau and Yakima Valley, irrigation is widely used in agriculture. This irrigation reduces the amount of water available for other uses. In addition, ongoing agricultural practices add nutrients, sediment, and chemicals to surface water runoff, degrading the water quality of receiving waterbodies and resulting in nonattainment of beneficial use designations.	CREP is designed to complement existing Federal and State conservation programs. Combined with these programs, CREP would result in cumulative benefits to water quantity and quality. Over the 10-15 years of CREP, sediment and nutrient loads would be expected to decrease as more land is enrolled in CREP and other conservation programs. CREP would improve the groundwater quality and protect SSAs by improving the quality of sources of recharge. Improved water quality and salmonid habitat in

Resource Issues	NRCS Programs	Other State and Federal Programs	Ongoing Agricultural Practices	CREP Alternatives
	including wetlands. NRCS programs restore native vegetation, install riparian buffers, and protect natural habitats, all of which serve to maintain or enhance floodplain functions.	and coastal zones are maintained and preserved to reduce impacts that occur from degradation of natural resources and land conversion.		agricultural streams would benefit downstream habitat in the coastal zone such as estuaries and wetlands. Installation of CPs would improve the capacity of floodplains to store excess water.
Human Health and Safety	Removal of land from active agriculture to implement NRCS conservation programs would minimally reduce farm worker exposure to agricultural chemicals.	Removal of land from active agriculture to implement conservation programs would minimally reduce farm worker exposure to agricultural chemicals	Application of agricultural chemicals may adversely impact farm worker health.	Marginal farmland typically requires greater application of fertilizers and pesticides. Enrolling this land into CREP and other conservation programs would reduce application of these chemicals, decreasing farm worker exposure.
Socioeconomic Resources	Rental rates from NRCS programs offset the cost of CP implementation and the removal of land from active agricultural production.	Existing State and Federal programs offer producers some monetary compensation for implementing conservation programs. Increased recreational use of land enrolled in or near conservation programs may benefit the local economy direct and/or indirect sales.	Agriculture provides jobs and adds to the overall economy through the sale and processing of agricultural product. Local economies are also stimulated by recreational visitors and use.	Through CREP, additional funds would be available to producers to implement CPs. Rental rates would be available to producers for cropland that provides or has the potential to provide habitat for salmonids. Additional acres placed into conservation programs could enhance recreational value of the land and could increase local income derived from recreation use.
Environmental Justice	No cumulative impacts have been identified.	No cumulative impacts have been identified.	No cumulative impacts have been identified.	No cumulative impacts have been identified.
Wild and Scenic Rivers	NRCS conservation programs improve water quality in wild and scenic rivers. CPs are designed to filter sediments and nutrients from agricultural runoff and improve the quality of water recharging groundwater and SSAs.	The NPS program is designed to preserve the character of designated rivers and protect the resource from impairments due to development or other human uses.	Ongoing agricultural practices add nutrients, sediment, and chemicals to surface water runoff, degrading water quality of receiving waterbodies and resulting in nonattainment of beneficial use designations.	CREP would complement existing NPS regulations for the protection of these resources. Under CREP sediment and nutrient loads would be expected to decrease.

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CHAPTER 6.0 MITIGATION MEASURES

6.1 ROLES AND RESPONSIBILITIES

6.1.1 FARM SERVICE AGENCY

FSA would oversee proper implementation of CREP and coordination with the State Incentive Program to minimize impacts on natural resources stemming from CP implementation on a site specific basis.

6.1.2 NATURAL RESOURCES CONSERVATION SERVICE

NRCS would assist producers and provide technical information in CP implementation. Representatives would work onsite to provide FSA with technical assistance, including assistance in completing the site specific environmental reviews.

6.1.3 FISH AND WILDLIFE SERVICE

FWS is responsible for the administration of the ESA. The agency's role in this project would be to assist FSA in ensuring that CP implementation does not jeopardize or destroy T&E species.

6.1.4 STATE HISTORIC PRESERVATION OFFICE

The Washington SHPO would review actions potentially affecting cultural resources in the State. SHPO would also consult on the location of historic and prehistoric materials.

6.2 MITIGATION

Mitigation measures would be decided on a site specific basis. Avoiding or minimizing the possible impacts to natural resources stemming from CP implementation is a key component to the success of CREP. Before a CP would be implemented, a site specific environmental review would be required for all lands as a condition of CREP contract approval.

As part of the site specific review process, coordination of specific actions and consultation with the appropriate agencies would be conducted to reduce or eliminate the incidence or risk to the specific resources identified in the environmental review. To minimize impacts, efforts would include consultation with the Washington SHPO and FWS to identify T&E species and critical habitat needs.

Specific mitigation measures might include:

- Spatial or temporal boundaries around sensitive breeding or foraging habitat;
- Limited human disturbance during the presence of sensitive species;
- Periodic or rotational harvest of riparian vegetation during CP implementation;
- Silt fencing to reduce stream sedimentation;
- Timely reseeding or revegetation to after major flood events; and
- Strict enforcement of BMPs and the proper use of herbicides, pesticides, and fertilizers in CP implementation.

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CHAPTER 7.0 LIST OF PREPARERS

Table 7.1. Individuals who prepared this PEA, with their area of expertise, education, and experience.

Name	Area of Expertise	Education	Experience
Kelson Forsgren The Shipley Group	Project Manager Writer/Editor	M.S., Technical Communication	12 years
Kim Richardson Barker The Shipley Group	Technical Writer	M.S. Range Science; B.S. Environmental Studies	3 years
Suzy Hill The Shipley Group	Technical Writer	M.A. Science Education; B.S. Watershed Science	3 years
Danielle Healey The Shipley Group	Technical Writer	M.S. Ecology; B.A. Biology	2 years

Table 7.2. Persons contacted on this PEA, with their area of expertise, education, and experience.

James Fortner FSA	National Environmental Compliance Manager	B.S., Agriculture and Extension Education	20 years
Kathleen Schamel FSA	Federal Preservation Officer	B.A.; M.A., Anthropology	19 years
Matthew Ponish FSA	Agricultural Program Technology Specialist	B.S., Wildlife/Fisheries Biology and Management	8 years
Melissa Cummins FSA	Washington State Environmental Coordinator		
Rod Hamilton FSA	Washington State Program Chief		

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CHAPTER 8.0 PERSONS AND AGENCIES CONTACTED

Many agencies and individuals have been involved in planning WA CREP. Table 8.1 provides a list of agencies and offices consulted during the research for this PEA.

Table 8.1. Organizations contacted for this PEA.

Organization
Bureau of Land Management (USDI)
Bureau of Reclamation (USDI)
Washington Farm Service Agency (USDA)
Washington Natural Resources Conservation Service (USDA)
U.S. Fish and Wildlife Service (USDI)
State Historic Preservation Office
The Nature Conservancy
Washington Department of Agriculture
Washington Department of Ecology
Washington Department of Fish and Game
Washington Department of Natural Resources

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CHAPTER 9.0 GLOSSARY

Aquifer: A geologic formation that is water bearing. A geological formation or structure that stores and/or transmits water, such as to wells and springs. Use of the term is usually restricted to those waterbearing formations capable of yielding water in sufficient quantity to constitute a usable supply for people's uses.

Categorical Exclusions: An agency-defined category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by the agency pursuant to NEPA. Projects qualifying for a “categorical exclusion” are not required to undergo additional NEPA analysis or documentation.

Conservation Practices: A series of NRCS approved agricultural practices and management techniques designed to control nonpoint pollution.

Decomposers: Organisms (e.g., bacteria, fungi) that break down dead plants and animals and release substances usable by consumers.

Denitrification: The process whereby bacteria reduce nitrate or nitrite to gaseous products such as nitrogen.

Environmental Assessment: A concise public document, prepared in compliance with NEPA, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (FONSI).

Environmental Impact Statement: A detailed written statement required by section 102(2)(C) of NEPA, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short term uses of the environment versus the maintenance and enhancement of long term productivity, and any irreversible and irretrievable commitment of resources. A *programmatic* EIS or EA covers general matters in broader terms and analyzes conceptual or planning alternatives. In such cases, at least one more level of site specific NEPA analysis is necessary before implementation can proceed.

Erosion: A geomorphic process that describes the wearing away of the land surface by wind, water, ice or other geologic agents. Erosion occurs naturally from weather or runoff but is often intensified by human land use practices.

Eutrophication: The natural and artificial addition of nitrogen and phosphorous (nutrients) to bodies of water, increasing algal growth. As the algae die, the decomposing microorganisms consume dissolved oxygen in the water, reducing the amount available to fish and other aquatic organisms. Ultimately, this can result in a dead lake or pond: a system where no larger aquatic organisms can survive.

Exotic species: A species occurring in an area outside of its historically known natural range as a result of intentional or accidental dispersal by human activities. Also known as an *introduced species*.

Groundwater: The supply of fresh water found beneath the Earth's surface, usually in aquifers, which supply wells and springs. Because ground water is a major source of drinking water, there is growing concern over contamination from leaching agricultural or industrial pollutants or leaking underground storage tanks.

Hydric soils: Soil that, in its undrained state, is flooded long enough during a growing season to develop anaerobic (lacking air – saturated) conditions that support the growth and regeneration of hydrophytic vegetation.

Hydrophytic vegetation: Plants specialized to grow in water or in soil too waterlogged for most plants to survive.

Listed species: Under the Endangered Species Act, or similar state statute, those species officially designated as threatened or endangered through all or a significant portion of their range. See also: *Threatened and endangered species*.

Nonpoint source (pollution): Cause of water pollution that is not associated with point (fixed) sources. Nonpoint sources include runoff from agricultural, urban, construction, and mining sites, as well as septic systems and landfills.

Nutrients: Chemical compounds in a usable form and have nutritive value for plants and/or animals.

Recharging groundwater: Refers to water entering and replenishing an underground aquifer through faults, fractures, or direct absorption.

Riparian: Refers to a stream and all the vegetation on its banks.

Sediment loading: Describes the excessive inputs of sediment into a waterbody.

Siltation: The deposition of finely divided soil and rock particles upon the bottom of stream and river beds and reservoirs.

Stormwater runoff: Water from precipitation that runs straight off the ground without first soaking into it. It does not infiltrate into the ground or evaporate due to impervious land surfaces, but instead flows onto adjacent land or water areas.

Threatened and endangered species: Under the Endangered Species Act, those species officially designated by the National Marine Fisheries Service or U.S. Fish and Wildlife Service as being in danger of extinction (i.e., endangered) or likely to become endangered (i.e., threatened) within the foreseeable future through all or a significant portion of their range. Threatened and endangered species are protected by law. See also: *Listed species*.

Traditional Cultural Properties: Places that are eligible for inclusion in the National Register of Historic Places because of their "association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community."

Watershed: 1.) Describes a cohesive, hydrologically-linked landscape that is drained by a waterway leading to a lake or reservoir. 2.) A geographic area delineated by its peaks and ridgelines, which divide surface water flow into two or more directions.

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APPENDIX A: CREP AGREEMENT AND AMENDMENTS

**AGREEMENT
BETWEEN
THE U.S. DEPARTMENT OF AGRICULTURE
COMMODITY CREDIT CORPORATION
AND
THE STATE OF WASHINGTON
CONCERNING THE IMPLEMENTATION OF A
CONSERVATION RESERVE ENHANCEMENT PROGRAM**

PURPOSE

This Agreement is between the Commodity Credit Corporation (CCC) of the United States Department of Agriculture (USDA) and the State of Washington (State) to implement a Conservation Reserve Enhancement Program (CREP) to assist in the recovery of salmon species that have been listed as threatened or endangered species under the federal Endangered Species Act.

GENERAL PROVISIONS

A number of salmonid species native to Washington have been either listed or proposed for listing as threatened or endangered species under the federal Endangered Species Act. Agricultural activities in riparian corridors, along with agriculture-related impacts on water quality, have contributed to habitat loss of these coldwater fish species in Washington. This Agreement for this Washington CREP is designed to help alleviate some of these problems.

It is the intent of USDA, CCC and the State of Washington that this CREP will address the following objectives:

1. Restoration of 100 percent to the area enrolled for the riparian forest practice to a properly functioning condition in terms of distribution and growth of woody plant species.
2. Reduction of sediment and nutrient pollution from agricultural lands adjacent to the riparian buffers by more than 50 percent.
3. Establishment of adequate vegetation on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.
4. Reduction of the rate of stream water heating to meet State ambient water quality standards by planting adequate vegetation on all riparian buffer lands.
5. Provision of a contributing mechanism for farmers and ranchers to meet the water quality requirements established under federal law and under Washington's water quality laws.

6. Provision of adequate riparian buffers on 2,700 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics which meet habitat requirements of salmonids.

The intended outcome of this Agreement in particular is to enhance the ability of producers to enroll certain acreage under the Conservation Reserve Program (CRP), where deemed desirable by USDA, CCC, and Washington. This Agreement is not intended to supersede any rules or regulations, which have been, or may be, promulgated by either USDA or CCC.

AUTHORITY

The CCC has the authority under provisions of the Food Security Act of 1985, as amended (1985 Act)(16 U.S.C. 3830 et seq.), and the regulations at 7 CFR part 1410 to perform all its activities contemplated by this agreement. In accordance with the 1985 Act, CCC is authorized to enroll land in CRP through December 31, 2007.

Sections 1230, 1234, and 1242 of the 1985 Act authorize the CCC to enter into agreements with States to use the CRP in a cost-effective manner to further specific conservation and environmental objectives of a State and the nation. Other authorities may also apply.

The authority for Washington to enter into this Agreement is RCW 43.06.120, Laws of Washington.

PROGRAM ELEMENTS

USDA, CCC, and Washington agree that:

- A. The Washington CREP will consist of a special continuous sign-up CRP component and a State of Washington incentive. The Washington CREP will seek to enroll up to 100,000 acres of agricultural lands adjacent to water bodies that provide, or have the potential to provide, important habitat for salmonids. These water bodies can be identified using maps from the 1993 Salmon and Steelhead Stock Inventory Report (SASSI) or updates to SASSI maps carried out by local conservation districts with the concurrence of Washington Department of Fish and Wildlife (WDFW) and Tribal fisheries biologists. Regular updates to SASSI carried out by WDFW can also be used to identify eligible lands. Where better data are available, important salmonid habitat can also be identified using one of the following processes:
 1. Under guidance from Washington legislative engrossed substitute House Bill 2496, an act relating to salmon recovery planning, the Washington State Conservation Commission is generating reports identifying habitat factors in each Water Resource Inventory Area (WRIA) that limit the production of salmonids. These Habitat Limiting Factors Analyses identify the known and presumed distribution of salmonids and the salmonid habitat in need of restoration. Eligible agricultural lands adjacent to these areas will be considered eligible for CREP.
 2. The Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP) is completing a GIS-based inventory of salmonid habitat conditions throughout WRIs 1-23, and ultimately throughout the state. Eligible agricultural lands adjacent to streams identified by SSHIAP with known or presumed presence of salmonids will be considered eligible for CREP.
 3. In cases where SASSI, SASSI updates, Habitat Limiting Factors Analysis or SSHIAP have not been completed, eligible streams may be designated if the conservation district, WDFW, and Tribal biologists all agree riparian habitat is a significant limiting factor for salmonids. The criteria for these updates will include all streams in watersheds with known presence of

SASSI stocks that are below natural barriers to fish passage and meet appropriate habitat requirements for the species of interest (e.g. gradient < 12%).

Updates to the eligible streams for CREP, based on the criteria above, will be reviewed and approved annually by the Washington Conservation Commission and the Washington State FSA Committee, in consultation with the Washington State Technical Advisory Committee. In no case will the number of eligible stream miles exceed 10,000 miles.

- B. The Riparian Buffer (practice code CP22) is the only CRP practice authorized under this Agreement.
- In determining CCC's share of the cost of practice establishment, CCC shall use the appropriate CRP procedures. All approved conservation plans shall be consistent with applicable CRP statutes and regulations. Until the Natural Resources Conservation Service issues a new practice standard for Riparian buffers in the State of Washington, Riparian Buffers shall be constructed in accord with the Riparian Buffer practice standard (practice code 391A) currently contained in the Field Office Technical Guide, except with respect to the minimum buffer width. The minimum buffer width shall be no less than 75 percent of the site potential tree height which shall be defined for most sites as the average height, at 100 years of growth of the tallest conifer species native to the site. For sites that historically supported black cottonwoods as the largest tree, the site potential tree height is the average height of a 50-year old black cottonwood. For croplands where trees were not historically present, or cannot be re-established, shrubs may be planted and the minimum riparian buffer width shall be 50 feet. The maximum buffer width shall be determined in accordance with 2-CRP and Field Office Technical Guide procedure. Modifications to these Field Office Technical Guides adopted subsequent to the date of this Agreement will be implemented as appropriate to achieve the overall purposes of this Agreement in a cost-effective manner.
- C. The continuous sign-up CRP contracts for acres enrolled in this CREP must be a minimum of 10 years, but may not exceed a maximum of 15 years.
- D. Eligible producers will not be denied the opportunity to offer eligible acreage for enrollment during general or continuous CRP enrollment periods.
- E. CRP contracts executed under this Agreement will be administered in accordance with, and subject to, the CRP regulations at 7 CFR part 1410, and the provisions of this Agreement. In the event of a conflict, the CRP regulations will be controlling.
- F. The Deputy Administrator for Farm Programs, Farm Service Agency, is delegated authority to carry out this Agreement, and with the Governor of Washington or his designee, may further amend this Agreement consistent with the provisions of the 1985 Act and the regulations at 7 CFR part 1410. The provisions of this Agreement may only be modified by written agreement between the parties.
- G. This Agreement shall remain in force and effect until terminated by USDA, CCC or Washington. This Agreement may be terminated by either party upon written notice. Such termination will not alter responsibilities regarding existing contractual obligations under the CREP between participants and USDA or CCC, or between participants and Washington.
- H. No lands may be enrolled under this program until the USDA's Deputy Administrator for Farm Programs, in consultation with USDA's Natural Resource Conservation Service, concurs with a detailed Washington Amendment to 2-CRP which will provide a thorough description of this program and applicable practices.

FEDERAL COMMITMENTS

USDA and CCC agree to:

- A. Cost share with producers for 50 percent of the eligible reimbursable costs of all approved conservation practices.

Make an annual rental payment for each eligible enrolled acre. The rental rate in all cases shall be the rate for non-irrigated land and will be calculated based on the existing CCC approved cropland Soil Rental Rates (SRR)

- B. Make an additional annual incentive payment, as a percentage of the base CRP contract annual rental rate otherwise applicable to the land to be enrolled in the CREP (as calculated under paragraph V.B. without regard to other incentive payments), in the following amounts:
 - (1) for land to be established as riparian buffers, 100 percent; and
 - (2) for lands protected under the Growth Management Act (RCW 75.090) as agricultural lands of State significance, 10 percent.
 - (3) subject to the availability of funds, pay a one-time Signing Incentive Payment (CRP-SIP) in accordance with 2-CRP procedure; and
 - (4) subject to the availability of funds, pay a one-time Practice Incentive Payment (PIP) in accordance with 2-CRP procedure.
- C. Make an annual “maintenance” incentive payment for each enrolled acre in the same manner as with other CRP contracts.
- D. Administer contracts for lands approved under the CREP.
- E. Develop conservation plans for treatment of a unit of land or water to address identified natural resource problems by devoting eligible land to permanent vegetative cover or other comparable practices, and review conservation plans developed by others for applicants offering to enroll eligible acreage in the CREP.
- F. Conduct annual compliance reviews according to Farm Service Agency Handbook 2-CRP to ensure compliance with the CRP contract.
- G. Provide information to landowners concerning Washington’s CREP program and technical assistance for the CREP program in general.
- H. Permit successors-in-interest to enroll under CREP in the same manner as allowed for under any other CRP contract.
- I. Share appropriate data, in accord with procedures and restrictions and exemptions established under the federal Freedom of Information Act, federal privacy laws and other applicable laws, with the State of Washington to facilitate State monitoring efforts.

STATE COMMITMENTS

Washington will:

- A. Contribute not less than 20 percent of the overall annual program costs.
- B. Be responsible for:
 - (1) making the following payments to approved participants:

- (i) 10 percent of the eligible reimbursable cost for all conservation practices established under this CREP; and
 - (ii) the difference between 100 percent, and the percent paid by CCC, of the eligible costs for animal damage control device for conifers; and
 - (iii) a maintenance incentive equal to 100 percent of the eligible costs for annual maintenance of riparian buffers where continued action is needed to maintain buffer to specifications, for up to 5 years from the establishment date; and
 - (iv) to compensate those already enrolled in the program prior to the USDA program changes of April 6, 2000, in the same manner as those enrolling after the date of this Amendment.
- (2) paying all costs associated with the annual monitoring program;
- (3) providing technical assistance in the development of conservation plans, including installation of forested riparian buffers;
- (4) providing conservation planning assistance for the entire farm to enrolled producers on a voluntary basis; and
- (5) providing grant funds for removal of fish barriers and installation of other salmonid habitat restoration practices.
- C. Establish an Enhancement Program Steering Committee, which will include representatives from the State Technical Committee, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Agriculture, Washington Department of Natural Resources, Washington Department of Fish and Wildlife, Extension Service, agriculture groups, conservation groups, local governments and Tribal government. This group will advise the Governor's Joint Natural Resources Cabinet on the implementation of the CREP.
- D. Seek applicants willing to offer eligible and appropriate land for enrollment in the CREP.
- E. Facilitate the provisions of technical assistance from the local conservation districts, and other cooperators to develop conservation plans, in cooperation with the Natural Resource Conservation Service and Washington State Conservation Commission for applicants offering to enroll eligible acreage in the CREP.
- F. Implement a broad campaign for continuous public information and education regarding the CREP.
- G. Ensure that the CREP is coordinated with other agricultural and natural resource conservation programs at the State and Federal level.
- H. Within 90 days of the end of each Federal fiscal year, the Conservation Commission shall provide a report to FSA summarizing the status of enrollments under this CREP and progress on fulfilling the other commitments of this program. The annual report to FSA shall include: level of program participation; the results of the annual monitoring program; a summary of non-federal CREP program expenditures; and, recommendations to improve the program. The report shall include a comparison of salmon habitat characteristics and population trends in streams where there is significant enrollment in this program with similar streams where program participation is not significant.
- I. Within 90 days of the end of the Federal fiscal year, state will submit information summarizing its overall costs for the program. In the event that the State has not obligated 20 percent of the

overall costs for a relevant Federal fiscal year, the State will fulfill its obligations within 90 days by paying the shortfall to CCC, or by providing some other mutually agreed-upon remedy.

MISCELLANEOUS PROVISIONS

- A. All commitments by USDA and the State are subject to the availability of funds. In the event either party is subject to a funding limitation, it will notify the other party expeditiously and any necessary modifications will be made to this Agreement.
- B. All CRP contracts under this CREP shall be subject to all limitations set forth in the regulations at 7 CFR Part 1410, including, but not limited to, such matters as economic use, transferability, violations and contract modifications. Agreements between producers or operators and the State may impose additional conditions not in conflict with those under the CRP regulations, but only if approved by CCC.
- C. Neither the State nor USDA shall assign or transfer any rights or obligations under this Agreement without the prior written approval of the other party.
- D. The State and USDA agree that each party will be responsible for its own acts and results to the extent authorized by law and shall not be responsible for the acts of any others and the results thereof.

IT IS SO AGREED:

FOR THE U.S. DEPARTMENT OF AGRICULTURE AND THE COMMODITY CREDIT CORPORATION

/s/ Dan Glickman

DAN GLICKMAN

Secretary

U.S. Department of Agriculture and

Chairman of the Board

Commodity Credit Corporation

October 19, 1998

Date

FOR THE STATE OF WASHINGTON

/s/ Gary Locke

GARY LOCKE

Governor

State of Washington

October 19, 1998

Date

APPENDIX B: RELEVANT LAWS AND REGULATIONS

Clean Water Act of 1972

The Clean Water Act (CWA) was passed in 1972, with a goal to “restore and maintain the chemical, physical, and biological integrity of the nation's waters.” The Act contains a number of provisions that affect agriculture:

- Clean Lakes Program is authorized by Section 314 of the CWA. It authorizes EPA grants to states for lake classification surveys, diagnostic/feasibility studies, and for projects to restore and protect lakes.
- Nonpoint Source Pollution Program is established by Section 319 of the CWA. It requires states and U.S. territories to identify navigable waters that cannot attain water quality standards without reducing nonpoint source pollution, and then develop management plans to reduce such nonpoint source pollution.
- National Estuary Program is established by Section 320 of the CWA. It provides for the identification of nationally significant estuaries that are threatened by pollution for the preparation of conservation and management plans and calls for federal grants to states, interstate, and regional water pollution control agencies to implement such plans.
- National Pollutant Discharge Elimination System Permit Program is established by Section 402 of the CWA. This program controls point source discharge from treatment plants and industrial facilities (including large animal and poultry confinement operations).
- Dredge and Fill Permit Program was established by Section 404 of the CWA. Administered by the U.S. Army Corps of Engineers, it regulates dredging, filling, and other alterations of waters and wetlands jointly with EPA, including wetlands owned by producers. Under administrative agreement, Natural Resources Conservation Service (NRCS) has authority to make wetland determinations pertaining to agricultural land.

Endangered Species Act of 1973

The Endangered Species Act (ESA) was enacted to conserve threatened or endangered species and the critical habitats in which they exist. When a species is designated as threatened with extinction, a recovery plan that includes restrictions on cropping practices, water use, and pesticide use is developed to protect the species from further population declines. All federal agencies are required to implement ESA by ensuring that federal actions do not jeopardize the continued existence of listed species.

The ESA defines an endangered species as one that is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future. T&E designations may be applied to all species of plants and animals, except pest insects. A species may be threatened at the state level, but that same designation does not automatically apply nationwide, as species numbers may be greater in other states.

The US Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) are mandated the responsibility of ensuring that other agencies plan or modify federal projects so that they will have minimal impact on listed species and their habitats. Section 7 of the ESA requires that project areas must be checked against FWS and state listings of critical habitat and T&E species. FSA ensures that all CREP contract meet this requirement by including T&E species in its EE.

The ESA also requires the delineation of the “critical habitat” of sensitive species. Critical habitat is defined by the ESA as areas that are “essential” to the conservation of listed species. Private, city, and state lands are generally not affected by critical habitat until the property producer needs a federal permit or requests federal funding. Because the Idaho CREP is partially funded by federal dollars, consultation

with FWS would be required when critical habitat is encountered. Critical habitat designations are published in the Federal Register and can be located at the FWS website—<http://endangered.fws.gov/>.

Farmland Protection Policy Act (FPPA) of 1981

The aim of the FPPA is to minimize federal programs (including technical or financial assistance) contribution to the conversion of important farmland to non-agricultural uses. The act seeks to encourage alternative, if possible, that would lessen the adverse effects to important farmlands. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land.

NRCS uses a land evaluation and site assessment (LESA) system to establish a farmland conversion impact rating score on proposed sites of federally funded and assisted projects. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level. The assessment is completed on form AD-1006, Farmland Conversion Impact Rating.

Federal Insecticide, Fungicide, and Rodenticide Act of 1947

The Federal Insecticide, Fungicide, and Rodenticide Act provides the legal basis under which pesticides are regulated. A pesticide can be restricted or banned if it poses unacceptable risks to human health or the environment. The re-registration process, mandated in 1988 for all active ingredients then on the market, has resulted in manufacturers dropping many less profitable products rather than paying the registration fees.

Food Security Act of 1985

FSA is authorized under this Act, as amended, and 7 CFR 1410 to institute the actions contemplated in this PEA (i.e. the proposed implementation of CREP). The FSA is authorized to enroll land into CREP through December 2007. Sections 1230, 1234, 1242 of the Act and 7 CFR 1410.50 authorize FSA to enter into agreements with states to use the CRP in a cost-effective manner to further specific conservation and environmental objectives of a given state and the nation. The following provisions are especially applicable to the implementation of CREP:

- Highly Erodible Land Conservation Compliance Provisions require that producers of agriculture commodities must protect all cropland classified as being highly erodible land (HEL) from excessive erosion. The provisions were amended in the 1990, 1996, and 2002 Farm Bills. The purpose of these provisions is to remove the incentive to produce annually tilled agricultural commodity crops on HEL unless it is protected from excessive soil erosion.
- Wetland Conservation Provisions (Swampbuster) help preserve the environmental functions and values of wetlands, including flood control, sediment control, groundwater recharge, water quality, wildlife habitat, recreation, and aesthetics. The 1996 Farm Bill modified Swampbuster to give USDA participants greater flexibility to comply with wetland conservation requirements and to make wetlands more valuable and functional. The 2002 Farm Bill changed the other Swampbuster provisions, including those associated with wetland determinations, mitigation (offsetting losses), "Minimal Effect" determinations, abandonment, and program eligibility.

National Environmental Policy Act of 1969 and Regulations

NEPA is intended to help federal officials make decisions that are based on consideration of the environmental consequences of their actions, and to take actions that protect, restore, and enhance the

environment. NEPA mandates that the FSA consider and document the impacts that major projects and programs would have on the environment.

CEQ Implementation Regulations

The NEPA implementation regulations found at 40 CFR 1500.

National Historic Preservation Act of 1966 and Regulations

This National Historic Preservation Act (NHPA) as amended (16 USC 470, P.L. 95-515), establishes as federal policy the protection of historic properties and their values in cooperation with other nations and with state and local governments. Amendments designated the State Historic Preservation Office (SHPO) or the Tribal Historic Preservation Office (THPO) as the party responsible for administering programs in the states or reservations.

The Act also creates the Advisory Council on Historic Preservation (ACHP). Federal agencies are required to consider the effects of their undertakings on historic resources, and to give the SHPO/THPO and, if necessary, the ACHP a reasonable opportunity to comment on those undertakings.

NHPA Implementation Regulations

The NHPA implementation regulations found at 36 CFR 800, Protection of Historic Properties. This regulation, governing compliance with Section 106 of NHPA must be followed in planning any agency activity and in the ongoing management of agency resources.

Safe Drinking Water Act of 1974

The Safe Drinking Water Act (SDWA) requires EPA to set standards for drinking water quality and requirements for water treatment of public water systems while also requiring states to establish a wellhead protection program to protect public water system wells from contamination by chemicals, including pesticides, nutrients, and other agricultural contaminants.

Sustainable Fisheries Act of 1996

The Sustainable Fisheries Act amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for “essential fish habitat” (EFH) descriptions in federal fishery management plans, it also requires federal agencies to consult with National Marine Fisheries Service (NMFS) on activities that may adversely affect EFH. Under the Magnuson-Stevens Act, NMFS must be consulted by any federal agency undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location.

Wild and Scenic Rivers Act of 1968

The purpose of the Wild and Scenic Rivers Act (WSRA) is to preserve the free-flowing state of rivers that are listed in the National Wild and Scenic Rivers System or under study for inclusion in the System because of their outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Rivers in the System are classified as wild river areas, scenic river areas, or recreational river areas. The WSRA establishes requirements applicable to water resource projects and protects both the river, or river segments, and the land immediately surrounding them. Section 7 of the WSRA specifically prohibits federal agencies from providing assistance for the construction of any water resources projects that would adversely affect Wild and Scenic Rivers.

Section 5 (d) of WSRA requires the National Park Service to compile and maintain a Nationwide Rivers Inventory (NRI), a register of river segments that potentially qualify as national wild, scenic or

recreational river areas. A river segment may be listed on the NRI if it is free-flowing and has one or more "outstandingly remarkable values." All agencies are required to consult with the National Park Service prior to taking actions which could effectively foreclose wild, scenic or recreational status for rivers on the NRI.

Executive Order 11514: Protection and Enhancement of Environmental Quality

This EO directed the federal government to provide leadership in protecting and enhancing the quality of the nation's environment to sustain and enrich human life. Federal agencies were directed to initiate measures needed to direct their policies, plans, and programs so as to meet national environmental goals. In order to achieve these goals agencies were directed to:

- Monitor, evaluate, and control on a continuing basis their activities so as to protect and enhance the quality of the environment;
- Encourage timely public information processes to foster understanding of federal plans and programs with environmental impact;
- Insure that information regarding existing or potential environmental issues be shared and coordinated with other; and
- Comply with the regulations issued by the CEQ.

Executive Order 11988: Floodplain Management—Floodplains and Wetlands

Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions:

- Acquiring, managing, and disposing of federal lands and facilities;
- Providing federally-undertaken, financed, or assisted construction and improvements;
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

Each federal agency is responsible for preparing implementing procedures for carrying out the provisions of the Order. Federal Agencies consult with FEMA concerning implementation of this EO.

Executive Order 11990: Protection of Wetlands

In order to protect wetlands, EO 11990 was signed. EO 11990 sought to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands" and minimize "to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative." To meet these objectives, the EO requires federal agencies, in planning their actions, to:

- Avoid and minimize direct or indirect loss of wetlands whenever there is a practicable alternative
- Achieve a no net loss of wetland quantity and quality through wetland replacement
- Preserve and enhance the natural and beneficial values of wetlands

Executive Order 12898, Environmental Justice for Minority and Low Income Populations

EO 12898 directs federal agencies "to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the U.S. ." Each federal agency must make achieving environmental justice one of their goals particularly when such analysis is required by NEPA. The EO and guidance emphasize the importance of NEPA's public participation process, directing each federal agency to provide opportunities for community input in the NEPA process by providing access to public documents and providing notices and hearings

Executive Order 13061, Federal Support of Community Efforts along American Heritage Rivers

EO 13061 established the American Heritage Rivers Initiative. The Initiative has three objectives: natural resource and environmental protection, economic revitalization, and historic and cultural preservation. Executive agencies, to the extent permitted by law and consistent with their missions and resources, shall coordinate federal plans, functions, programs, and resources to preserve, protect, and restore rivers and their associated resources important to our history, culture, and natural heritage. Agencies are encouraged, to the extent permitted by law, to develop partnerships with state, local, and tribal governments, community and non-governmental organizations.

Comprehensive State Groundwater Protection Program

The program was initiated by EPA in 1991. It coordinates the operation of all federal, state, tribal, and local programs that address groundwater quality. States have the primary role in designing and implementing the program based on distinctive local needs and conditions.

CRP Programmatic Environmental Impact Statement

The Federal Register dated April 24, 2002 announced the Notice of Intent of FSA to prepare a PEIS for the CRP and its counterpart the CREP. The Final PEIS was published in January 2003 and provides FSA decision makers with programmatic level analyses that provides context for state-specific EAs. The ROD was published in the Federal Register on May 8, 2003 (68 FR 24847-24854).

- USDA Departmental Regulation 9500-3

Section 1540 (c) of the Farmland Protection Policy Act and DR 9500-3 established four general categories of farmlands meriting federal protection. They are cumulatively referred to as "important farmland." Important farmland categories are:

- Prime
- Unique
- Farmland of statewide importance
- Farmland of local importance

DR 9500-3 also made it USDA policy to promote land use objectives responsive to current and long term economic, social, and environmental needs.

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APPENDIX C: BIOLOGICAL OPINION

Endangered Species Act - Section 7 Consultation

BIOLOGICAL OPINION

NMFS Log # WSB-99-462

USFWS Log # 1-3-F-0064

Washington Conservation Reserve Enhancement Program

Agency: U.S. Department of Agriculture, Farm Services Agency, Washington, D.C.

Consultation Conducted By: National Marine Fisheries Service, Northwest Region
U.S. Fish and Wildlife Service, Western Washington Office

Date Issued:

Donna Darm
Acting Regional Administrator
Northwest Region
National Marine Fisheries Service

Gerry A. Jackson
Manager
Western Washington Office
U.S. Fish and Wildlife Service

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EXECUTIVE SUMMARY

This biological opinion concludes that implementation of the Washington Conservation Reserve Enhancement Program will not jeopardize the continued existence of threatened or endangered species or species which are listed or proposed for listing under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act). The Opinion was prepared by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service (jointly, the Services) in response to the Farm Service Agency's (FSA) written request to the Services for formal consultation dated October 18, 1999, and amended on April 25, 2000.

The Conservation Reserve Enhancement Program (CREP) was established to provide a flexible and cost-effective means to address agriculture-related environmental issues by targeting Federal and state funding for restoration projects in geographic regions of particular environmental sensitivity. In April 1999 the State of Washington submitted a CREP contract proposal to the FSA to enhance riparian habitat conditions on agricultural lands along streams which provide important habitat for listed salmonid species.

The program is cooperatively administered by the Farm Service Agency and the Washington State Conservation Commission and relies on voluntary participation by landowners. The farmers and ranchers who participate in the program sign 10- to 15- year contracts with the Federal Government, agreeing to remove their land from agricultural production and planting it to woody or shrub vegetation. The landowners will be eligible to receive rental payments and other financial incentives in return for the loss of production from their lands.

The Washington CREP proposal is designed to address water quality degradation that is a direct or indirect result of agricultural activities on private lands along freshwater streams. On a statewide basis, approximately 37 percent of the freshwater salmon streams on private lands in Washington pass through agricultural land use areas. Farming and ranching activities on these lands have led to removal or elimination of native riparian vegetation with resultant increases in water temperature, rates of sedimentation, and changes in channel morphology.

The project area includes private agricultural lands along streams identified in the 1993 Salmon and Steelhead Status Inventory (SASSI) that provide habitat for salmonid stocks in depressed or critical condition and that are listed under the Federal Endangered Species Act. Up to 100,000 acres of private cropland and grazing land, including 3-4,000 miles of riparian area, will be eligible for inclusion in this program. The riparian forest buffer is the primary conservation practice authorized in the Washington CREP. It is anticipated that restoring forested riparian buffers will have a significant positive impact on the targeted freshwater streams.

The six objectives of the Washington CREP are directly related to improvement of riparian and aquatic ecosystems that provide key habitats for salmonids. These six objectives are:

- Restore 100 percent of the area enrolled for the riparian forest practice to a properly functioning condition for distribution and growth of woody plant species.
- Reduce sediment and nutrient pollution from agricultural lands next to the riparian buffers by more than 50 percent.
- Establish adequate vegetation on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.
- Reduce the rate of stream water heating to ambient levels by planting adequate vegetation on all riparian buffer lands.
- Help farmers and ranchers to meet the water quality requirements established under Federal law and Washington's agricultural water quality laws.
- Provide adequate riparian buffers on 2,700 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics that meet the habitat requirements of salmon and trout.

Washington CREP includes a set of best management practices (BMPs) designed to reduce adverse environmental impacts. These BMPs will be followed on all CREP activities and will be provided to all farmers and ranchers who enroll in the program. The Services regard these BMPs as integral components of the Washington CREP and consider them to be part of the action.

The Services believe that this programmatic consultation on the Washington CREP removes the requirement for most project level consultation. Consequently, unless otherwise identified within the biological opinion (BO), activities performed within the Washington CREP that are consistent with the BMPs described in the biological assessment (BA) and Reasonable and Prudent Measures (RPMs) and Terms and Conditions described in the BO will not require further consultation. However, the Services have identified certain activities which have a greater likelihood of adverse impacts to salmonids and their habitat which will require site-specific consultation. These activities are identified within the BO and include, but are not limited to, actions such as, bankshaping that exceeds 30 linear feet and any activities that are not consistent with the CREP BA (BMPs inclusive) and this BO (Reasonable and Prudent Measures and Terms and Conditions inclusive).

The biological opinion is rendered on the effects of the proposed activities within the riparian zone and is not, per se, an opinion on the adequacy of the buffer to meet all of the requirements for listed species. Both Services have determined that the riparian restoration activities, if installed in accordance with the criteria outlined in the Washington CREP, work towards recovering listed and proposed salmonids and are designed to provide the majority of riparian functions, particularly if maintained beyond the length of the contract (15 years). If the FSA

should seek a concurrence on the adequacy of the width of the riparian forest buffer, an analysis on how various forest buffer widths provide different levels of riparian and aquatic ecological functions would be needed. The analysis should also address what functions can be achieved in the relatively short time period of the program (15 years) and how the CREP program might be enhanced to ensure that the buffers are maintained to meet the long term recovery goals outlined in the program objectives.

The Services believe that full achievement of the Washington CREP is likely to make a very substantial contribution to the survival and recovery of those aquatic species covered by this opinion. Nonetheless, the Services also believe that some of the site-specific actions associated with CREP may result in short term adverse effects to listed fish and associated incidental take. Accordingly, the Services provided a set of nondiscretionary “reasonable and prudent measures” in the accompanying incidental take statement which they believe are necessary to minimize the take of listed species associated with the Washington CREP. The opinion also provides a set of “conservation recommendations” based on discretionary actions the Services believe the FSA and U.S. Department of Agriculture can carry out for the conservation of threatened and endangered species.

Species addressed by this opinion include Snake River sockeye salmon (*Oncorhynchus nerka*), Ozette Lake sockeye (*Oncorhynchus nerka*), Snake River fall chinook salmon (*Oncorhynchus tshawytscha*), Snake River spring/summer chinook (*Oncorhynchus tshawytscha*), Upper Columbia River spring-run chinook (*Oncorhynchus tshawytscha*), Upper Willamette spring chinook (*Oncorhynchus tshawytscha*), Puget Sound chinook (*Oncorhynchus tshawytscha*), Lower Columbia River chinook, all runs (*Oncorhynchus tshawytscha*), Hood Canal early run chum salmon (*Oncorhynchus keta*), Columbia River Chum (*Oncorhynchus keta*), Snake River Basin steelhead trout (*Oncorhynchus mykiss*), Upper Columbia River Basin steelhead (*Oncorhynchus mykiss*), Middle Columbia Basin steelhead (*Oncorhynchus mykiss*), Lower Columbia Basin steelhead (*Oncorhynchus mykiss*), Upper Willamette River steelhead (*Oncorhynchus mykiss*), Southwestern Washington / Columbia River cutthroat trout (*Oncorhynchus clarki clarki*), Bull trout (*Salvelinus confluentus*), Bald eagle (*Haliaeetus leucocephalus*), Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Nelson’s checkermallow (*Sidalcea nelsoniana*), Bradshaw’s lomatium (*Lomatium bradshawii*), and Ute’s ladie’s-tresses (*Spiranthes diluvialis*).

BIOLOGICAL OPINION

This document transmits the U.S. Fish and Wildlife Service and National Marine Fisheries Service's (collectively the Services) biological opinion based on our review of the proposed Washington State Conservation Reserve Enhancement Program (CREP), and its effects on listed and proposed species in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Formal consultation was initiated on April 3, 2000 upon receipt of the Farm Service Agency's (FSA) amendment to the biological assessment.

This Biological Opinion (BO) is based on information provided in the FSA's Biological Assessment (BA), dated October 18, 1999 and amended on April 3, 2000, the opinion prepared by the Oregon State Office for the Oregon CREP program, dated June 2, 1999, telephone conversations and correspondence with the FSA, field investigations, and other sources of information. A complete administrative record of this consultation is on file at the Western Washington Office in Lacey, Washington.

Consultation History

On June 1, 1999, the FSA submitted a request for informal consultation to the National Marine Fisheries Service (NMFS) for installation of the riparian buffers (planting) and consultation for this action was completed on June 22, 1999 (Appendix A). A draft copy of the biological assessment covering all other CREP activities (use of herbicides, installation of livestock crossings, bank stabilization etc) was prepared in August, 1998 and sent to the Upper Columbia Basin Field Office in Spokane. The Farm Service Agency requested comments to the draft in an e-mail message, dated August 17, 1999. The Spokane office of the U.S. Fish and Wildlife Service provided input in their September 2, 1999 letter, including the need to change the effects determination for instream work, re-evaluate impacts to eagles from non-noise generating activities, and clarifying the benefits of the program to bull trout. In a subsequent letter, dated December 1, 1999, the Spokane Office indicated that they were unable to process the request for formal consultation due to staffing shortages and that the lead for the CREP program would be transferred to the Western Washington Office (WWO). The WWO reviewed the biological assessment and noted some discrepancies between the Oregon and Washington CREP assessments, including effects determinations and the omission of several species, such as the Columbia white-tail deer, coastal cutthroat trout, Nelson's checkermallow and Bradshaw's lomatium, as well as three of the salmon species, which were listed on the species list for Washington. The WWO addressed the need to incorporate these revisions in a letter dated January 20, 2000 (Appendix B). Due to staffing changes in the Washington DC Office of the FSA, including the transfer of the biologist who prepared the biological assessment, the responsibility of making revisions to the assessment was directed to the Washington State FSA office in Spokane. The amendment containing the additional information and requesting initiation of formal consultation was received in the Western Washington Office on April 3, 2000.

(Appendix C). A letter from FSA (Spokane) was sent to NMFS requesting inclusion of 3 additional species in the BA on July 18, 2000 (Appendix D).

In May, 2000, a multi-agency committee (USFWS, NMFS, Washington State Department of Agriculture, Environmental Protection Agency and others) was established to evaluate the effects of the most commonly used agricultural chemicals, including those proposed for the CREP program, on listed salmonids. This information was used in the development of the Best Management Practices and Terms and Conditions of this Biological Opinion.

Other sources of information used in this opinion include the *Washington State's Proposal to Participate in the Conservation Reserve Enhancement Program*, dated April 19, 1999, *Agreement between the U.S. Department of Agriculture Commodity Credit Union and the State of Washington Concerning the Implementation of a Conservation Reserve Enhancement Program* (CREP Co-op Agreement, Appendix E), dated October 19, 1998, the FSA's CREP Manual, file materials, the Services' Biological Opinions on the USFWS Partners for Fish and Wildlife program, all relevant approved recovery plans, and the Federal Register notices of proposed and final listing rules for species covered in this opinion (Table 1). This programmatic consultation covers the Washington CREP through the year 2015.

Description of the Proposed Action

Overview

The following description of the CREP program is taken largely from the CREP BA and from correspondence among the Services and FSA. The CREP BA was modified by the January 20, 2000 letter to incorporate a number of recommendations made by the USFWS regarding the proposed action and to clarify questions raised in the USFWS' letter to FSA. The CREP program is based on the CRP authorized under the provisions of the Food Security Act of 1985, as amended (16 U.S.C. 3830 *et seq.*) and the regulations at 7 C.F.R. Part 1410. As a result, conservation practices referred to in the CREP BA and other supporting documents are defined according to Conservation Reserve Program (CRP) rules and regulations (Appendix F). The proposed action is limited to the installation and maintenance of those conservation practices referred to in the CREP BA. Activities that differ from those described in the BA will require additional site-specific consultation with the Services.

The CREP project area includes private agricultural lands along all streams in Washington which currently or potentially provides habitat for 17 species or Evolutionarily Significant Units (ESU) of salmon and trout which are listed under the Act. Up to 100,000 acres of private cropland and grazing land will be eligible for inclusion in this program. Under the program, riparian buffers averaging 100 feet in width would be installed along approximately 3,000-4,000 miles of streams. It is estimated that there are approximately 50,000 miles of anadromous fish-bearing streams in the state. About 15-20,000 miles pass through privately owned agricultural lands. The scope of the Washington CREP program is adequate to address about 20 percent of the highest priority salmon streams on agricultural lands. The stream segments eligible under the program are those identified in the 1993 Salmon and Steelhead Status Inventory and are highlighted in Figure 1.

In June 1999, the CREP agreement between the USDA and the state of Washington incorporated new requirements for the Natural Resources Conservation Service (NRCS) riparian buffer standard (Appendix G) which increased the buffer to 75 percent of a site-potential tree height or 50 feet in areas where trees were not historically present or cannot be re-established (see Appendix H). A new conservation practice, the Herbaceous Riparian Cover practice, has also been approved by the NRCS and is awaiting USDA clearance before it may be used in the Washington CREP program. If approved as proposed, it will be eligible for inclusion in the program.

This CREP proposal is designed to address water quality degradation which is a direct or indirect result of agricultural activities on private lands along freshwater streams. Farming and ranching activities on these lands have led to removal or elimination of native riparian vegetation with resultant increases in water temperature, rates of sedimentation, and changes in channel morphology.

Under this program, farmers and ranchers who voluntarily participate will enter into a contract with the Federal government for 10 to 15 years, agreeing to remove portions of their land from agricultural production and plant grass, shrubs and trees in place of agricultural commodities. These producers will be eligible to receive rental payments and other financial assistance in return for removal of their lands from agricultural production. For non-irrigated land, farmers and ranchers will be paid the federally-established dry land soil rental rates. Where land is irrigated, an irrigated soil rental rate will be paid when farmers and ranchers agree to lease the appurtenant water right to the State for instream use.

Farmers and ranchers will receive incentive payments for participation in this program which will be 35 percent above the normal annual rental rate for installation of riparian buffers. Where at least 50 percent of the land along a five mile stretch of stream is enrolled under the program prior to January 1, 2002, producers will receive an additional incentive equal to four times the base annual rental rate. A total of 75 percent of the installation cost of conservation practices will be paid through a combination of State and Federal funds. The total cost of the CREP project is estimated to be \$251,000,000 over 15 years.

Table 1. Species covered in the Biological Opinion for the Washington Conservation Reserve Enhancement Program.

GROUP	SPECIES	STATUS	LEAD AGENCY
Fishes	Snake River sockeye salmon (<i>Oncorhynchus nerka</i>)	E, CH	NMFS
	Ozette Lake sockeye salmon (<i>Oncorhynchus nerka</i>)	T, CH	NMFS
	Snake River fall chinook salmon (<i>Oncorhynchus tshawytscha</i>)	T, CH	NMFS
	Snake River spring/summer chinook salmon (<i>Oncorhynchus tshawytscha</i>)	T, CH	NMFS
	Upper Columbia River spring-run chinook salmon (<i>Oncorhynchus tshawytscha</i>)	E, CH	NMFS
	Lower Columbia River chinook salmon, all runs (<i>Oncorhynchus tshawytscha</i>)	T, CH	NMFS
	Puget Sound chinook salmon (<i>Oncorhynchus tshawytscha</i>)	T, CH	NMFS
	Upper Willamette River spring chinook salmon (<i>Oncorhynchus tshawytscha</i>)	T, CH	NMFS
	Hood Canal early-run Chum salmon (<i>Oncorhynchus keta</i>)	T, CH	NMFS
	Columbia River Chum salmon (<i>Oncorhynchus keta</i>)	T, CH	NMFS
	Snake River steelhead (<i>Oncorhynchus mykiss</i>)	T, CH	NMFS
	Upper Columbia River steelhead (<i>Oncorhynchus mykiss</i>)	E, CH	NMFS
	Middle Columbia River steelhead (<i>Oncorhynchus mykiss</i>)	T, CH	NMFS
	Lower Columbia River steelhead (<i>Oncorhynchus mykiss</i>)	T, CH	NMFS
	Upper Willamette River steelhead (<i>Oncorhynchus mykiss</i>)	T, CH	NMFS

GROUP	SPECIES	STATUS	LEAD AGENCY
	Southwestern Washington / Columbia River cutthroat trout (<i>Oncorhynchus clarki clarki</i>)	PT	USFWS
Fish Continued	Bull trout (<i>Salvelinus confluentus</i>)	T	USFWS
Birds	Bald eagle (<i>Haliaeetus leucocephalus</i>)	T	USFWS
Mammals	Columbian white-tailed deer (<i>Odocoileus virginianus leucurus</i>)	E	USFWS
Plants	Nelson's checkermallow (<i>Sidalcea nelsoniana</i>)	T	USFWS
	Bradshaw's lomatium (<i>Lomatium bradshawii</i>)	E	USFWS
	Ute's Ladie's tresses (<i>Spiranthes diluvialis</i>)	T	USFWS

E = Endangered, T = Threatened, PE = Proposed Endangered, PT = Proposed Threatened, CH = Critical Habitat, PCH = Proposed Critical Habitat

Objectives of the Washington CREP

The six objectives of the Washington CREP are directly related to improvement of freshwater stream systems which provide key habitat for salmonids. These objectives are:

1. Restore 100 percent of the area enrolled for the riparian forest practice to a properly functioning condition in terms of distribution and growth of woody plant species.
2. Reduce sediment and nutrient pollution from agricultural lands adjacent to the riparian buffers by more than 50 percent.
3. Establish adequate vegetation on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.

4. Reduce the rate of stream water heating to ambient levels by planting adequate vegetation on all riparian buffer lands.
5. Provide a contributing mechanism for farmers and ranchers to meet the water quality requirements established under Federal law and Washington's agricultural water quality laws.
6. Provide adequate riparian buffers on 2,700 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics which meet the habitat requirements of salmon and trout.

Description of the Washington CREP

The Washington CREP is a comprehensive, state-wide program designed to reduce and mitigate agriculture-related impacts on streams that provide current or historical habitat for salmon and trout listed pursuant to the Act. In addition to the CREP BA, details of the Washington CREP program are set forth in the CREP Co-op Agreement and in FSA's CREP Manual.

The primary mechanism to accomplish this program will be through the establishment of forested riparian buffers. Farmers and ranchers will be afforded the opportunity to voluntarily enter into 10 to 15 year contracts with USDA to plant grasses, shrubs and/or trees on riparian lands they own or manage along salmon and trout streams. Applications from all eligible producers will be accepted into the program on a first-come, first-served basis up to a maximum enrollment of 100,000 acres. Figure 1 of the BA depicts the areas eligible for enrollment under this program, and is herein incorporated by reference.

Forest riparian buffers (practice code CP 22) will be the primary conservation practice used for this program. Grass filter strips (practice code CP 21) and herbaceous riparian cover (if approved as proposed) will be used on cropland only where analysis of available records (historical accounts and photographs) indicates that no trees or shrubs, including willow (*Salix* spp.) or cottonwoods, existed on the site within historic times. Additionally, if the herbaceous riparian cover practice is approved as proposed, the grass filter strip practice will only be used upslope of the herbaceous riparian cover practice.

These conservation practices shall be installed in accord with all applicable CRP statutes (16 U.S.C. 3831 *et seq.*), regulations and the CREP Manual. In addition, the practices shall be consistent with the specifications outlined in the applicable NRCS Field Office Technical Guides. Appendices E and F of the BA consist of a current copy of the CRP practices from the FSA national policy handbook (2-CRP) and copies of the current NRCS Washington Practice Standards and Specifications (incorporated herein by reference).

The State of Washington, NRCS, USFWS, NMFS, and the Environmental Protection Agency (EPA) have signed an October 19, 1998 Memorandum of Understanding (NRCS MOU) which provides for the enhancement of the NRCS Field Office Technical Guides (FOTG) as appropriate to better meet endangered species and water quality issues. The CREP Co-op Agreement between the State of Washington, the Commodity Credit Corporation and FSA, signed April 19, 1999 recognizes that future modifications to the current FOTGs may be implemented, and it provides for the modified practice standards to be implemented within the context of the CREP. The state-wide Agriculture, Fish and Water (AFW) forum, a working group representing agriculture, federal and state agencies, tribes, and the environmental community, is chartered with updating the FOTGs and ensuring adequate instream flows by updating agricultural practices to meet requirements under the Endangered Species and Clean Water Acts. The Services fully expect these ongoing modifications will provide greater protection to the listed species targeted under this program. A virtually identical group under the auspices of the AFW process is reviewing the practices of the irrigation districts to ensure that adequate stream flows and fish passage, among other requirements, are provided for salmon, steelhead, coastal cutthroat, and bull trout.

According to the BA, riparian buffers will be installed on 90 percent of the lands enrolled under the CREP. During negotiations in 1999, the National Marine Fisheries Service (NMFS), Natural Resources Conservation Service (NRCS), Washington State Department of Agriculture, and the FSA agreed to seventy-five percent of a site potential tree height as the minimum buffer width for the Washington State CREP program. For most sites, the site potential tree height shall be defined as the average height at 100 years of the tallest conifer species native to the site. For sites that historically supported cottonwoods as the largest tree, the site potential tree height is defined as the height of a 50-year old black cottonwood. In areas where trees did not historically occur or where they cannot be established, the minimum width of the buffer was set at 50 feet and will be planted to woody shrubs, forbs or other vegetation native to the site. The program will fund activities up to a maximum width of 150 feet. However, this width can be exceeded to accommodate particular resource objectives on a site-specific basis.

It is important to note that CREP is a national habitat restoration program that allows practices to be customized to meet local, state, and regional needs. This is particularly true as applied to the width and composition of the riparian buffers. This biological opinion is rendered on the effects of the activities proposed within the riparian buffer zone and is not, per se, an opinion on the adequacy of buffer widths to meet all of the functional needs of listed salmonids and, therefore, all of the requirements under the Endangered Species or Clean Water Acts. These determinations must be made on a site by site basis and reflect topography, land use practices, fish needs within particular stretches of rivers, etc. These issues are currently being negotiated within the context of the AFW process with the expectation that "Best Management Practices" will be adopted into the NRCS farm practices that will, if implemented, meet all of the requirements under both the Endangered Species Act and the Clean Water Act.

Under this program, funds can only be used to install and maintain conservation practices on eligible cropland and marginal pastureland. No instream work (i.e., work within the “streambank width”) will be undertaken except for the installation of offstream livestock watering facilities and livestock crossings across small streams. The definition of the term “streambank width” as used in the BA, CREP Co-op Agreement, and CREP Manual is the width of the stream at “bankfull discharge”:

Bankfull discharge: The discharge that controls the shape of the stream channel; the discharge which is most efficient, transporting the most sediment and water with the least amount of energy. The level of the active floodplain (Leopold 1994).

According to the BA, nearly 60 percent of the land which will be enrolled under this program is pasture or range land. Pursuant to existing law (16 U.S.C. 3831(b)(3)), marginal pastureland can only be enrolled in the Conservation Reserve Program, and thus in CREP, if planted with trees in or near riparian areas. Therefore, all marginal pastureland will be planted with trees.

In any case where USDA pays the irrigated cropland rental rates to a participating farmer, that portion of the existing water right appurtenant to the enrolled acreage shall be dedicated for instream flow pursuant to the laws of the State of Washington for the duration of the CREP contract. At the end of the CREP contract, water right holders will have several options: resume the right for the authorized purpose on all lands to which it is appurtenant, continue leasing the water for instream use, transfer the instream right to the State, transfer the right to other lands, or abandon the water right. Based on the average statewide agricultural irrigation water usage of three acre feet for each acre of agricultural land, as cited in the BA, CREP is projected to restore up to 60,000 acre feet of water per year to salmon and trout streams.

The Washington CREP proposes a cumulative impact incentive designed to encourage adjacent farmers and ranchers to enter the program to concentrate the use of restoration practices, thereby increasing the effectiveness of those practices. Under this incentive system, USDA will make a one-time payment to all enrollees when a sufficient number of landowners agree to participate along a particular stream. This incentive payment would be made in any case where a total of at least 50 percent of the streambank within a five-mile stream segment is enrolled under the program. The incentive will be four times the base annual rental rate (without inclusion of any other incentives) for each acre enrolled. Enrollees would be eligible for this incentive only through the end of calendar year 2002, which will encourage producers to enroll soon after the program is established. Under this CREP agreement, farmers and ranchers will be eligible to enroll in contracts of 10 to 15 years duration, but administering agencies intend to encourage enrollment in longer contracts.

The State and USDA will jointly administer this CREP. The primary responsibilities of the various Federal and State agencies involved in the implementation of this CREP are as follows:

The FSA will:

- develop recommendations for soil rental rates;
- work with Washington Department of Fish and Wildlife (WDFW), NMFS and USFWS to determine streams eligible for inclusion in the program;
- determine eligibility for the cumulative impact payments;
- approve CREP contracts; and
- prepare monitoring reports for anticipated incidental take and insure program compliance with the Endangered Species and Clean Water Acts

The NRCS will:

- determine acreage eligible and suitable for enrollment;
- participate in development and approval of all conservation plans;
- develop specifications, provide oversight during installation, certify completion of filter strips and wetland restoration practices;
- complete required status reviews; and
- develop tree planting specifications, provide oversight during installation and certify the completion of all installations of forested riparian buffers.

The Conservation District, funded by the State of Washington, will:

- provide outreach on the program and assist landowners in the development of conservation plans;
- provide technical assistance in the development of conservation plans; and
- coordinate and fund the overall the annual monitoring effort by the various State agencies.

Monitoring

The Washington CREP monitoring program will build on existing monitoring programs of the Department of Ecology, Washington State Conservation Commission, and the Natural Resources Conservation Service. Where available, this program will utilize existing data from other Federal and citizen monitoring programs.

As a condition for funding, participant landowners must agree to allow access to sites for monitoring purposes including pre-treatment baseline data collection. Participants will be informed that effectiveness monitoring sites will be selected randomly. Participants will be informed that data will be collected to assess the effectiveness of the program in reaching water quality and aquatic habitat goals and not for enforcement purposes. If potential violations are discovered, the appropriate agency will work cooperatively with the landowner to achieve compliance.

The near-term focus of the CREP monitoring program will be on project documentation, plant growth and survival, and the effects of riparian treatments on instream water quality conditions. The extended response time associated with riparian forest growth and recovery necessitates a

commitment to long-term monitoring. Mid-term monitoring will incorporate stream shading, temperature monitoring and channel morphology. Large woody debris recruitment is a long-term component of the CREP.

The Washington Conservation District currently collects data on riparian enhancement activities throughout the state using a written survey method. This inventory should be expanded to address specific monitoring questions for the CREP.

Effectiveness monitoring will focus on the specific project objectives and will be addressed in the field. Data collection will follow existing protocols. Primary focus of the monitoring plan will be to insure that the practices are accomplished and meet the objectives outlined in the CREP contract. The NRCS and/or FSA will evaluate planting success and effectiveness of fencing, bank stabilization and livestock crossings for all enrolled properties. A subset of completed CREP projects will be randomly selected to evaluate the long-term success of the CREP program. Where feasible, monitoring will include both treated and reference sites.

Water quality parameters are monitored at selected sites throughout the state by the Department of Ecology. These include stream temperature, sediment deposition, and agriculture chemical concentrations. Additional water quality monitoring sites may be established at upstream and downstream locations from a subset of the areas treated in the CREP program if not already included in the existing sites. Since the long-term benefits of restoration activities such as planting for shade and future recruitment of large woody material may not be measurable for many years, effectiveness monitoring should occur throughout the life of the program.

Bank stability and stream channel morphology should also be evaluated. Riparian tree growth and survival will be assessed by NRCS and will include assessment of woody and herbaceous browsing. Fish populations will be sampled as part of WDFW's regular stream surveys to determine if treated reaches provide favorable habitat for salmonids.

Outreach

The overall success of this voluntary program will be directly correlated to the level of enrollment by farmers and ranchers. A critical aspect of securing enrollment is distribution of program information and education of producers. Research has shown that one-on-one discussions of agricultural programs between producers and key individuals (USDA representatives, Extension agents, and other producers) is the most effective way to secure producer participation. Therefore, broad public outreach by Federal and State employees is proposed as a major component of this program.

In addition, the State will develop public outreach material in cooperation with the USDA agencies (FSA, NRCS) and WDFW. Information will address native fish and water quality issues. Local community groups (watershed councils, local FSA committees, and Soil and Water

Conservation Districts) will identify interested landowners and develop cooperative landowner outreach efforts. Several interagency efforts are currently underway to develop criteria for water withdrawals and to review the NRCS standards and guidelines as they relate to agricultural practices. The Agriculture, Fish and Water process (AFW) consists of the Irrigation District (ID) and Field Office Technical Guide (FOTG) Committees. These efforts are being conducted in conjunction with the major agricultural representatives, state legislature, tribes and environmental groups. Some of the outcomes of these negotiations may be incorporated into the CREP program practices in the future.

Best Management Practices

Best management practices (BMPs) are designed to reduce adverse environmental impacts resulting from the installation of CREP practices. The Services consider these BMPs to be part of the CREP action. For the analysis presented in this BO, the Services assume that these BMPs will be binding requirements within each contract. Consequently, the following BMPs will be required of all farmers and ranchers who enroll in the program.

1. All terms and conditions in regulatory permits and other official project authorizations to eliminate or reduce adverse impacts to any endangered or threatened species or their critical habitats will be followed.
2. Restoration activities at individual project sites will be completed in an expeditious manner. In addition, appropriate work timing windows will be used to reduce disturbance and/or displacement of fish and wildlife species in the immediate project area.
3. Vehicular access ways to project sites must minimize impacts on riparian corridors.
4. Use of heavy equipment and techniques that will result in soil disturbance or compaction of soils, especially on steep or unstable slopes, will be minimized.
5. Vehicles will not enter or cross streams except in cases where no alternative exists. Where stream crossings are required, the number of crossings will be minimized. Vehicles and machinery will cross streams at right angles to the main channel whenever possible. Any stream crossings will be consistent with WDFW hydraulic code instream operating restrictions.
6. Staging and refueling areas will be located outside of the riparian area and away from water sources/drainages to prevent potential contamination of any waterbody.
7. There will be no instream work except for installation of livestock crossings and installation of offstream livestock watering facilities. Bank shaping will be done from the top of the bank.

8. Vegetative planting techniques must not cause major disturbances to soils and slopes. Hand planting is the preferred technique for all planting. Plantings will occur during the appropriate seasonal period for the respective plant species involved.
9. The evaluation of herbicide use will include the accuracy of applications, effects on target and non-target species, and the potential impacts to aquatic and terrestrial ecosystems. All chemical applications will follow label instructions as well as adhere to the guidance in 10 and 11 below. Projects specifications, to be developed by qualified agency personnel, will fully address timing, rate of application and application methodology.
10. Since the use of herbicides to establish riparian vegetation may require application distances closer to the streams than is recommended by the manufacturer on the product labels, the following prioritization shall be given for the 7 chemicals requested for use under the CREP program in order to minimize impacts to both aquatic and terrestrial organisms:
 1. Glyphosate - formulation in Rodeo, rather than Roundup
Triclopyr - using formulations in Crossbow or Garlon 3A, rather than Garlon 4
 2. Sulfometuron-methyl (trade name Oust)
Oxyflourfen (trade name Goal)
2,4-D (amine, or salt formulation)

The following chemicals are known to be toxic to fish, amphibians, and/or migratory birds or are currently under investigation. These chemicals should only be used if *no other* control mechanisms exist:

Atrazine and Hexazinone, both triazine derivatives

11. Chemicals shall be applied by hand, using backpack or small vehicle-mounted sprayers (ATV or pickup). There shall be no aerial application of chemicals.
12. Sedimentation and erosion controls will be implemented on all project sites where the implementation of restoration activities has the potential to deposit sediment into a stream or waterbody. Control structures/techniques may include, but are not limited to, silt fences, straw bale structures, seeding by hand and hydro-seeding, jutte mats, and coconut logs. Grading and shaping will generally restore natural topography and hydrology.
13. Streambank shaping will only be implemented where streambank stability is extremely poor or where necessary to restore riparian functions. Streambank modification for planting purposes will be thoroughly documented, and on each CREP contract where more than 30 linear feet of streambank is shaped by mechanical equipment, USDA will consult

with the Services. Design of all streambank modification projects will recognize the important wildlife values provided along naturally eroding outside meander curves. Any soil control structures will be bio-engineered to the extent possible. No rip rap will be used under this program for streambank stabilization. No streambank stabilization activity will reduce natural stream functions or floodplain connection.

14. Qualified agency personnel will develop plant specifications detailing seedlings, sources for seed, handling of plant material, and planting techniques. Seedling competition will be reduced by controlling grasses, forbs, and undesirable woody shrubs (non-native) from around each seedling for an appropriate distance. Proper methods to protect seedlings from animal, insect, and environmental damage will be employed.
15. Fence designs (e.g., wire type and wire spacing) will be in accord with NRCS standards. Fencing projects on Puget Island, the Hunting Islands, Price Island, and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of Skamokawa Creek in Wahkiakum County will use only 3-strand barbed wire to minimize impacts to Columbian white-tailed deer and their movements.
16. Off-channel livestock watering facilities will not be located in areas where compaction and/or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock. Livestock stream crossings will only be constructed on small streams. Crossings will not be placed on the mid- to downstream end of gravel point bars. Crossings will generally be 30 feet or less in width. Any culverts constructed for livestock crossing purposes will meet NMFS guidelines. Livestock fords across streams will be appropriately rocked to stabilize soils/slopes and prevent erosion. Fords will be placed on bedrock or stable substrates whenever possible.
17. Native vegetation will be used. Where use of native vegetation is not feasible, similar species which are functional equivalents and known not to be aggressive colonizers may be substituted. Hybrid cottonwoods are not approved for use in this program.
18. For any project within $\frac{1}{4}$ mile non-line-of-sight or $\frac{1}{2}$ mile line-of-sight of an eagle nest identified by WDFW, no activities producing noise above ambient levels will occur at the site from January 1 to August 31. If a proposed activity is near a bald eagle nest and must occur during this restricted period, site-specific consultation with USFWS will be initiated to evaluate the potential for adverse effects.
19. Survey data from USFWS and Washington Natural Heritage Inventory will be used to identify potential locations where listed and proposed plant species (see Table 2) may be located along stream corridors within the project area. Where required, surveys by trained personnel will be conducted for the presence of these species. Any locations of these plants identified in a survey will be avoided through redesign of the project as necessary.

20. Restoration activities on Puget Island, the Hunting Islands, Price Island, and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of Skamokawa Creek in Wahkiakum County will not occur from June 1 to June 30, to avoid and minimize impacts to Columbian white-tailed deer during the fawning season.

Table 2. Soil type associations of listed and proposed plants that may be affected by the Washington Conservation Reserve Enhancement Program.

Species	Location	Habitat	NRCS Mapped Soil Unit	Soil Series
Nelson's Checkermallow (<i>Sidalcea nelsoniana</i>)	Willapa Hills/Coast Range extension Cowlitz County	Wetlands and riparian areas	STATSGO 81 and STATSGO 91	Wapto, Bashaw, Mcalpin; and, Malabon, Coburg, Salem
Ute Ladies'tresses (<i>Spiranthes diluvialis</i>)	Okanogan County	Floodplain and wet meadows	STATSGO 81 and STATSGO 91	Wapto, Bashaw, Mcalpin; and, Malabon, Coburg, Salem
Bradshaw's Lomatium (<i>Lomatium bradshawii</i>)	Willamette Valley and Clark County in Washington	Wet prairies	STATSGO 81	Wapto, Bashaw, Mcalpin

Note: The USFWS has been able to further refine the soils data provided during informal consultation and development of the FSA's biological assessment. However, additional refinement of the soil types or series on which all CREP projects will require botanical surveys cannot be completed until additional data are made available on the NRCS SSURGO database. Once the relevant data are made available, the USFWS will work with FSA and NRCS to further reduce the required level of survey effort by developing more refined plant/soil associations.

Environmental Baseline

Regulations implementing section 7 of the Act (51 Fed. Reg. 19957; 1986) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. The environmental baseline also includes the anticipated impacts of all proposed Federal projects in the action area that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

The action area is defined to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of this consultation, the action area includes all lands where CREP projects may be implemented within the State of Washington, and all areas downstream from these sites.

The following Environmental Baseline discussion focuses primarily on the baseline conditions of streams inhabited by the 13 listed salmonid fishes that are the target species for the Washington CREP program, and two non-target listed or proposed fish species: the bull trout and coastal cutthroat trout. All of these aquatic species, though variable in their biological and life history traits, would experience the impacts of agricultural practices in similar ways, though to varying degrees. The environmental baseline for non-target terrestrial species is addressed near the end of this section of the Biological Opinion.

The current population status of the proposed, listed and candidate species addressed in this Biological Opinion is described below. For some species, adequate population data are lacking, and habitat conditions provide a means of evaluating the status of the species.

Status of Aquatic Species within the Action Area

Snake River Sockeye Salmon

Snake River sockeye salmon are listed as endangered in the Federal Register (56 Fed. Reg. 58519; 1991). The following summary information is taken from that Federal Register.

Snake River sockeye salmon enter the Columbia River primarily during June and July. Arrival at Redfish Lake, Idaho, which now supports the only remaining run of Snake River sockeye salmon, peaks in August and spawning occurs primarily in October. Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for three to five weeks, emerge in April through May, and move immediately into the lake where juveniles feed on plankton for one to three years before migrating to the ocean. Migrants leave Redfish Lake from late April through May, and smolts migrate almost 900 miles to the Pacific Ocean.

The critical habitat for the Snake River sockeye salmon was designated in December 1993 (58 Fed. Reg. 68543; 1993). The designated habitat consists of river reaches of the Columbia, Snake, and Salmon Rivers, Alturas Lake Creek, Valley Creek, and Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks).

Passage at Lower Granite Dam (the first dam on the Snake River downstream from the Salmon River) ranges from late April to July, with peak passage from May to late June. Once in the ocean, the smolts remain inshore or within the Columbia River influence during the early summer months. Later, they migrate through the northeast Pacific Ocean. Snake River sockeye salmon usually spend two to three years in the Pacific Ocean and return in their fourth or fifth year of life. Historically, the largest numbers of Snake River sockeye salmon returned to headwaters of the Payette River, where 75,000 were taken one year by a single fishing operation in Big Payette Lake. During the early 1880s, returns of Snake River sockeye salmon to the headwaters of the Grande Ronde river in Oregon (Walleye Lake) were estimated between 24,000 and 30,000 at a

minimum. During the 1950s and 1960s, adult returns to Redfish Lake numbered more than 4,000 fish.

Snake River sockeye salmon returns to Redfish Lake since at least 1985, when the Idaho Department of Fish and Game began operating a temporary weir below the lake, have been extremely small (one to 29 adults counted per year). Snake River sockeye salmon have a very limited distribution relative to critical spawning and rearing habitat. Redfish Lake represents only one of the five Stanley Basin lakes historically occupied by Snake River sockeye salmon and is designated as critical habitat for the species.

Ozette Lake Sockeye Salmon

Ozette Lake sockeye salmon were listed as threatened in March 1999 (64 Fed. Reg. 14528; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11750; 1998).

This ESU consists of sockeye salmon that return to Ozette Lake through the Ozette River and currently spawn primarily in lakeshore upwelling areas in Ozette Lake (particularly at Allen's Bay and Olsen's Beach). Minor spawning may occur below Ozette Lake in the Ozette River or in Coal Creek, a tributary of the Ozette River.

Critical Habitat includes all lake areas and river reaches accessible to listed sockeye salmon in Ozette Lake, located in Clallam County, Washington. Accessible areas are those within the historical range of the ESU that can still be occupied by any life stage of sockeye salmon. Inaccessible areas are those above longstanding, naturally impassible barriers. Critical Habitat includes riparian areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

The 1992-1996 5-year average annual escapement for this ESU was about 700. Historical estimates indicate run sizes of a few thousand sockeye salmon in 1926, with a peak recorded harvest of nearly 18,000 in 1949. Estimates indicate that recent abundance is substantially below the historical abundance range for this ESU. Declines are likely a result of a contribution of factors, possibly including introduced species, predation, loss of tributary populations, decline in quality of beach spawning habitat, temporarily unfavorable oceanic conditions, excessive historical harvests, and introduced diseases.

Chinook Salmon

The following summary of general life history and ecology is taken from the Federal Register (63 Fed. Reg. 11481; 1998). Chinook salmon are easily distinguished from other *Oncorhynchus* species by their large size. Adults weighing over 120 pounds have been caught in North American waters. Chinook salmon are very similar to coho salmon in appearance while at sea

(blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth. Chinook salmon are anadromous and semelparous. This means that as adults, they migrate from a marine environment into the freshwater streams and rivers of their birth (anadromous) where they spawn and die (semelparous). Adult female chinook will prepare a spawning bed, called a redd, in a stream area with suitable gravel composition, water depth and velocity. Redds will vary widely in size and in location within the stream or river. The adult female chinook may deposit eggs in four to five “nesting pockets” within a single redd. After laying eggs in a redd, adult chinook will guard the redd from four to 25 days before dying. Chinook salmon eggs will hatch, depending upon water temperatures, between 90 to 150 days after deposition. Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs. Juvenile chinook may spend from three months to two years in freshwater after emergence and before migrating to estuarine areas as smolts, and then into the ocean to feed and mature.

Among chinook salmon two distinct races have evolved. One race, described as a “stream-type” chinook, is found most commonly in headwater streams. Stream-type chinook salmon have a longer freshwater residency, and perform extensive offshore migrations before returning to their natal streams in the spring or summer months. The second race is called the “ocean-type” chinook, which is commonly found in coastal streams in North America. Ocean-type chinook typically migrate to sea within the first three months of emergence, but they may spend up to a year in freshwater prior to emigration. They also spend their ocean life in coastal waters. Ocean-type chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate. The difference between these life history types is also physical, with both genetic and morphological foundations.

Juvenile stream- and ocean-type chinook salmon have adapted to different ecological niches. Ocean-type chinook salmon tend to utilize estuaries and coastal areas more extensively for juvenile rearing. The brackish water areas in estuaries also moderate physiological stress during parr-smolt transition. The development of the ocean-type life history strategy may have been a response to the limited carrying capacity of smaller stream systems and glacially scoured, unproductive, watersheds, or a means of avoiding the impact of seasonal floods in the lower portion of many watersheds.

Stream-type juveniles are much more dependent on freshwater stream ecosystems because of their extended residence in these areas. A stream-type life history may be adapted to those watersheds, or parts of watersheds, that are more consistently productive and less susceptible to dramatic changes in water flow, or which have environmental conditions that would severely limit the success of subyearling smolts. At the time of saltwater entry, stream-type (yearling) smolts are much larger, averaging 73-134 mm depending on the river system, than their ocean-type (subyearling) counterparts and are, therefore, able to move offshore relatively quickly.

Coast wide, chinook salmon remain at sea for one to six years (more common, two to four years), with the exception of a small proportion of yearling males, called jack salmon, which mature in

freshwater or return after two or three months in salt water. Ocean- and stream-type chinook salmon are recovered differentially in coastal and mid-ocean fisheries, indicating divergent migratory routes. Ocean-type chinook salmon tend to migrate along the coast, while stream-type chinook salmon are found far from the coast in the central North Pacific. Differences in the ocean distribution of specific stocks may be indicative of resource partitioning and may be important to the success of the species as a whole.

There is a significant genetic influence to the freshwater component of the returning adult migratory process. A number of studies show that chinook salmon return to their natal streams with a high degree of fidelity. Salmon may have evolved this trait as a method of ensuring an adequate incubation and rearing habitat. It also provides a mechanism for reproductive isolation and local adaptation. Conversely, returning to a stream other than that of one's origin is important in colonizing new areas and responding to unfavorable or perturbed conditions at the natal stream.

Chinook salmon stocks exhibit considerable variability in size and age of maturation, and at least some portion of this variation is genetically determined. The relationship between size and length of migration may also reflect the earlier timing of river entry and the cessation of feeding for chinook salmon stocks that migrate to the upper reaches of river systems. Body size, which is correlated with age, may be an important factor in migration and redd construction success. Under high density conditions on the spawning ground, natural selection may produce stocks with exceptionally large-sized returning adults.

Early researchers recorded the existence of different temporal "runs" or modes in the migration of chinook salmon from the ocean to freshwater. Freshwater entry and spawning timing are believed to be related to local temperature and water flow regimes. Seasonal "runs" (i.e., spring, summer, fall, or winter) have been identified on the basis of when adult chinook salmon enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning. Egg deposition must occur at a time to ensure that fry emerge during the following spring when the river or estuary productivity is sufficient for juvenile survival and growth.

Pathogen resistance is another locally adapted trait. Chinook salmon from the Columbia River drainage were less susceptible to *Ceratomyxa shasta*, an endemic pathogen, than stocks from coastal rivers where the disease is not known to occur. Alaskan and Columbia River stocks of chinook salmon exhibit different levels of susceptibility to the infectious hematopoietic necrosis virus (IHNV). Variability in temperature tolerance between populations is likely due to selection for local conditions; however, there is little information on the genetic basis of this trait.

Physical and chemical habitat characteristics for chinook salmon, in general are as follows:

- Temperatures for optimal egg incubation are 5.0-14.4 °C.
- Upper lethal limit is 25.1 °C, but may be lower depending on other water quality factors.

- Dissolved oxygen for successful egg development in redds is ≥ 5.0 mg/l, and water temperatures of 4-14 °C.
- Freshwater juveniles avoid water with ≤ 4.5 mg/l dissolved oxygen at 20 °C.
- Migrating adults will pass through water with dissolved oxygen levels as low as 3.5-4.0 mg/l. Excessive silt loads ($>4,000$ mg/l) may halt chinook salmon movements or migrations. Silt can also hinder fry emergence, and limit benthic invertebrate production. Low pH decreases egg and alevin (larval stage dependent on yolk sac as food) survival.

Sneke River Fall Chinook Salmon

Sneke River fall chinook salmon were listed as threatened in 1992 (59 Fed. Reg. 66786; 1994). An Emergency Rule (59 Fed. Reg. 54840; 1994) proposing to reclassify Sneke River chinook from threatened to endangered, was published in November 1994, but expired on May 1995. Critical habitat for the Sneke River fall chinook salmon was designated in December 1993 (58 Fed. Reg. 68543; 1993) and modified in March 1998 (63 Fed. Reg. 11515; 1998) to include the Deschutes River. The following summary is taken from information in these Federal Register notices.

A 1995 status review found that the Deschutes River fall-run chinook salmon population should be considered part of the Sneke River fall-run ESU. Populations from Deschutes River and the Marion Drain (tributary of the Yakima River) show a greater genetic affinity to Sneke River ESU fall chinook than to the Upper Columbia River summer/fall-run chinook (63 Fed. Reg. 11490; 1998). The designated critical habitat (63 Fed. Reg. 11515; 1998) includes all river reaches assessable to chinook salmon in the Columbia River from The Dalles Dam upstream to the confluence with the Sneke River in Washington (inclusive). Critical habitat in the Sneke River includes its tributaries in Idaho, Oregon, and Washington (exclusive of the upper Grande Ronde River and the Wallowa River in Oregon, the Clearwater River above its confluence with Lolo Creek in Idaho, and the Salmon River upstream of its confluence with French Creek in Idaho). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to The Dalles Dam. Excluded are areas above specific dams identified in Table 17 of the Federal Register (63 Fed. Reg. 11519; 1998) or above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years).

Almost all historical Sneke River fall-run chinook salmon spawning habitat in the Sneke River Basin was blocked by the Hells Canyon Dam complex; other habitat blockages have also occurred in Columbia River tributaries. The ESU's range has also been affected by agricultural water withdrawals, grazing, and vegetation management. The continued straying by non-native hatchery fish into natural production areas is an additional source of risk. Assessing extinction risk to the newly-configured ESU is difficult because of the geographic discontinuity and the disparity in the status of the two remaining populations. The relatively recent extirpation of fall-run chinook in

the John Day, Umatilla, and Walla Walla Rivers is also a factor in assessing the risk to the overall ESU. Long-term trends in abundance for specific tributary systems are mixed. NMFS concluded that the ESU as a whole is likely to become an endangered species within the foreseeable future, in spite of the relative health of the Deschutes River population.

See the third paragraph under Snake River spring/summer chinook salmon for life history comparisons between fall and spring/summer chinook salmon. Adult Snake River fall chinook salmon enter the Columbia River in July and migrate into the Snake River from August through October. Fall chinook salmon natural spawning is primarily limited to the Snake River below Hells Canyon Dam, and the lower reaches of the Clearwater, Grand Ronde, Imnaha, Salmon and Tucannon Rivers. Fall chinook salmon generally spawn from October through November and fry emerge from March through April.

Downstream migration generally begins within several weeks of emergence with juveniles rearing in backwaters and shallow water areas through mid-summer prior to smolting and migration. Peak migration in the Brownlee-Oxbow Dam reach of the Snake River occurs from April through the middle of May. Juveniles will spend one to four years in the Pacific Ocean before beginning their spawning migration. Chinook salmon fry tend to linger in the lower Columbia River and may spend a considerable portion of their first year in the estuary. For detailed information on the Snake River fall chinook salmon, see the Federal Register (56 Fed. Reg. 29542;1991).

Elevated water temperatures are thought to preclude returning of fall chinook salmon in the Snake River after early to mid-July. The preferred temperature range for chinook salmon has been variously described as 12.2-13.9 °C, 10-15.6 °C, or 13-18 °C. Summer temperatures in the Snake River substantially exceed the upper limits of this range.

No reliable historic estimates of abundance are available for Snake River fall chinook salmon. Estimated returns of Snake River fall chinook salmon declined from 72,000 annually between 1938 and 1949, to 29,000 from 1950 through. Estimated returns of naturally produced adults from 1985 through 1993 range from 114 to 742 fish.

Snake River Spring/Summer Chinook Salmon

Snake River spring/summer chinook salmon were listed as threatened in 1994 (59 Fed. Reg. 66786; 1994). The following summary information is from this Federal Register notice. This Evolutionarily Significant Unit (ESU) was listed as threatened in April 1992 and was changed to a proposed endangered status in December 1994. The November 1994 Emergency Rule (59 Fed. Reg. 54840; 1994), reclassifying Snake River chinook from threatened to endangered, expired in May 1995. The critical habitat for the Snake River spring/summer chinook salmon was designated in December 1993 (58 Fed. Reg. 68543; 1993). The designated habitat consists of river reaches of the Columbia, Snake, and Salmon Rivers, and all tributaries of the Snake and Salmon Rivers (except the Clearwater River) presently or historically accessible to

Snake River spring/summer chinook salmon (except reaches above impassable natural falls and Hells Canyon Dam).

This information is taken from the Federal Register (56 Fed. Reg. 29544; 1991). Historically, it is estimated that 44 percent of the combined Columbia River spring/summer chinook salmon returning adults entered the Salmon River. Since the 1960s, counts at Snake River dams have declined considerably. Snake River redd counts in index areas provide the best indicator of trends and status of the wild spring/summer chinook population. The abundance of wild Snake River spring/summer chinook has declined more at the mouth of the Columbia River than the redd trends indicate. Although pre-1991 data suggest several thousand wild spring/summer chinook salmon return to the Snake River each year, these fish are thinly spread over a large and complex river system.

In general, the habitats utilized for spawning and early juvenile rearing are different among the three chinook salmon forms (spring, summer, and fall). In both the Columbia and Snake Rivers, spring chinook salmon tend to use small, higher elevation streams (headwaters), and fall chinook salmon tend to use large, lower elevation streams or mainstem areas. Summer chinook are more variable in their spawning habitats; in the Snake river, they inhabit small, high elevation tributaries typical of spring chinook salmon habitat, whereas in the upper Columbia River they spawn in the larger lower elevation streams characteristic of fall chinook salmon habitat. Differences are also evident in juvenile out-migration behavior. In both rivers, spring chinook salmon migrate swiftly to sea as yearling smolts, and fall chinook salmon move seaward slowly as subyearlings. Summer chinook salmon in the Snake River resemble spring-run fish in migrating as yearlings, but migrate as subyearlings in the upper Columbia River. Early researchers categorized the two behavioral types as "ocean-type" chinook for seaward migrating subyearlings and as "stream-type" chinook for the yearling migrants.

Life history information clearly indicates a strong affinity between summer- and fall-run fish in the upper Columbia River, and between spring- and summer-run fish in the Snake River. Genetic data support the hypothesis that these affinities correspond to ancestral relationships. The relationship between Snake River spring and summer chinook salmon is more complex and is not discussed here.

The present range of spawning and rearing habitat for naturally-spawned Snake River spring/summer chinook salmon is primarily limited to the Salmon, Grande Ronde, Imnaha, and Tucannon sub-basins. Most Snake River spring/summer chinook salmon enter individual sub-basins from May through September. Juvenile Snake River spring/summer chinook salmon emerge from spawning gravels from February through June. Typically, after rearing in their nursery streams for about one year, smolts begin migrating seaward in April through May. After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit near shore areas before beginning their northeast Pacific Ocean migration, which lasts two to three

years. For detailed information on the life history and stock status of Snake River spring/summer chinook salmon, see the Federal Register (56 Fed. Reg. 29542; 1991).

The number of wild adult Snake River spring/summer chinook salmon in the late 1800s was estimated to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults. Escapement estimates indicate that the population continued to decline through the 1970s. Redd count data also show that the populations continued to decline through about 1980.

The Snake River spring/summer chinook salmon ESU, the distinct population segment listed under the Act, consists of 39 local spawning populations (sub-populations) spread over a large geographic area. The number of fish returning to a given subpopulation would, therefore, be much less than the total run size.

Based on recent trends in redd counts in major tributaries of the Snake River, many sub-populations could be at critically low levels. Sub-populations in the Grande Ronde River, Middle Fork Salmon River, and Upper Salmon River basins are at particularly high risk. Both demographic and genetic risks would be of concern for such sub-populations, and in some cases, habitat may be so sparsely populated that adults have difficulty finding mates.

Upper Columbia River Spring-Run Chinook Salmon

Upper Columbia River spring-run chinook salmon were listed as endangered in March 1999 (64 Fed. Reg. 14308; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11489; 1998).

This ESU includes stream-type chinook salmon spawning above Rock Island Dam - that is, those in the Wenatchee, Entiat, and Methow Rivers. All chinook salmon in the Okanogan River are apparently ocean-type and are considered part of the Upper Columbia River summer- and fall-run ESU. Critical habitat designation is found in the Federal Register (63 Fed. Reg. 11515; 1998; 65 Fed. Reg. 7774; 2000). Critical habitat includes all river reaches accessible to chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clapsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington. Excluded are areas above Chief Joseph Dam, areas above longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years), and all Indian lands. Also included are all riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

This ESU was first identified as the Mid-Columbia River summer/fall chinook salmon ESU but a later determination concluded this ESU's boundaries do not extend downstream from the Snake River. The ESU status of the Marion Drain population from the Yakima River is still unresolved.

Access to a substantial portion of historical habitat was blocked by Chief Joseph and Grand Coulee Dams. There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and instream habitat from urbanization and livestock grazing. Mainstem Columbia River hydroelectric development has resulted in a major disruption of migration corridors and affected flow regimes and estuarine habitat. Some populations in this ESU must migrate through nine mainstem dams.

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation. Harvest rates are low for this ESU, with very low ocean and moderate instream harvest. Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Due to lack of information on chinook salmon stocks that are presumed to be extinct, the relationship of these stocks to existing ESUs is uncertain. Recent total abundance of this ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years. At least six populations of spring chinook salmon in this ESU have become extinct, and almost all remaining naturally-spawning populations have fewer than 100 spawners. In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so. NMFS concluded that chinook salmon in this ESU are in danger of extinction.

Chinook salmon from this ESU primarily emigrate to the ocean as subyearlings but mature at an older age than ocean-type chinook salmon in the Lower Columbia and Snake Rivers. Furthermore, a greater proportion of tag recoveries for this ESU occur in the Alaskan coastal fishery than is the case for Snake River fish. The status review for Snake River fall chinook salmon also identified genetic and environmental differences between the Columbia and Snake rivers. Substantial life history and genetic differences distinguish fish in this ESU from stream-type spring chinook salmon from the upper-Columbia River.

The ESU boundaries fall within part of the Columbia Basin Ecoregion. The area is generally dry and relies on Cascade Range snowmelt for peak spring flows. Historically, this ESU likely extended farther upstream; spawning habitat was compressed down-river following construction of Grand Coulee Dam.

Lower Columbia River Chinook Salmon, All Runs:

In March 1999, NMFS listed several chinook salmon ESUs in the Lower Columbia River as threatened under the Act (64 Fed. Reg. 14308; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11488; 1998).

Lower Columbia River spring-run chinook are listed as threatened. This ESU includes all naturally spawned chinook populations from the mouth of the Columbia river to the crest of the Cascade Range, excluding populations above Willamette Falls. Critical habitat is designated in the Federal Register (63 Fed. Reg. 11515; 1998; 65 Fed. Reg. 7774; 2000). It includes all river reaches accessible to chinook salmon in Columbia River tributaries between the Grays and White Salmon Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Dalles Dam; with the usual exclusions, including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

Apart from the relatively large and apparently healthy fall-run population in the Lewis River, production in this ESU appears to be predominantly hatchery-driven with few identifiable naturally spawned populations. All basins are affected (to varying degrees) by habitat degradation. Hatchery programs have had a negative effect on the native ESU. Efforts to enhance chinook salmon fisheries abundance in the lower Columbia River began in the 1870s. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations. The large number of hatchery fish in this ESU make it difficult to determine the proportion of naturally produced fish. The loss of fitness and diversity within the ESU is an important concern.

Harvest rates on fall-run stocks are moderately high, with an average total exploitation rate of 65 percent. Harvest rates are somewhat lower for spring-run stocks, with estimates for the Lewis River totaling 50 percent. Previous assessments of stocks within this ESU have identified several stocks as being at risk or of concern. There have been at least six documented extinctions of populations in the ESU, and it is possible that extirpation of other native population has occurred but has been masked by the presence of naturally spawning hatchery fish. NMFS concludes that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future.

Upper Willamette River Spring-Run Chinook Salmon

Upper Willamette River spring-run chinook salmon were listed as threatened in March 1999 (64 Fed. Reg. 14308; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11489; 1998).

This ESU includes naturally spawned spring-run chinook salmon populations above Willamette Falls. Fall chinook above Willamette Falls are introduced and although they are naturally spawning, they are not considered a population for purposes of defining this ESU. Critical habitat is designated in the Federal Register (63 Fed. Reg. 11515; 1998; 65 Fed. Reg. 7774; 2000). In

addition to the area of the Willamette River and its tributaries above the Falls, also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to and including the Willamette River in Oregon, with the usual exclusions regarding specific dams, longstanding barriers, and Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

While the abundance of Willamette River spring chinook salmon has been relatively stable over the long term, and there is evidence of some natural production, it is apparent that at present natural production and harvest levels the natural population is not replacing itself. With natural production accounting for only one-third of the natural spawning escapement, it is questionable whether natural spawners would be capable of replacing themselves even in the absence of fisheries. The introduction of fall-run chinook into the basin and laddering of Willamette Falls have increased the potential for genetic introgression between wild spring- and hatchery fall-run chinook. Habitat blockage and degradation are significant problems in this ESU. Another concern for this ESU is that commercial and recreational harvests are high relative to the apparent productivity of natural populations. Recent escapement is less than 5,000 fish and been declining sharply. NMFS concludes that chinook salmon in this ESU are not presently in danger of extinction but are likely to become endangered in the foreseeable future.

Historic, naturally spawned populations in this ESU have an unusual life history that shares features of both the stream and ocean types. Scale analysis of returning fish indicate a predominantly yearling smolt life-history and maturity at four years of age, but these data are primarily from hatchery fish and may not accurately reflect patterns for the natural fish. Young-of-year smolts have been found to contribute to the returning three year-old year class. The ocean distribution is consistent with an ocean-type life history, and tag recoveries occur in considerable numbers in the Alaskan and British Columbian coastal fisheries. Intra-basin transfers have contributed to the homogenization of Willamette River spring chinook stocks; however, Willamette River spring chinook remain one of the most genetically distinctive groups of chinook salmon in the Columbia River Basin.

The geography and ecology of the Willamette Valley is considerably different from surrounding areas. Historically, the Willamette Falls offered a narrow temporal window for upriver migration, which may have promoted isolation from other Columbia River stocks.

Puget Sound Chinook Salmon

Puget Sound chinook salmon were listed as threatened in March 1999 (64 Fed. Reg. 14308; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11488: 1998).

This ESU encompasses all naturally spawned spring, summer and fall runs of chinook salmon in the Puget Sound region from the North Fork Nooksak River to the Elwha River on the Olympic Peninsula, inclusive. Chinook salmon in this ESU all exhibit an ocean-type life history. Although some spring chinook salmon populations in the Puget Sound ESU have a high proportion of yearling smolt emigrants, the proportion varies substantially from year to year and appears to be environmentally mediated rather than genetically determined. Puget Sound stocks all tend to mature at ages 3 and 4 and exhibit similar, coastally-oriented, ocean migration patterns. The boundaries of the Puget Sound ESU correspond generally with the boundaries of the Puget Lowland Ecoregion. The Elwha River, which is in the Coastal Ecoregion, is the only system in this ESU which lies outside the Puget Sound Ecoregion.

Designated Critical Habitat (65 Fed. Reg. 7777; 2000) includes all marine, estuarine and river reaches accessible to listed chinook salmon in Puget Sound. Puget Sound marine areas include South Sound, Hood Canal, and North Sound to the international boundary at the outer extent of the Strait of Georgia, Haro Strait, and the Strait of Juan de Fuca to a straight line extending north from the west end of Freshwater Bay, inclusive. Excluded are areas above specific dams as identified or above longstanding naturally impassable barriers (i.e. natural waterfalls in existence for at least several hundred years). Critical habitat includes riparian areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambed stability, and input of large woody debris or organic matter.

Overall abundance of chinook salmon in this ESU has declined substantially from historical levels, and many populations are small enough that genetic and demographic risks are likely to be relatively high. Both long- and short-term trends in abundance are predominantly downward, and several populations are exhibiting severe short-term declines. Spring chinook salmon populations throughout this ESU are all depressed.

Habitat throughout this ESU has been blocked or degraded. In general, upper tributaries have been impacted by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization.

The preponderance of hatchery production throughout the ESU may mask trends in natural populations and makes it difficult to determine whether they are self-sustaining. Overall, the pervasive use of Green River stock throughout much of the extensive hatchery network that exists in this ESU may reduce the genetic diversity and fitness of naturally spawning populations.

Harvest impacts on Puget Sound chinook salmon stocks are quite high. NMFS concluded that chinook salmon in this ESU are not presently in danger of extinction, but they are likely to become endangered in the foreseeable future.

Columbia River Chum Salmon

Columbia River chum salmon are listed as threatened (64 Fed. Reg. 14508; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11773; 1998). Chum salmon in the Columbia River ESU spawn in tributaries to the lower Columbia River in Washington and Oregon.

Critical habitat was designated in the Federal Register (63 Fed. Reg. 11792; 1998; 65 Fed. Reg. 7774; 2000). Designated critical habitat consists of the water and substrate of estuarine and riverine reaches in specific hydrologic units and counties. It also includes those riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. Columbia River chum salmon critical habitat designation includes all accessible reaches in the Columbia River downstream from Bonneville Dam, excluding Oregon tributaries upstream of Milton Creek at river km 144 near the town of St. Helens. It does not include Indian lands. Accessible reaches are those within the historical range of the ESUs that can be occupied by any life stage of chum salmon.

Life history information specific to the above ESU is not available. The chum salmon or dog salmon is the third most abundant salmon species in the Pacific Northwest. Spawning for chum salmon adults may take place just at the head of tide waters similar to pink salmon (*O. gorbuscha*), however unlike pinks, chum also migrate upriver to spawn. Spawning occurs from October through December. Most adult females construct their redds near saltwater and are territorially aggressive; therefore, females may "miss out" on male spawners. Because of the location of most redds in lower rivers, an embryo mortality of 70 - 90 percent is possible due to siltation and decreased dissolved oxygen transfer. Chum salmon benefit from high quality habitat conditions in lower rivers and estuaries.

After emergence, fry do not rear in freshwater. Chum salmon fry migrate immediately, at night, to the estuary for rearing. Out-migration is March through June. Juveniles remain near the seashore during July and August. Juveniles spend from just half a year to four years at sea.

Hood Canal Summer-Run Chum Salmon

Hood Canal summer-run chum salmon are listed as threatened (64 Fed. Reg. 14508; 1999). The following life history information is taken from the Federal Register (63 Fed. Reg. 11774; 1998). This ESU includes summer-run chum salmon populations in Hood Canal; Puget Sound; and in Discovery, Sequim and Dungeness Bays on the Strait of Juan de Fuca.

Designated critical habitat (65 Fed. Reg. 7774; 2000) includes all river reaches accessible to listed summer-run chum salmon (including tributaries) draining into Hood Canal as well as Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. It includes estuarine/marine areas adjacent to the basins within the range of the ESU as well as the Hood Canal waterway, and areas of Admiralty Inlet and the Strait of Juan de Fuca. Excluded are areas

above Cushman Dam or above longstanding naturally impassable barriers. It also includes the adjacent riparian areas that provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter.

Although summer-run chum salmon in this ESU have experienced a steady decline over the past 30 years, escapement in 1995-96 increased dramatically in some streams. Spawning escapement of summer-run chum salmon in Hood Canal (excluding the Union River) numbered over 40,000 fish in 1968, but was reduced to only 173 fish in 1989. In 1991, only 7 of 12 streams that historically contained spawning runs of these fish still had escapements. In 1995-96 escapement increased to more than 21,000 fish in Northern Hood Canal, mostly on the west side. Population levels of early-run chum in the Strait of Juan de Fuca are at very low population levels. The overall trend in the Strait populations is one of continued decline. In 1994, of 12 streams in Hood Canal identified by petitioners as recently supporting spawning populations of summer-run chum salmon, 5 may have already become extinct, 6 of the remaining 7 showed strong downward trends in abundance, and all were at low levels of abundance.

See the discussion for Columbia River chum salmon for a life history discussion.

The present depressed condition is the result of several longstanding, human-induced factors (e.g., habitat degradation, water diversions, harvest, and artificial propagation) that serve to exacerbate the adverse effects of natural factors (e.g., competition and predation) or environmental variability from such factors as drought and poor ocean conditions.

Steelhead

The following summary of general life history and ecology is taken from the Federal Register (63 Fed. Reg. 11797; 1998). Steelhead exhibit one of the most complex life histories of any salmonid species. Steelhead may exhibit anadromy or freshwater residency. Resident forms are usually referred to as “rainbow” or “redband” trout, while anadromous life forms are termed “steelhead”.

Steelhead typically migrate to marine waters after spending two years in freshwater. They then reside in marine waters for two to three years prior to returning to their natal stream to spawn as 4- or 5- year-olds. Depending on water temperature, steelhead eggs may incubate in redds for one and one half to four months before hatching as alevins. Following yolk sac absorption, alevins emerge from the gravel as young juveniles (fry) and begin actively feeding. Juveniles rear in freshwater from one to four years, then migrate to the ocean as smolts.

Biologically, steelhead can be divided into two reproductive ecotypes, based on their state of sexual maturity at the time of river entry and the duration of their spawning migration. These two ecotypes are termed “stream maturing” and “ocean maturing”. Stream maturing steelhead return to freshwater in a sexually immature condition and require several months to mature and spawn. Ocean maturing steelhead enter freshwater with well-developed gonads and spawn shortly after

river entry. These two reproductive ecotypes are more commonly referred to by their season of freshwater entry as either summer or winter steelhead.

Two major genetic groups or “subspecies” of steelhead occur on the west coast of the United States: a coastal group and an inland group, separated on the Fraser and Columbia River Basins by the Cascade crest. Historically, steelhead likely inhabited most coastal streams in Washington, Oregon, and California, as well as many inland streams in these states and Idaho. However, during this century, over 23 indigenous, naturally-reproducing stocks of steelhead are believed to have been extirpated, and many more are thought to be in decline in numerous coastal and inland streams.

Factors contributing to the decline of specific steelhead ESUs are discussed under each ESU. General information for west coast steelhead is summarized here. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat. Washington and Oregon’s wetlands are estimated to have diminished by one-third. Loss of habitat complexity as seen in the decrease of abundance of large, deep pools due to sedimentation and loss of pool-forming structures has also adversely affected west coast steelhead.

Steelhead are not generally targeted in commercial fisheries but do support an important recreational fishery throughout their range. A particular problem occurs in the main stem of the Columbia River where listed steelhead from the Middle Columbia River ESU are subject to the same fisheries as unlisted, hatchery-produced steelhead, chinook and coho salmon. Infectious disease and predation also take their toll on steelhead. Introductions of non-native species and habitat modifications have resulted in increased predator populations in numerous river systems. Federal and state land management practices have not been effective in stemming the decline in west coast steelhead.

Snake River Basin Steelhead

This inland steelhead ESU occupies the Snake River Basin of southeast Washington, northeast Oregon and Idaho. A final listing status of threatened was issued in August 1997 (62 Fed. Reg. 43937; 1997) for the spawning range upstream from the confluence with the Columbia River. Critical habitat was proposed in the Federal Register (64 Fed. Reg. 5740; 1999) and finalized (65 Fed. Reg. 7775; 2000). It is designated to include all river reaches accessible to listed steelhead in the Snake River and tributaries in Idaho, Oregon, and Washington. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clapsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the confluence with the Snake River in Washington with the usual exclusions including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and

input of large woody debris or organic matter. The following information is taken from the Federal Register (62 Fed. Reg. 43937; 1997; 63 Fed. Reg. 11482; 1998).

The Snake River flows through terrain that is warmer and drier on an annual basis than the upper Columbia Basin or other drainages to the north. Geologically, the land forms are older and much more eroded than most other steelhead habitat. Collectively, the environmental factors of the Snake River Basin result in a river that is warmer and more turbid, with higher pH and alkalinity, than is found elsewhere in the range of inland steelhead.

SNAKE RIVER BASIN (SRB) STEELHEAD all defined as “B-run” steelhead. Prior to Ice Harbor Dam completion in 1962, there were no counts of Snake River basin naturally spawned steelhead. From 1949 to 1971 counts averaged about 40,000 steelhead for the Clearwater River. At Ice Harbor Dam, counts averaged approximately 70,000 until 1970. The natural component for steelhead escapements above Lower Granite Dam was about 9400 (2400 B-run) from 1990-1994.

SRB steelhead recently suffered severe declines in abundance relative to historical levels. Low run sizes over the last 10 years are most pronounced for naturally produced steelhead. The drop in parr densities characterizes many river basins in this region as being underseeded relative to the carrying capacity of streams. Declines in abundance have been particularly serious for B-run steelhead, increasing the risk that some of the life history diversity may be lost from steelhead in this ESU.

Interactions between hatchery and natural SRB steelhead are of concern because many of the hatcheries use composite stocks that have been domesticated over a long period of time. The primary indicator of risk to the ESU is declining abundance throughout the region.

SRB steelhead are summer steelhead, as are most inland steelhead, and comprise two groups, A-run and B-run, based on migration timing, ocean-age, and adult size. SRB steelhead enter freshwater from June to October and spawn in the following spring from March to May. A-run steelhead are thought to be predominately 1-ocean (one year at sea), while B-run steelhead are thought to be 2-ocean. SRB steelhead usually smolt at age 2- or 3-years.

The steelhead population from Dworshak National Fish Hatchery is the most divergent single population of inland steelhead based on genetic traits determined by protein electrophoresis; these fish are consistently referred to as B-run.

Similar factors to those affecting other salmonids are contributing to the decline of SRB steelhead. Widespread habitat blockage from hydrosystem management and potentially deleterious genetic effects from straying and introgression from hatchery fish. The reduction in habitat capacity resulting from large dams such as the Hells Canyon dam complex and Dworshak Dam is somewhat mitigated by several river basins with fairly good production of natural steelhead runs.

Upper Columbia River Basin Steelhead

This inland steelhead ESU occupies the Columbia River Basin upstream from the Yakima River, Washington, to the U.S./Canada border. The geographic area occupied by the ESU forms part of the larger Columbia Basin Ecoregion. Upper Columbia River Basin (UCRB) steelhead were listed as endangered in August 1997 (62 Fed. Reg. 43937; 1997). Critical habitat was proposed (64 Fed. Reg. 5740; 1999) and finalized (65 Fed. Reg. 7775; 2000). It is designated to include all river reaches accessible to listed steelhead in the Columbia River tributaries upstream of the Yakima River, Washington, and downstream of Chief Joseph Dam. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clapsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington, with the usual exclusions including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. The following life history information is taken from the Federal Register (62 Fed. Reg. 43937; 1997).

NMFS cites a pre-fishery run size estimate in excess of 5000 adults for tributaries above Rock Island Dam. Runs may have already been depressed by lower Columbia River fisheries at the time of the early estimates (1933-1959). Most of the escapement to naturally spawning habitat within the range of this ESU is to the Wenatchee, Methow and Okanogan Rivers. The Entiat River also has a small spawning run. Steelhead in the Upper Columbia river ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat Rivers). The proportion of hatchery fish is high in these rivers (65-80 percent) with extensive mixing of hatchery and natural stocks.

Life history characteristics for UCRB steelhead are similar to those of other inland steelhead ESUs. However, some of the oldest smolt ages for steelhead, up to 7 years, are reported from this ESU; this may be associated with the cold stream temperatures. Based on limited data available from adult fish, smolt age in this ESU is dominated by 2-year-olds. Steelhead from the Wenatchee and Entiat Rivers return to freshwater after one year in salt water, whereas Methow River steelhead are primarily 2-ocean resident (i.e., two years in salt water).

In an effort to preserve fish runs affected by Grand Coulee Dam, which blocked fish passage in 1939, all anadromous fish migrating upstream were trapped at Rock Island Dam (river km 729) from 1939 through 1943 and either released to spawn in tributaries between Rock Island and Grand Coulee Dams or spawned in hatcheries and the offspring released in that area. Through this process, stocks of all anadromous salmonids, including steelhead, which historically were native to several separate sub-basins above Rock Island Dam, were randomly redistributed among tributaries in the Rock Island-Grand Coulee reach. Exactly how this has affected stock composition of steelhead is unknown.

Habitat degradation, juvenile and adult mortality in the hydrosystem, and unfavorable environmental conditions in both marine and freshwater habitats have contributed to the declines and represent risk factors for the future. Harvest in lower river fisheries and genetic homogenization from composite broodstock collection are other factors that may contribute significant risk to the Upper Columbia River Basin ESU.

Middle Columbia Basin Steelhead

After a comprehensive status review of West Coast steelhead populations in Washington and Oregon, NMFS identified 15 ESUs. In March 1999, Middle Columbia River steelhead were listed as threatened (64 Fed. Reg. 14517; 1999). The middle Columbia area includes tributaries from above (and excluding) the Wind River in Washington and the Hood River in Oregon, upstream to, and including the Yakima River, in Washington. Steelhead of the Snake River Basin are excluded. Critical habitat was proposed (64 Fed. Reg. 5740; 1999) and finalized (65 Fed. Reg. 7775; 2000). It is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries (except the Snake River) between Mosier Creek in Oregon and the Yakima River in Washington (inclusive). Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clapsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Yakima River in Washington, with the usual exclusions including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. The following life history information is taken from the Federal Register (63 Fed. Reg. 11797; 1998).

Current population sizes are substantially lower than historic levels, especially in the rivers with the largest steelhead runs in the ESU: the John Day, Deschutes, and Yakima Rivers. At least two extinctions of native steelhead runs in the ESU have occurred (the Crooked and Metolius Rivers, both in the Deschutes River Basin). In addition, NMFS remains concerned about the widespread long- and short-term downward trends in population abundance throughout the ESU.

Genetic differences between inland and coastal steelhead are well established, although some uncertainty remains about the exact geographic boundaries of the two forms in the Columbia River (63 Fed. Reg. 11801; 1998). All steelhead in the Columbia River Basin upstream from The Dalles Dam are summer-run, inland steelhead. Life history information for steelhead of this ESU indicates that most middle Columbia River steelhead smolt at two years and spend one to two years in salt water (i.e., 1-ocean and 2-ocean fish, respectively) prior to re-entering freshwater, where they may remain up to a year before spawning. Within this ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead, and the summer steelhead are dominated by 2-ocean steelhead, whereas most other rivers in this region produce about equal number of both 1- and 2-ocean steelhead.

The recent and dramatic increase in the percentage of hatchery fish in natural escapement in the Deschutes River Basin is a significant risk to natural steelhead in this ESU. Coincident with this increase in the percentage of strays has been a decline in the abundance of native steelhead in the Deschutes River.

Lower Columbia Basin Steelhead

This coastal steelhead ESU occupies tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon Rivers in Washington. Lower Columbia River steelhead are listed as threatened (63 Fed. Reg. 13347; 1998). Critical habitat was proposed (64 Fed. Reg. 5740; 1999) and finalized (65 Fed. Reg. 7775; 2000). It is designated to include all river reaches accessible to listed steelhead in Columbia River tributaries between the Cowlitz and Wind Rivers in Washington and the Willamette and Hood Rivers in Oregon, inclusive. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to the Hood River in Oregon with the usual exclusions including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. The following life history information is taken from the Federal Register (63 Fed. Reg. 11482; 1998).

The lower Columbia River has extensive intertidal mud and sand flats and differs substantially from estuaries to the north and south. Rivers draining into the Columbia River have their headwaters in increasingly drier areas, moving from west to east. Columbia River tributaries that drain the Cascade mountains have proportionally higher flows in late summer and early fall than rivers on the Oregon coast.

Steelhead populations are at low abundance relative to historical levels, placing this ESU at risk due to random fluctuations in genetic and demographic parameters that are characteristic of small populations. There have been almost universal, and in many cases dramatic, declines in steelhead abundance since the mid-1980s in both winter- and summer-runs. Genetic mixing with hatchery stocks have greatly diluted the integrity of native steelhead in the ESU. NMFS is unable to identify any natural populations of steelhead in the ESU that could be considered “healthy”.

Steelhead populations in this ESU are of the coastal genetic group, and a number of genetic studies have shown that they are part of a different ancestral lineage than inland steelhead from the Columbia River Basin. Genetic data also show steelhead in this ESU to be distinct from steelhead in the upper Willamette River and coastal streams in Oregon and Washington. Washington Department of Fish and Wildlife data show genetic affinity between the Kalama, Wind, and Washougal River steelhead. These data show differentiation between the Lower

Columbia River ESU and the Southwest Washington and Middle Columbia River Basin ESUs. The Lower Columbia ESU is composed of winter steelhead and summer steelhead.

Habitat loss, hatchery steelhead introgression, and harvest are major contributors to the decline the steelhead in this ESU. Details on factors contributing to the decline of west coast steelhead are discussed above.

Upper Willamette River Steelhead

In March 1999, the Upper Willamette River steelhead were listed as threatened (64 Fed. Reg. 14517; 1999). Critical habitat was proposed (64 Fed. Reg. 5740; 1999) and finalized (65 Fed. Reg. 7775; 2000). It is designated to include all river reaches accessible to listed steelhead in the Willamette River and its tributaries above Willamette Falls upstream to, and including, the Calapooia River. Also included are river reaches and estuarine areas in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to, and including, the Willamette River in Oregon with the usual exclusions including Indian lands. It includes riparian areas which provide the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter. The following life history information is taken from the Federal Register (63 Fed. Reg. 11797; 1998).

This coastal ESU occupies the Willamette River and its tributaries, upstream from Willamette Falls. The Willamette River Basin is geographically complex. In addition to its connection to the Columbia River, the Willamette River historically has had connections with coastal basins through stream capture and headwater transfer events.

Steelhead from the upper Willamette River are genetically distinct from those in the lower river. Reproductive isolation from lower river populations may have been facilitated by Willamette Falls, which is known to be a migration barrier to some anadromous salmonids. For example, winter steelhead and spring chinook salmon occurred historically above the falls, but summer steelhead, fall chinook salmon, and coho salmon did not.

Steelhead in the Upper Willamette ESU are distributed in a few, relatively small, natural populations. Over the past several decades, total abundance of natural late-migrating winter steelhead ascending the Willamette Falls fish ladder has fluctuated several times over a range of approximately 5,000-20,000 spawners. However, the last peak occurred in 1988, and this peak has been followed by a steep and continuing decline. Abundance in each of the last five years (to 1998) has been below 4,300 fish, and the run in 1995 was the lowest in 30 years. The low abundance, coupled with potential risks associated with interactions between naturally spawned steelhead and hatchery stocks is of great concern to NMFS.

The native steelhead of this basin are late-migrating winter steelhead, entering freshwater primarily in March and April, whereas most other populations of west coast winter steelhead enter

freshwater beginning in November or December. As early as 1885, fish ladders were constructed at Willamette Falls to aid the passage of anadromous fish. As technology improved, the ladders were modified and rebuilt, most recently in 1971. These fishways facilitated successful introduction of Skamania stock summer steelhead and early-migrating Big Creek stock winter steelhead to the upper basin. Another effort to expand the steelhead production in the upper Willamette River was the stocking of native steelhead in tributaries not historically used by that species. Native steelhead primarily used tributaries on the east side of the basin, with cutthroat trout predominating in streams draining the west side of the basin.

Nonanadromous steelhead are known to occupy the Upper Willamette River Basin; however, most of these nonanadromous populations occur above natural and man-made barriers. Historically, spawning by Upper Willamette River steelhead was concentrated in the North and Middle Santiam River Basins. These areas are now largely blocked to fish passage by dams, and steelhead spawning is distributed throughout more of the Upper Willamette River Basin than in the past. Due to introductions of non-native steelhead stocks and transplantation of native stocks within the basin, it is difficult to formulate a clear picture of the present distribution of native Upper Willamette River steelhead, and their relationship to nonanadromous and possibly residualized steelhead within the basin.

Southwest Washington/Lower Columbia River Cutthroat Trout

Southwest Washington/Lower Columbia River cutthroat trout were proposed as endangered in April 1999 (64 Fed.Reg. 16397; 1999). The ESU consists of coastal cutthroat trout populations in southwestern Washington and the Columbia River, excluding the Willamette River above Willamette Falls. In this proposed ESU, only naturally spawned cutthroat trout are proposed for listing. Prior to the final listing determination, NMFS and USFWS will examine the relationship between hatchery and naturally spawned populations of cutthroat trout, and populations of cutthroat trout above barriers to assess whether any of these populations warrant listing. This may result in the inclusion of specific hatchery populations or populations above barriers as part of the listed ESU in the final listing determination.

The southwestern Washington-lower Columbia River region historically supported healthy, highly productive coastal cutthroat trout populations. Coastal cutthroat trout, especially, the freshwater forms, may still be well distributed in most river basins in this geographic region, although probably in lower numbers relative to historical populations sizes. However, severe habitat degradation throughout the lower Columbia River areas has contributed to dramatic declines in anadromous coastal cutthroat trout populations and two near extinctions of anadromous runs in the Hood and Sandy Rivers. The Services remain concerned about the extremely low populations sizes of anadromous coastal cutthroat trout in lower Columbia River streams, indicated by low incidental catch of coastal cutthroat trout in salmon and steelhead recreational fisheries, and by low trap counts in a number of tributaries throughout the region. The general life history forms are similar to those described for the Umpqua Cutthroat trout below.

Numbers of anadromous adults and outmigrating smolts in the southwestern Washington portion of this ESU are all declining. Returns of both naturally and hatchery produced anadromous coastal cutthroat trout in almost all lower Columbia River streams have declined markedly over the last 10 to 15 years. Serious declines in the anadromous form have occurred throughout the lower Columbia River, and it has been nearly extirpated in at least two rivers on the Oregon side of the basin. Indeed, the only anadromous coastal cutthroat population in the lower Columbia River to show increased abundance over the last 10 years is the North Fork Toutle River population, which is thought to be recovering from the effects of the Mt. Saint Helens eruption in 1980.

Factors for the decline of this subspecies include: habitat degradation as a result of logging; recreational fishing; predation by marine mammals, birds, and native and non-native fish species; adverse environmental conditions resulting from natural factors such as droughts, floods, and poor ocean conditions; non-point and point pollution source pollution caused by agriculture and urban development; disease outbreaks caused by hatchery introductions and warm water temperatures; mortality resulting from unscreened irrigation inlets; competition in estuaries between native and hatchery cutthroat trout; cumulative loss and alteration of estuarine areas; and loss of habitat caused by the construction of dams.

Southwest Washington/Lower Columbia River Cutthroat Trout (*Oncorhynchus clarkii clarkii*)

Southwest Washington-Lower Columbia River cutthroat trout were proposed as threatened in April 1999 (64 Fed. Reg. 16397; 1999). A 6-month extension on the listing has been approved and the species will be under review until October 5, 2000. The distinct population segment (DPS) consists of coastal cutthroat trout populations in southwestern Washington and the Columbia River downstream of Willamette Falls. In this proposed DPS, only naturally spawned cutthroat trout are proposed for listing. Prior to the final listing determination, the Service will examine the relationship between hatchery and naturally spawned populations of cutthroat trout, and populations of cutthroat trout above barriers to assess whether any of these populations warrant listing. This may result in the inclusion of specific hatchery populations or populations above barriers as part of the listed DPS in the final listing determination.

Factors contributing to the decline of anadromous cutthroat trout in the southwest Washington-Lower Columbia River DPS include: habitat degradation from land management activities such as logging and road construction; recreational, tribal and commercial fishing; predation by marine mammals, birds, and native and non-native fish species; adverse environmental conditions resulting from natural factors such as droughts, floods, and poor ocean conditions; non-point and point pollution source pollution caused by agriculture and urban development; disease outbreaks caused by hatchery introductions and warm water temperatures; mortality resulting from unscreened irrigation and drainage systems; competition between native cutthroat and hatchery-

produced salmon and trout; cumulative loss and alteration of estuarine areas; and loss of habitat caused by the construction of dams.

The southwestern Washington-Lower Columbia River region historically supported healthy, highly productive coastal cutthroat trout populations. Sea-run coastal cutthroat trout on the Washington side of the lower Columbia were believed to have existed in tributaries as far up as the Klickitat River (Bryant 1949) but are currently confined downstream of Bonneville Dam. Cutthroat trout population trend data is limited primarily to available harvest information (i.e. creel census), incidental catch records, and juvenile abundance data from smolt trapping and electrofishing operations conducted for salmon and steelhead. Numbers of anadromous adults and outmigrating smolts in the southwestern Washington-Lower Columbia River DPS are all showing significant declines (Melcher and Watts 1995; Leider 1997). Returns of both naturally and hatchery produced anadromous coastal cutthroat trout in almost all of the lower Columbia River streams have declined markedly over the last 10 to 15 years and it has been nearly extirpated in at least two rivers on the Oregon side of the basin. The catch of sea-run cutthroat trout in the recreational salmon and steelhead fishery on the lower river dropped from an average of around 4,200 fish between 1975 and 1985 to less than 500 from 1976 to 1995 (Leider 1997). A similar trend has been reported for returning adults during the same time periods, based on counts at the Kalama Falls hatchery (Hulett et al. 1995). The only anadromous coastal cutthroat population in the lower Columbia River to show increased abundance over the last 10 years is the North Fork Toutle River population, which is thought to be recovering from the effects of the Mount St. Helens eruption in 1980.

In comparison to the poor condition of the coastal cutthroat stocks in the lower Columbia, the streams containing sea-run cutthroat trout in the Grays Harbor, Willapa Bay and along the southern Washington coast are faring a bit better, likely due to the availability of the two large estuaries. Sea-run cutthroat trout along the southern coast do not appear to migrate far from their respective estuaries and data for the lower Chehalis River and streams entering Willapa Bay indicate that the populations are low but relatively stable. However, the populations of sea-run cutthroat trout in the upper Chehalis River watershed (e.g. above the confluence of the Skookumchuck River) and other headwater areas in southwest Washington appear to be depressed. This likely is due to the cumulative effects of intensive land management activities in the upper basins and fishing pressure. Approximately 37,000 smolts were released between 1982 and 1994 into nine coastal streams, representing almost 14% of the statewide production of sea-run cutthroat for that time period. The vast majority of hatchery produced cutthroat trout are released into the lower Columbia River.

The resident freshwater form of coastal cutthroat trout, may still be well distributed in most river basins in this geographic region, although probably in lower numbers relative to historical populations sizes. Because of their tendency to reside in small streams and headwater areas, cutthroat trout are highly vulnerable to changes in freshwater habitat.

Coastal cutthroat trout occur along the coast of North America from Humboldt Bay, California to Prince William Sound, Alaska. This species occurs inland to the crest of the Cascade Mountain Range in Washington and Oregon, and to the crest of the Coast Range in British Columbia and Alaska (Trotter 1989).

Cutthroat trout evolved to exploit habitats least preferred by other salmonid species. There are three basic life history forms that occur with coastal cutthroat trout, including an anadromous (sea-run) form, a potamodromous form that includes both stream-dwelling (fluvial) and lake dwelling (adfluvial) populations, and a non-migratory (resident) form found in small streams and headwater tributaries (Trotter 1989).

Sea-run coastal cutthroat trout spawn in low or gentle gradient areas of the mainstem or tributaries of small to moderate size streams systems. Spawning periods extend from December through May with peak spawning periods in February in Washington, Oregon and southern British Columbia (Trotter 1989).

Emergence from the gravel can occur from March through June, with a peak occurring around mid April (Trotter 1989). After emergence, cutthroat trout need nursery and rearing habitat with protective cover and low velocity water (Behnke 1992). These habitats occur along stream margins, side channels, small tributaries and spring seeps.

In the absence of competition, juvenile cutthroat trout are found predominantly in pools and backwater areas downstream or adjacent to faster water (Glova 1987). In systems where juvenile coho and cutthroat trout occur in the same area, interspecies competition is observed. Both species utilize similar habitats during their first year. Because of their earlier emergence from the gravel, juvenile coho salmon tend to be larger and more aggressive and displace the young cutthroat trout into less favorable faster water areas (Glova 1984, 1987; Trotter et al. 1993). The cutthroat trout remain in the riffles until the water temperature drops, which reduces aggression in coho salmon (Trotter 1989). In addition, increasing winter flows will eventually force the cutthroat trout into areas of the stream with lower velocities and more protected environments (Glova and Mason 1976, 1977). Releases of hatchery coho salmon fry into areas with age-0 cutthroat trout has been shown to result in displacement of the native cutthroat into less favorable habitats during their first summer, which may have adverse consequences on the affected populations (Glova 1984, 1987; Trotter et al. 1993).

Sea-run cutthroat trout begin their downstream movement in the winter and spring of their first year (Trotter 1989). The fish may move back up into the tributaries during high water events. Typically, as the fish get larger and older, they move into deeper waters with some form of cover nearby such as undercut banks, large woody debris or overhanging vegetation. These selected areas are often adjacent to fast waters that carry food for the trout to access (Behnke 1992).

Anadromous coastal cutthroat trout have been documented to smolt and migrate to sea from age 1 to age 6 (Leider, referenced in OCAFS 1997), with the majority smolting and migrating at age 2, 3 or 4 (Trotter 1989). Sea-run coastal cutthroat trout can attain a maximum age of 10 years. In Washington and Oregon, seaward migration peaks in mid-May (Trotter 1989). The fish spend approximately 2-5 months in the bays, estuaries and along the coast before returning to the rivers as the winter months approach (Behnke 1992). Sea-run coastal cutthroat trout may complete this seaward migration pattern twice before returning to their natal streams to spawn (Trotter 1989). While in salt water, they feed predominantly on crustaceans and fish, compared to the freshwater diet which consists primarily of aquatic insects, as well as other fish species (Behnke 1992).

The potamodromous form of coastal cutthroat trout includes both stream (fluvial) and lake dwelling (adfluvial) life history patterns. Fluvial coastal cutthroat trout have the same migratory patterns as the sea-run trout, but mature in the mainstem river systems rather than the marine environment (Trotter 1989; Leider 1997). Fluvial cutthroat trout populations are typically located above natural barriers to upstream migration for anadromous trout, such as Willamette and Snoqualmie Falls, and utilize similar spawning habitats (Trotter 1989). In areas where fluvial cutthroat trout occur in sympatry with sea-run populations, the stream dwelling populations move into the mainstem river systems as the sea-run populations are migrating to the marine environment, thus reducing competition (Tomasson 1978). In systems where rainbow trout, char, or other salmonid species are present, there is a tendency for habitat partitioning and competition to occur between the species (Leider 1997).

The lake dwelling forms of coastal cutthroat trout exhibit life history patterns similar to the sea-run forms but their spawning periods occur in late winter or spring versus fall and early winter (Trotter 1989). Lake dwelling coastal cutthroat trout mature at around ages 3 to 4 (Pierce 1984), and these fish spawn every year thereafter. The lake dwelling forms exhibit both inlet and

outlet spawning populations. After emergence from the gravel, the trout spend 1 to 3 years in tributaries before migrating back to the lakes (Trotter 1989). If lake dwelling coastal cutthroat trout are the only salmonid present in the lake, they use a wide variety of habitats, ranging from shallow to deep water areas (Nilsson and Northcote 1981) and are strongly attracted to areas with cover (Shepherd 1974). They forage in all zones, consuming surface food such as terrestrial insects and floating or emerging aquatic insects, crustacean plankton, small fish, and benthic prey items, with an emphasis on mid-water prey (Nilsson and Northcote 1981).

In lakes where cutthroat trout, rainbow trout, and bull trout/Dolly Varden (char), occur in sympatry, interactive segregation occurs. In these conditions, cutthroat trout are found closer inshore while the rainbow trout and char remain further offshore. Feeding zones are partitioned into these inshore and offshore zones and feeding patterns change. The cutthroat trout, now displaced from the preferred mid-water feeding areas, are restricted to nearshore surface and benthic prey and also exhibit more piscivory than their allopatric counterparts (Trotter 1989; Nilsson and Northcote 1981).

Resident nonmigratory coastal cutthroat trout are found in small headwater streams and exhibit only limited instream movement (Trotter 1989). Wyatt (1959) reported that only 3 percent of the population ever moved more than 200m (600 ft) from their emergence area. Resident cutthroat trout are small, generally not exceeding 150 to 200mm (6-7 in) in length. These fish mature at age 2 to 3 and have a shorter life span, typically living only 3 to 4 years (Wyatt 1959; Nicholas 1978).

After emerging from the gravel, the young resident cutthroat trout move to channel margins, side channels and slow water areas and move to feeding areas in pools towards the end of summer (Moore and Gregory 1988). In winter, they may move downstream to more secure habitats to avoid high water events. In the spring, when water temperatures reach 15°C (59°F), the mature trout move back into the spawning areas. Resident life history forms primarily feed at the head of pools on drift prey (Wilzbach and Hall 1985).

Bull Trout (*Salvelinus confluentus*)

Bull trout in the Columbia River and Klamath Basins were listed as threatened on June 10, 1998 (63 Fed. Reg. 31674; 1998). The Jarbridge population segment was emergency listed on August 11, 1998 and the Coastal Puget Sound and remaining populations in the coterminous United States were listed on November 1, 1999.

Bull trout presently occur in about 45 to 60 percent of their historic range (Quigley and Arbelbide 1997). The remaining distribution of bull trout in the Columbia River basin and Coastal Puget Sound is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. Many of these small remnant populations have a low likelihood of long-term persistence (Reiman and McIntyre 1993) and several populations and life history forms of bull trout have been extirpated entirely.

Bull trout are threatened by habitat degradation and fragmentation from past and ongoing land management activities such as mining, timber harvest, road construction and maintenance, dams, water diversions and withdrawals, agriculture, development, and grazing. Bull trout are also threatened by interactions with non-native fishes, such as brook trout (*Salvelinus fontinalis*), with which they hybridize, and numerous introduced species, found in reservoirs, which prey on bull trout or compete for limited resources.

Bull trout, members of the family Salmonidae, are char native to the Pacific Northwest and western Canada. Bull trout historically occurred in major river drainages in the Pacific Northwest from about 41° N to 60° N latitude, extending from northern California to the headwaters of the Yukon River in the Northwestern Territories of Canada (Cavender 1978; Bond 1992). To the west, the species' range includes Puget Sound, various coastal rivers of Washington, British Columbia, and southeast Alaska (Bond 1992; McPhail and Carveth 1992; Leary and Allendorf 1997). In California, bull trout were historically found only in the McCloud River, which represented the southernmost extension of the species' range. Bull trout numbers steadily declined after the completion of McCloud and Shasta Dams (Rode 1990). The last confirmed report of a bull trout in the McCloud River was in 1975, and the original population is now considered to be extirpated (Rode 1990).

Bull trout currently occur in rivers and tributaries in Montana, Idaho, Washington, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the McKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997).

The Columbia River population segment is composed of 141 sub-populations within the lower, mid, and upper river sections as well as the Snake River drainage. The lower Columbia River includes all tributaries in Oregon and Washington below the confluence of the Snake River. The Service identified 20 sub-populations within nine major tributaries in the lower river, three of which are located in Washington - the Lewis River, White Salmon, and the Walla Walla River basins. Of the 20 sub-populations, thirteen are considered migratory, primarily adfluvial populations which inhabit reservoirs created by dams, and five are at high risk of extirpation.

The mid-Columbia River geographic area includes 16 sub-populations in four major tributaries - the Yakima River, Wenatchee River, Entiat River and the Methow drainage. Bull trout are believed to have been extirpated in 10 streams within the area - Satus Creek, Nile Creek, Orr Creek, the Little Wenatchee River, Napecqua River, Lake Chlan, Okanogan River, Eightmile Creek, South Fork Beaver Creek, and the Hanford Reach of the Columbia River. Within the mid-Columbia River system, bull trout are most abundant in Rimrock Lake (Yakima basin) and Lake Wenatchee. The remaining 14 sub-populations have low numbers and 10 are at risk of extirpation.

The Upper Columbia River geographic area covers all tributaries upstream of Chief Joseph Dam, including the Spokane and the Pend Oreille Rivers in Washington. The remaining DPS is located in Idaho and Montana. Although the upper Columbia River still contains some “strongholds” for bull trout, the species has been extirpated from 64 streams and lakes within this geographic area, including the Kettle River.

The Coastal Puget Sound population segment encompasses all Pacific coast drainages within Washington, including Puget Sound. Within this area, bull trout often occur sympatically with Dolly Varden and several sub-populations exhibit an anadromous life history form. Because the two species are virtually impossible to differentiate visually, the WDFW currently manages bull trout and Dolly Varden together as “native char.” The Service has delineated 34 sub-populations of native char within the Coastal Puget Sound DPS, distributed in five geographic areas - Coastal, Strait of Juan de Fuca, Hood Canal, Puget Sound and the trans-boundary area (Canadian border).

Although most native char populations in the northwestern coastal area occur within the relatively protected areas of Olympic National Forest and Park, brook trout have been stocked in many of the high lakes and streams and threaten the bull trout populations from competition and hybridization. The WDFW believes that the Hoh River may have the largest subpopulation on the Washington coast, although their numbers have greatly declined since 1982 (WDFW *in lit.* 1992; WDFW 1997a).

Populations of native char in the southwestern coastal area appear to be low, likely because this represents the southern extent of both coastal bull trout and Dolly Varden. Habitat degradation has contributed to the decline of the species within the Chehalis, Moclips, and Copalis River systems (64 Fed. Reg. 58910; 1999b; WDFW 1997a).

Within the Juan de Fuca geographic area, bull trout occur within the Elwha River, Angeles Basin, and the lower Dungeness River. Large portions of the Dungeness lie outside of the park and have been impacted by past forest and agricultural practices and residential development. Populations of native char in the Elwha River and lower Dungeness/Grey Wolf are considered depressed due to declining numbers, while the status of sub-populations in the upper Dungeness within the Buckhorn Wilderness Area are stable.

Native char populations in the Hood Canal geographic area occur in the Skokomish River basin. Due to the construction of Cushman Dam on the North Fork Skokomish river, bull trout in Cushman Reservoir are isolated and restricted to an adfluvial life history form while fish in the lower river are anadromous. The populations within Cushman Reservoir and the upper North Fork Skokomish River have stabilized since the harvest closure on the reservoir and upper river in 1986 (Brown 1992). However, the South Fork-lower Skokomish River and upper river populations are still considered to be depressed due to low spawner numbers.

Within the Puget Sound geographic area, 15 native char sub-populations occur in nine river basins - the Nisqually River, Puyallup River, Green River, Lake Washington Basin, Snohomish River, Skykomish River, Stillaguamish, Skagit and the Nooksack River systems. The current abundance of native char in the southern Puget Sound is below historic levels and declining (64 Fed. Reg. 58910; 1999b and Fred Goetz, U.S. Army Corps of Engineers (COE), pers. Comm. 1994a, b). Historical accounts from southern Puget Sound indicate that anadromous char entered the rivers in "vast numbers" in fall and were harvested until Christmas (Federal Register reference to Suckley and Cooper 1860). There is only one recent record of a char collected in the Nisqually River and only 23 adults have been caught at the Buckley diversion dam on the Puyallup River since 1987 (WDFW 1998a). In the Cedar River, native char are rarely observed and fewer than 10 redds were reported above the Chester Morse Reservoir in 1995 and 1996 (64 Fed. Reg. 58910; 1999b; F. Goetz, pers. comm. 1994a, b). It is questionable if the Sammamish River and Issaquah Creek sub-populations, which have been severely impacted by urbanization and poor water quality, are viable (Williams *et al.* 1975; 64 Fed. Reg. 58910; 1999b).

Water quality, temperatures, and instream habitats in the Skagit, South Fork Sauk, Skykomish River, and other river systems of northern Puget Sound are relatively good and support stronger populations of bull trout than elsewhere in the Puget Sound DPS. All but 5 of the sub-populations of native char in the drainages of the northern Puget Sound region are considered to be strong or stable.

Bull trout exhibit resident and migratory life-history strategies through much of their current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from 1 to 4 years before migrating to either a lake (adfluvial) or river (fluvial). Anadromous bull trout spawn in tributary streams, with major growth and maturation occurring in the ocean (Fraley and Shepard 1989; Goetz 1989).

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality, especially increasing temperatures and

increased amounts of fine sediments, alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

Persistence of migratory life history forms and maintenance or re-establishment of stream migration corridors is crucial to the viability of bull trout populations (Reiman and McIntyre 1993). Migratory bull trout facilitate the interchange of genetic material between populations, ensuring sufficient variability within populations. Migratory forms also provide a mechanism for reestablishing local populations that have been extirpated and are more fecund and larger than smaller non-native brook trout, potentially reducing the risks associated with hybridization (Reiman and McIntyre 1993).

Bull trout have relatively specific habitat requirements compared to other salmonids (Reiman and McIntyre 1993). Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Reiman and McIntyre 1993, 1995; Rich 1996; Buchanan and Gregory 1997; Reiman et al. 1997; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout to successfully spawn and rear, and that these characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur. Because bull trout exhibit a patchy distribution, even in pristine habitats (Reiman and McIntyre 1993), they should not be expected to simultaneously occupy all available habitats (Reiman et al. 1997). However, while a small fraction of available stream habitat within a drainage or subbasin may be used for spawning and rearing, a much more extensive area may be utilized as foraging habitat, or seasonally as migration corridors to other waters.

Water temperature above 15° C (59° F) is believed to limit bull trout distribution, which partially explains their generally patchy distribution within a watershed (Fraley and Shepard 1989; Reiman and McIntyre 1995). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Reiman and McIntyre 1993; Reiman et al. 1997).

All life history stages of bull trout are closely associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995)

observed bull trout overwintering in deep beaver ponds or pools containing complex large woody debris in the Bitterroot River drainage, Montana, and suggested that suitable winter habitat may be more restrictive than summer habitat. Maintaining bull trout populations requires high stream channel stability and relatively stable stream flows (Rieman and McIntyre 1993). Several authors have observed highest juvenile densities in streams with complex cover associated with side channels, stream margins, and pools and areas with diverse cobble substrate and low percentage of fine sediments (Sexauer and James 1997; Shepard *et al.* 1984; Pratt 1992).

The size and age of maturity for bull trout is variable, depending upon life-history strategy. Growth of resident fish is generally slower than migratory fish and resident fish tend to be smaller at maturity and less fecund (Fraley and Shepard 1989; Goetz 1989) than the migratory forms. Juvenile bull trout average 50-70 mm (2-3 in) in length at age 1, 100-120 mm (4-5 in) at age 2, and 150-170 mm (6-7 in) at age 3 (Pratt 1992). Individuals normally reach sexual maturity in 4 to 7 years and may live as long as 15-20 years. Repeat and alternate year spawning has been reported, although repeat spawning frequency and post spawning mortality are not well known (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996).

Preferred spawning habitat consists of low gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 5° to 9° C (41° to 48° F) in late summer to early fall (Goetz 1989). Bull trout typically spawn from August to November. However, adult bull trout in the larger river systems may begin migrating to their spawning areas as early as April, and have been known to move upstream as far as 250 kilometers (km) (155 miles) to spawning grounds (Fraley and Shepard 1989). Typically, spawning occurs in gravel, in runs or tails of spring-fed pools. Adults hold in deep pools or under cover and often migrate at night (Pratt 1992).

Bull trout eggs require very cold incubation temperatures for normal embryonic development (McPhail and Murray 1979). In natural conditions, hatching usually takes 100 to 145 days and newly-hatched fry, known as alevins, require 65 to 90 days to absorb their yolk sacs (Pratt 1992). Consequently, fry do not emerge from the gravel and begin feeding for 200 or more days after eggs are deposited (Fraley and Shepard 1989), usually in about April or May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992). The spawning areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period and channel instability may decrease survival of eggs and young juveniles in the gravel (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993).

Fraley and Shepard (1989) reported that juvenile bull trout were rarely observed in streams with summer maximum temperatures exceeding 15°C (59°F). Fry, and perhaps juveniles, grow faster in cool water (Pratt 1992). Juvenile bull trout are closely associated with the substrate,

frequently living on or within detritus or the streambed cobble (Pratt 1992). Along the stream bottom, juvenile bull trout use small pockets of slow water near high velocity, food-bearing water. Juvenile bull trout in four streams in central Washington occupied slow-moving water less than 0.5 m/sec (1.6 ft/sec) over a variety of small to boulder size substrates (Sexauer and James 1997). Adult bull trout, like the young, are strongly associated with the bottom, preferring deep pools in cold water rivers, as well as lakes and reservoirs (Thomas 1992).

Juvenile adfluvial fish typically spend one to three years in natal streams before migrating in spring, summer, or fall to a large lake. After traveling downstream to a larger system from their natal streams, subadult bull trout (age 3 to 6) grow rapidly but do not reach sexual maturity for several years. Growth of resident fish is much slower, with smaller adult sizes and older age at maturity. Growth varies depending upon life-history strategy. Resident adults range from 150 to 300 millimeters (mm) (6 to 12 in.) total length and migratory adults commonly reach 600 mm (24 in.) or more (Pratt 1985; Goetz 1989).

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, amphipods, mysids, crayfish and small fish (Wyman 1975; Rieman and Lukens 1979; Rieman and McIntyre 1993; Boag 1987; Goetz 1989; Donald and Alger 1993). Subadult bull trout rapidly convert to eating fish and, as the evolution of the head and skull suggest, adults are opportunistic and largely nondiscriminating fish predators. Historically, native sculpins (*Cottus* spp.), suckers (*Catostomus* spp.), salmonids, and mountain whitefish (*Prosopium williamsoni*) were probably the dominant prey across most of the bull trout range (Fraley and Shepard 1989; Donald and Alger 1993). Today, with many of the bull trout populations confined above reservoirs, introduced species such as kokanee (*Oncorhynchus nerka*) and yellow perch (*Perca flavescens*), are often key food items (Pratt 1992). Primary prey species for anadromous bull trout while in the marine environment include juvenile salmonids as well as Pacific sand lance (*Ammodytes hexapterus*), Pacific herring (*Clupea harengus pallasi*), and surf smelt (*Hypomesus pretiosus*) (Kraemer in prep.).

Status of Terrestrial Species within the Action Area

Bald Eagle (*Haliaeetus leucocephalus*)

In 1978, the bald eagle was federally listed throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (USDI 1978). In July, 1995, the USFWS reclassified the bald eagle to threatened throughout the lower 48 states. Bald eagle populations have increased in number and expanded

their range. The improvement is a direct result of recovery efforts including habitat protection and the banning of DDT and other persistent organochlorines. The 1998 information provided by the Washington Department of Fish and Wildlife (WDFW unpub. data) indicates that 638 nests were known to be occupied and 1.08 young/nest were produced. This is well above the recovery goal of 276 pairs for Washington and meets the recovery criteria of an average of 1.00 young/nest. Since bald eagle populations have met or exceeded recovery goals over most of their range, the species has been proposed for delisting.

Habitat loss continues to be a long-term threat to the bald eagle in the Pacific Recovery Area (Washington, Idaho, Nevada, California, Oregon, Montana, and Wyoming). Urban and recreational development, environmental contaminants, logging, mineral extraction and exploration, and other forms of human activities, will continue to adversely affect the suitability of breeding, wintering, and foraging areas for bald eagles.

The bald eagle is found throughout North America. The largest breeding populations in the contiguous United States occur in the Pacific Northwest states, the Great Lake states, Chesapeake Bay and Florida. The bald eagle winters over most of the breeding range, but is most concentrated from southern Alaska and southern Canada southward.

Most nesting territories in Washington are located on the San Juan Islands, the Olympic Peninsula coastline, and along the Strait of Juan De Fuca, Puget Sound, Hood Canal, and the Columbia River. In addition, bald eagle nesting territories are found within southwestern Washington, the Cascade Mountains, and in the eastern part of the State where adequate sources of prey are available. Most bald eagles winter on river systems in the Puget Trough and the Olympic Peninsula, along the outer coast and Strait of Juan De Fuca, or in the Columbia River Basin.

In Washington, bald eagles are most common along the coasts, major rivers, lakes and reservoirs (USFWS 1986). Bald eagles require accessible prey and trees for suitable nesting and roosting habitat (Stalmaster 1987). Food availability, such as aggregations of waterfowl or salmon runs, is a primary factor attracting bald eagles to wintering areas and influences the distribution of nests and territories (Stalmaster 1987; Keister et al. 1987).

Bald eagle nests in the Pacific Recovery Area are usually located in uneven-aged stands of coniferous trees with old-growth forest components that are located within 1 mile of large bodies of water. Factors such as relative tree height, diameter, species, form, position on the surrounding topography, distance from the water, and distance from disturbance appear to influence nest site selection. Nests are most commonly constructed in Douglas-fir or Sitka spruce trees, with average heights of 116 feet and size of 50 inches dbh (Anthony et al. 1982 in Stalmaster 1987). Bald eagles usually nest in the same territories each year and often use the same nest repeatedly. The territories are generally centered around the primary nest tree and surrounding perch trees and often contain two or more alternate nest sites. Nest sites are generally within 1 mile of water (USFWS 1986). The average territory radius ranges from 1.55

miles in western Washington to 4.41 miles along the lower Columbia River (Grubb 1980; Garrett et al. 1988). In Washington, courtship and nest building activities normally begin in January, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July (Anderson et al. 1986).

During the winter months bald eagles are known to band together in large aggregations where food is most easily acquired. Oregon and Washington support approximately 25 percent of the wintering bald eagles in the conterminous United States. Wintering sites are typically in the vicinity of concentrated food sources such as anadromous fish runs, high concentrations of waterfowl or mammalian carrion. A number of habitat features are desirable for wintering bald eagles. Key contributing factors are available fish spawning habitat with exposed gravel bars in areas close to bald eagle perching habitat. Bald eagles select perches that provide a good view of the surrounding territory, typically the tallest perch tree available within close proximity to a feeding area (Stalmaster 1987). Tree species commonly used as perches are black cottonwood, big leaf maple, or Sitka spruce (Stalmaster and Newman 1979).

Wintering bald eagles may roost communally in single trees or large forest stands of uneven ages that have some old-growth forest characteristics (Anthony et al. 1982 in Stalmaster 1987). Some bald eagles may remain at their daytime perches through the night but bald eagles often gather at large communal roosts during the evening. Communal night roosting sites are traditionally used year after year and are characterized by more favorable micro climatic conditions. Roost trees are usually the most dominant trees of the site and provide unobstructed views of the surrounding landscape (Anthony et al. 1982 in Stalmaster 1987). They are often in ravines or draws that offer shelter from inclement weather (Hansen et al. 1980; Keister 1987). A communal night roost can consist of two birds together in one tree, or more than 500 in a large stand of trees. Roosts can be located near a river, lake, or seashore and are normally within a few miles of day-use areas but can be located as far away from water as 17 miles or more. Prey sources may be available in the general vicinity, but close proximity to food is not as critical as the need for shelter that a roost affords (Stalmaster 1987).

Bald eagles utilize a wide variety of prey items, although they primarily feed on fish, birds and mammals. Diet can vary seasonally, depending on prey availability. Given a choice of food, however, they typically select fish. Many species of fish are eaten, but they tend to be species that are easily captured or available as carrion. In the Pacific Northwest, salmon form an important food supply, particularly in the winter and fall. Birds taken for food are associated with aquatic habitats. Ducks, gulls and seabirds are typically of greatest importance in coastal environments. Mammals are less preferred than birds and fish, but form an important part of the diet in some areas. Deer and elk carcasses are scavenged, and in coastal areas, eagles feed on whale, seal, sea lion and porpoise carcasses (Stalmaster 1987).

Columbian White-tailed Deer (*Odocoileus virginianus leucurus*)

Two populations of this subspecies exist, one in Douglas County, Oregon, (Douglas County population), and the other in Columbia and Clatsop Counties, Oregon, and Wahkiakum County, Washington (Columbia River population). The Columbia River population was listed as endangered in 1967 under the Endangered Species Preservation Act, and the Douglas County population received protection under the Act as a threatened species in 1977. The Columbian River population has increased from fewer than 400 animals in 1977 to 550 to 800 individuals in 1994-1997 (USFWS 1997, unpublished data).

This deer is medium-sized, with a coat that is tawny in the summer and bluish-gray in winter. Bucks weigh up to 182 kg (400 lb), whereas does are smaller, usually weighing less than 113 kg (250 lb). Female Columbian white-tailed deer typically have one or two fawns every season. Young deer have a reddish-tan coat with small white speckles. The greatest human-caused threat to the Columbian white-tailed deer is the degradation of riparian habitats. Other human-caused threats include automobile collisions, poaching, entanglement in barbed wire fences, and competition with livestock. Natural threats include flooding, disease, and parasites (USFWS 1983a).

The Columbian white-tailed deer is one of 38 subspecies of white-tailed deer in the Americas. Historically, the subspecies ranged from the southern end of Puget Sound in Washington to the Willamette Valley of Oregon and throughout the river valleys west of the Cascade Mountains (Bailey 1936). Following European settlement, conversion of land to agriculture pushed the deer into small vestiges of habitat. They are now confined to a small area near the mouth of the Columbia River and in the upper Umpqua River drainage near Roseburg, Oregon. In Washington, Columbia white-tailed deer are only found in Wahkiakum County on islands in, and along the banks of, the Columbia River. Most of the habitat occupied by the deer on the Washington mainland is within the boundaries of the Julia Butler Hansen Refuge for the Columbian white-tailed Deer.

Columbian white-tailed deer are found on islands containing mature forest land, and on bottomland farms, forested swamps, and riparian areas adjacent to the Columbia River. Distribution of deer throughout this area is strongly related to the availability of woody vegetation for cover (Suring and Vohs 1979). Suring and Vohs (1979) reported little use of those portions of pastures located more than 250 m (750 feet) from woodland edges. The deer prefer plant communities that provide both forage and cover; park forest is preferred. Other important plant communities include open canopy forests, sparse rush, and dense thistle (USFWS 1983a). Peak fawning occurs the second week of June.

Their feeding preferences shifts seasonally. Studies at the Julia Butler Hansen Refuge for the Columbian White-tailed Deer show herbs to be preferred foraging items spring through fall. The use of browse is most important in winter and fall (Dublin 1980).

Sidalcea nelsoniana (Nelson's checkermallow)

Nelson's checkermallow bears tall lavender to deep pink flowers borne in clusters 50-150 cm (1.6-5 ft) tall at the end of short stalks. Inflorescences are usually somewhat spike-like, elongate and somewhat open (Hitchcock 1969). Plants have either perfect flowers (male and female) or pistillate flowers (female). The plant can reproduce vegetatively, by rhizomes, and by producing seeds, which drop near the parent plant. Flowering can occur as early as mid-May and extend into September in the Willamette Valley. Fruits have been observed as early as mid-June and as late as mid-October. Coast Range populations generally flower later and produce seed earlier, probably because of the shorter growing season (CH₂M Hill 1991).

Sidalcea nelsoniana was listed as a threatened species, without critical habitat, in February 1993 (USDI 1993c). The species is a perennial herb in the mallow family (Malvaceae). The majority of sites for the species occur in the Willamette Valley of Oregon; the plant is also found at several sites in the Coast Range of Oregon and at two sites in the Puget Trough of southwestern Washington. Thus the range of the plant extends from southern Benton County, Oregon, north to Cowlitz County, Washington, and from central Linn County, Oregon, west to just west of the crest of the Coast Range. In the Willamette Valley, Nelson's checkermallow occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81); in Oregon's Coast Range, the plant is found on soils in the Malabon, Coburg and Salem Series (NRCS mapped soil unit STATSGO 91) (Dr. Andrew F. Robinson, Ph.D., USFWS, Oregon State Office, Portland, Oregon, personal communication, 1999).

Threats to the populations include: mowing, plowing, stream channel alteration, recreational activities, roadside spraying, conversion of habitat to agricultural uses, logging, water impoundment and loss of suitable habitat (USDI 1993c). Stream channel alterations, such as straightening, splash dam installation, and rip-rapping cause accelerated drainage and reduce the amount of water that is diverted naturally into adjacent meadow areas. As a result, areas that would support Nelson's checkermallow are lost. The species is now known to occur in 62 patches within five relict population centers in Oregon, and at two sites in Washington (CH₂M Hill 1991).

The range of *Sidalcea nelsoniana* extends from southern Benton County, Oregon north to Cowlitz County Washington, and from central Linn County Oregon west, to just west of the crest of the Coast Range of Oregon (USDI 1993c). *Sidalcea nelsoniana* is known to be present in restricted areas of the Willamette Valley and the adjacent Coast Range of Oregon and at one site in the Willapa Hills/Coast Range extension into Cowlitz County, Washington (USDI 1993c). Historically, there were at least six identified population centers in Oregon (this does not include the recently discovered population center in Washington State), (USDI 1998). One population center has been extirpated in the Willamette Valley, four population centers remain in the Willamette Valley, one population center exists in the Coast Range, and one population center in the Willapa Hills/Coast Range extension in southwest Washington (USDI 1993c). Within this range, a total of 48 sites within six population centers are present (USDI 1998).

Nelson's checkermallow most frequently occurs in ash (*Fraxinus* sp.) swales and meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Some sites occur along roadsides at stream crossings where exotics such as blackberry (*Rubus* spp.) and Queen Anne's lace (*Daucus carota*) are also present (USDI 1993c). Nelson's checkermallow primarily occurs in open areas with little or no shade and will not tolerate encroachment of woody species. In the Willamette Valley of Oregon, the species generally occurs in prairie situations interspersed with oak and ash woodlands and coniferous forests (USDI 1993c). These prairies were historically maintained by fire. Fire suppression, conversion to agricultural land use, and invasion by introduced grasses and forbs are primary threats to this species. In the Oregon Coast Range and the Willapa Hills of Washington, *Sidalcea nelsoniana* occurs along streams in meadows and other relatively open sites. These areas in the Coast Range of Oregon and the Willapa Hills of Washington have been impacted by logging practices which may result in destruction of the plant, changes to groundwater hydrology, and introduction of woody species which compete with *Sidalcea nelsoniana* (USDI 1993c). Soil types that the plant occurs on have been documented as moist to dry sites with poorly to well drained clay, clay loam and gravelly loam soils in meadow and rarely wooded habitats (CH2MHill 1986; Glad et al. 1987). Plant associations include yarrow (*Achillea*), various grasses (*Festuca*, *Agrostis*, *Elymus*) and sedges (*Carex*) (USDI 1993c).

Bradshaw's Lomatium (*Lomatium bradshawii*)

Bradshaw's lomatium was listed as federally endangered in September 1988 (USFWS 1993b). The population sizes have been estimated to be approximately 2,500 and over 70,000 individuals at the two Washington sites (Wentworth 1996). The species is threatened by the destruction or modification of habitat through agricultural, residential and commercial development. Fire suppression permits the invasion of grassland vegetation by woody and invasive species, thus rendering habitat unsuitable, and precludes the expansion of *Lomatium bradshawii* populations. Activities that affect the hydrology of the area may have an impact on the populations. Although the effects of cattle grazing, rodent seed predation, and fungal and insect infestations have not been studied in Washington, they have been documented as negatively impacting *Lomatium bradshawii* in Oregon. Rodent activity is evident at the two Washington sites (Wentworth 1996).

Most of the Bradshaw's lomatium populations are known from habitat fragments in the Willamette Valley of western Oregon (Wentworth 1996). The species occurs in four counties in Oregon and one county in Washington. In 1994, two populations were discovered in Clark County, Washington. Prior to the 1994 discovery, *Lomatium bradshawii* was not known to occur in Washington (Gaddis 1996 in Wentworth 1996).

Bradshaw's lomatium is a member of the parsley family (Apiaceae), and grows from 20-50 cm (8-20 in) in height, with mature plants having only two to six leaves. Leaves are chiefly basal and are divided into very fine, almost threadlike, linear segments. The yellow flowers are small, measuring about 1 mm (0.05 in) long and 0.5 mm (0.025 in) across, and are grouped into

asymmetrical umbels. Each umbel is composed of 5 to 14 umbellets, which are subtended by green bracts divided into sets of three. This bract arrangement differentiates *L. bradshawii* from other lomatiums. Bradshaw's lomatium blooms during April and early May, with fruits appearing in late May and June. Fruits are oblong, about 1.2 cm (0.5 in) long, corky and thick-winged along the margin, and have thread-like ribs on the dorsal surface. This plant reproduces entirely from seed. Insects observed to pollinate this plant include a number of beetles, ants, and some small native bees.

Lomatium bradshawii occurs in remnant fragments of once widespread low elevation grasslands and prairies. The habitat type is described as wet, seasonally flooded prairies and grasslands common around creeks and small rivers (Moir and Mika 1976; Alverson 1989). The Washington populations of *Lomatium bradshawii* occur in wet meadows, one dominated by *Deschampsia cespitosa* and the other dominated by non-native grasses. The community ranges from wetter, with sedges and rushes as associated species, to drier, with more native and non-native grasses (Wentworth 1996). Bradshaw's lomatium is found in areas with alluvial soils. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 15-30 cm (6-12 in) below the surface. This clay layer results in a perched water table during winter and spring, and so is critical to the wetland character of these grasslands, known as tufted hair-grass (*Deschampsia cespitosa*) prairies. The species occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81)(Dr. A.F. Robinson, Ph.D., personal communication, 1999).

Ute Ladies'tresses (*Spiranthes diluvialis*)

Ute Ladies' tresses, a member of the orchid family, was federally listed as threatened in 1992. The main threat factors cited were loss and modification of habitat, and modification of the hydrology of existing and potential habitat. The orchids pattern of distribution as small, scattered groups, its restricted habitat, and low reproductive rate under natural conditions make it vulnerable to both natural and human caused disturbances (USFWS 1995). These life history and demographic features make the species more vulnerable to the combined impacts of localized extirpations, diminishing potential habitat, increasing distance between populations, and decreasing population sizes (Belovsky et al. 1994; USFWS 1995).

In the State of Washington, *Spiranthes diluvialis* is only known to occur in Okanogan County.

Ute ladies'tresses is a perennial, terrestrial orchid that is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams (USFWS 1995). Observations by Jennings (1990) and Coyner (1989 and 1990) indicate that the Ute ladies'tresses requires soil moisture to be at or near the surface throughout the growing season, indicating a close affinity with the flood plain. These observations were corroborated by Martin and Wagner (1992) with monitoring research at the Dinosaur National Monument. However, Riedel (1992) reported that once established it appears to be tolerant of somewhat drier conditions, but loses vigor and may

gradually die out if the groundwater table begins to consistently drop during late summer (Riedel 1992; Arft 1994 pers. comm. in USFWS 1995).

Ute ladies' tresses were originally reported to occur at elevations between 4,300 and 7,000 feet in eastern Utah and Colorado (Stone 1993). However, recent discoveries of small populations in the Snake River Basin (1996; southeastern Idaho) and in Okanogan County, Washington (1997) indicates that orchids are found at lower elevations (1,500-4,000 feet) in the more western part of their range (USFWS 1995). Ute ladies' tresses are found in a variety of soil types ranging from fine slit/sand to gravels and cobbles (USFWS 1995). They have also been found in areas that are highly organic or consist of peaty soils. Ute ladies' tresses are not found in heavy or tight clay soils or in extremely saline or alkaline soils (pH>8.0) (USFWS 1995).

Ute ladies' tresses occur primarily in areas where vegetation is relatively open and not overly dense or overgrown (Coyner 1989 and 1990; Jennings 1989 and 1990). A few populations have been found in riparian woodlands of eastern Utah and Colorado (USFWS 1995). However, the orchid is generally intolerant of shade, preferring open, grass and forb-dominated sites (USFWS 1995).

The associated plant community composition and structure is frequently a good indicator across the range of the orchid (USFWS 1995). For example, beaked spikerush (*Eleocharis rostellata*) appears to dominate the plant community in areas occupied by the orchid (Washington State). In Idaho, Ute ladies' tresses occupies areas dominated by silverleaf (*Elaeagnus commutata*) and creeping bentgrass (*Agrostis stolonifera*). The USFWS (1995) reported that species most commonly associated with Ute ladies' tresses throughout its range include creeping bentgrass, baltic rush (*Juncus balticus*), long-styled rush (*J. longistylis*), scouring rush (*Equisetum laevigatum*), and bog orchid (*Habenaria hyperborea*). Coyote willow (*Salix exigua*) and yellow willow (*S. lutea*) are commonly present in small numbers as saplings and small shrubs (USFWS 1995). Other species commonly associated with the Ute ladies' tresses throughout its range include paint-brush (*Castilleja* spp.), thinleaf alder saplings (*Alnus incana*), narrowleaf cottonwood saplings (*Populus angustifolia*), sweet clover (*Melilotus* spp.), sedges (*Carex* spp.), red clover (*Trifolium pratense*), and western goldenrod (*Solidago occidentalis*).

The Ute ladies' tresses appears to be tolerant and well adapted to disturbances, especially those caused by water movement through flood plains over time (Naumann 1992 and Riedel 1994 pers. comm. in USFWS 1995). Habitat alteration resulting from agricultural use (grazing, mowing, and burning) may be beneficial, neutral, or detrimental (McClaren and Sundt 1992). Grazing and mowing seem to promote flowering, presumably by opening the canopy to admit more light. However, these management practices may impede fruit set by directly removing flowering stalks, enhancing conditions for herbivory by small mammals and altering habitat required by bumble bees, the primary pollinator (USFWS 1995; Arft 1993)

Ute Ladies' tresses flower from mid-July to mid-August. Fruits mature and dehisce from mid-August into September. Plants may remain dormant for one or more growing seasons without

producing above ground shoots. Orchids generally require symbiotic associations with mycorrhizal fungi for seed germination.

Factors Affecting Species Environments Within the Action Area

Populations of anadromous salmonids are at risk or already extinct in many river basins of Washington, leading to many listings and proposed listings for anadromous fish. Disease, predation, competition from introduced species, climatic variation and unfavorable ocean conditions are among the many natural events that have taken a toll (Botkin *et al.* 1995; NMFS 1995; Spence *et al.* 1996; State of Washington 1993). These natural events exacerbated population and habitat declines induced by human activities such as land and water development, over harvest, artificial propagation, and water pollution (Botkin *et al.* 1995; NMFS 1995; Spence *et al.* 1996; State of Washington 1993).

Many land and water management activities have degraded habitats of declining salmonids. Significant examples include water withdrawals, unscreened water diversions, crop production, livestock production, hydropower development, road construction, removal of large woody debris from streams, splash dams, timber harvest, mining, urbanization and outdoor recreation (Botkin *et al.* 1995; NMFS 1995; Spence *et al.* 1996; State of Washington 1993). Connectivity (defined as the flow of energy, organisms, and materials between streams, riparian areas, floodplains, and uplands) has been reduced. Delivery of fine sediment to streams has increased, filling pools and reducing spawning and rearing habitats for fish. The volume and distribution of instream and riparian large woody debris that traps sediment, stabilizes stream banks, and helps form pools, has been reduced. Vegetative canopies that reduce temperature fluctuations have been reduced or eliminated. Streams have become straighter, wider, and shallower, thus reducing spawning and rearing habitats and increasing temperature fluctuations. Hydrological regimes have been altered, including the timing, size and other characteristics of peak flow regimes necessary to sustain channel conditions and sustain fish migration behavior. Floodplain function, water tables and base flows have been altered resulting in riparian, wetland and stream dewatering. Finally, increases in heat, nutrients and toxicants have degraded water quality.

The Services conclude that not all of the biological requirements of the species within the action area are being met under current conditions, based on the best available information on the status of the listed, proposed and candidate species rangewide and within the action area; information regarding population status, trends, and genetics; and the environmental baseline conditions within the action area. Significant improvement in habitat conditions is needed to meet the biological requirements for survival and recovery of these species. Any further degradation of these conditions would have a significant impact on the future of the affected species. CREP will be implemented on agricultural lands in Washington. This section contains an analysis of past and ongoing agricultural practices on stream environments, based largely on Spence *et al.* 1996. The purpose of this extended discussion is to provide a substantial context for nondiscretionary measures included in the incidental take statement issued with this

Biological Opinion, and for discretionary conservation recommendations that FSA should carry out to fulfill its section 7 (a)(1) obligations.

1. Grazing Lands

Livestock grazing is the second most dominant nonfederal land use in Washington, following timber production. Grazing currently occurs on about 1 million acres of federal lands, about 1 million acres of state lands and about 8.5 million acres of private rangeland (Palmisano et al 1993). In 1999 more than 856,000 cattle were slaughtered in Washington State (USDA 1999). The vast majority of rangeland (about 98%) occurs on the east side of the Cascade Range.

Range condition is a measure of rangeland health. Heavy livestock grazing in the western United States beginning in the mid-to-late 19th century and continuing in many areas until the mid 20th century or later severely damaged many rangelands. The 1982 National Resource Inventory documented widespread degradation of Washington's rangelands and found that 34 percent of Washington's rangelands were in "poor" condition, 32 percent were "fair" and only 21 percent were classified as "good" (USDA 1989). Despite improved upland conditions in many areas, extensive field observations in the late 1980's suggest riparian areas in much of the West are in the worst condition in history (Chaney *et al.* 1993). In April 1997, USDA officially launched a National Riparian Buffer Initiative, with a goal of establishing two million miles of conservation buffers by the year 2002 to help restore streams damaged by grazing and crop production (USDA 1997).

Despite the generally poor condition of most riparian areas, the potential for restoring riparian areas damaged by grazing is arguably greater than for those affected by other activities (Behnke 1977; Platts 1991). Recovery of grasses, willows and other woody species can occur within a few years when grazing pressure is reduced or eliminated (Elmore and Beschta 1987; Platts 1991; Elmore 1992). Restoration of fully functioning riparian areas that support a variety of plant species, including older forests of cottonwood and other large tree species, will take considerable time. Nevertheless, many important riparian functions such as shading, bank stabilization, sediment and nutrient filtering, and allochthonous inputs may be rapidly restored to the benefit of salmonids, provided the stress of grazing is alleviated and prior damage has not been too severe.

1. Grazing Effects on Vegetation

Heavy livestock grazing around the turn of the century had significant and widespread effects, many of which persist today, on upland and riparian vegetation. Rangelands have experienced decreases in the percentage of ground covered by vegetation and associated organic litter (Heady and Child 1994). Species composition of plants in upland areas has shifted from perennial grasses toward nonnative annual grasses and weedy species (Heady and Child 1994). In riparian areas, willow, aspen, sedge, rush, and grass communities have been reduced or eliminated and replaced with annual grasses or sagebrush. Diaries of early trappers in eastern Oregon noted that

grasses were as high as seven feet (Wilkinson 1992) and that streams were well lined with willows, aspen, and other woody vegetation (Elmore 1992). In eastern Oregon meadows, alteration of the vegetation has been so pervasive that little is known about the native vegetation that once inhabited riparian meadow communities. Currently, these meadows are dominated by Kentucky bluegrass, big sagebrush, and annual brome grasslands (Johnson *et al.* 1994). Kauffman and Pyke (in press), Belsky *et al.* (1999) and Fleischner (1994) recently reviewed the literature and found many examples of deleterious changes in species composition, diversity, and richness associated with livestock grazing and beneficial changes associated with removal of livestock in western states.

Much early alteration of rangelands was by settlers who engaged in widespread clearing of grasslands and riparian forests to grow crops, build houses, obtain fuelwood, and increase availability of land for domestic animals (Heady and Child 1994). Conversion of lands for livestock production continues today. Woody shrubs and trees are sometimes removed by using anchor chains or cables stretched between tractors to uproot vegetation and increase grass production (Heady and Child 1994). Removal of woody shrubs through chemical application or by mechanical means is also a common practice in range management. In addition, suppression of fire on rangelands is responsible for changes in upland vegetation, including encroachment by juniper in many areas of eastern Oregon and Washington (Miller *et al.* 1989).

Cattle and sheep affect vegetation primarily through browsing and trampling. Grazing animals are selective in what they eat; consequently, preferred vegetation types are generally removed first, followed by less palatable species. Heavy, continual grazing causes plants to be partially or wholly defoliated, which can reduce biomass, plant vigor, and seed production (Kauffman 1988; Heady and Child 1994). Selection of specific plant species may allow other taxa to dominate (Kauffman and Krueger 1984; Fleischner 1994). Vegetation may also be lost or damaged through trampling, which tears or bruises leaves and stems, and may break stems of woody plants. Regeneration of some woody vegetation, such as willow, cottonwood, and aspen, is inhibited by browsing on seedlings (Fleischner 1994). Vegetation may also be directly lost when buried by cattle dung. In a dairy pasture, MacDiarmid and Watkin (1971) found that 75 percent of grasses and legumes under manure piles were killed.

Livestock grazing also influences vegetation by modifying soil characteristics. Hooves compact soils that are damp or porous, which inhibits the germination of seeds and reduces root growth (Heady and Child 1994). Changes in infiltration capacity associated with trampling may lead to more rapid surface runoff, lowering moisture content of soil and the ability of plants to germinate or persist (Heady and Child 1994). However, sometimes, trampling may break up impervious surface soils, allowing for greater infiltration of water and helping to cover seeds (Savory 1988 in Heady and Child 1994). Soils in arid and semi-arid lands have a unique microbiotic surface layer or crust of symbiotic mosses, algae, and lichens that covers soils between and among plants. This "cryptogamic crust" plays an important role in hydrology and nutrient cycling and is believed to provide favorable conditions for the germination of vascular plants (Fleischner 1994). Trampling by livestock breaks up these fragile crusts, and reformation may take decades. Anderson *et al.*

(1982) found recovery of cryptogamic crusts took up to 18 years in ungrazed exclosures in Utah. Finally, livestock indirectly affect plant species composition by aiding the dispersion and establishment of nonnative species; seeds may be carried on the fur or in the dung of livestock (Fleischner 1994).

The effects of livestock grazing on vegetation are especially intense in the riparian zone because of the tendency for livestock to congregate in these areas. Gillen *et al.* (1984) found that 24 percent to 47 percent of cattle in two pastures in north-central Oregon were observed in riparian meadows occupying only 3 percent to 5 percent of the total land area. Roath and Krueger (1982) reported that riparian meadows that are only 1 percent to 2 percent of the total land area accounted for 81 percent of the total herbaceous biomass removed by livestock. Similar preferences for riparian areas have been observed elsewhere in the west (reviewed in Kauffman and Krueger 1984; Fleischner 1994). Cattle and sheep typically select riparian areas because they offer water, shade, cooler temperatures, and an abundance of high quality food that typically remains green longer than in upland areas (Kauffman and Krueger 1984; Fleischner 1994; Heady and Child 1994). In mountainous terrain, the preference of cattle and sheep for the riparian zone also appears related to hillslope gradient (Gillen *et al.* 1984). Heady and Child (1994) suggest that cattle avoid slopes greater than 10 to 20 percent. The intensity of use by livestock in riparian zones exacerbates all of the problems noted above and generates additional concerns. Alteration of flow regimes, changes in the routing of water, and incision of stream channels can lead to reduced soil moisture in the floodplain. Many types of riparian vegetation are either obligate or facultative wetland species adapted to the anaerobic conditions of permanently or seasonally saturated soils. Stream downcutting and the concomitant lowering of the water table can lead to encroachment of upland species, such as sagebrush and bunchgrasses into areas formerly dominated by willows, sedges, rushes and grasses (Elmore 1992). In addition, flood events may be important mechanisms for seed dispersal throughout the floodplain for woody plants, a function diminished as channels are incised.

2. Effects on Soils

Rangeland soils are frequently compacted by livestock. The degree of soil compaction depends on soil characteristics, including texture, structure, porosity, and moisture content (Platts 1991; Heady and Child 1994). Generally, soils that are high in organic matter, porous, and composed of a wide range of particle sizes are more easily compacted than other soils. Similarly, moist soils are usually more susceptible to compaction than dry soils, although extremely wet soils may give way and then recover following trampling by livestock (Clayton and Kennedy 1985). The result of soil compaction is an increase in bulk density (specific gravity) in the top five to 15 cm of soil as pore space is reduced. Because of the loss of pore space, infiltration is reduced and surface runoff is increased, thereby increasing the potential for erosion. The available studies show that compaction generally increases with grazing intensity, but that site-specific soil and vegetative conditions are important in determining the response of soils to grazing activity (reviewed in Kauffman and Krueger 1984; Heady and Child 1994).

Trampling by livestock may also displace or break up surface soils. In instances where surface soils have become impervious to water, light trampling may increase the soil's ability to absorb water. On the other hand, loosening soils makes them more susceptible to erosion. Heavily pulverized soil (dust) may become hydrophobic, reducing infiltration and increasing surface runoff. In arid and semi-arid climates, the cryptogamic crust has been shown to increase soil stability and water infiltration (Loope and Gifford 1972; Kleiner and Harper 1977; Rychert *et al.* 1978). Disruption of the cryptogamic crust may thus have long-lasting effects on erosional processes.

Livestock also alter surface soils indirectly by removing ground cover and mulch, which in turn affects the response of soils to rainfall. Kinetic energy from falling raindrops erodes soil particles (splash erosion), which may then settle in the soil interstices resulting in a less pervious surface. Livestock grazing can increase the percentage of exposed soil and break down organic litter, reducing its effectiveness in dissipating the energy of falling rain.

3. Effects on Hydrology

Grazing modifies two fundamental hydrologic processes, evapotranspiration and infiltration, that ultimately affect the total water yield from a watershed and the timing of runoff to streams. Loss of upland and riparian vegetation results in reduced interception and transpiration losses, thus increasing the percentage of water available for surface runoff (Heady and Child 1994). Shifts in species composition from perennials to annuals may also reduce seasonal transpiration losses. Reductions in plant biomass and organic litter can increase the percentage of bare ground and can enhance splash erosion, which clogs soil pores and decreases infiltration. Similarly, soil compaction reduces infiltration. Rauzi and Hanson (1966) report higher infiltration rates on lightly grazed plots, compared with moderately and heavily grazed plots in South Dakota. Similar experiments in northeastern Colorado showed reductions in infiltration in heavily grazed plots, but no differences between moderately and lightly grazed plots (Rauzi and Smith 1973). Johnson (1992) reviewed studies related to grazing and hydrologic processes and concluded that heavy grazing nearly always decreases infiltration, reduces vegetative biomass, and increases bare soil.

Decreased evapotranspiration and infiltration increases and hastens surface runoff, resulting in a more rapid hydrologic response of streams to rainfall. Some authors have suggested that the frequency of damaging floods has increased in response to grazing; however, there remains uncertainty about the role of grazing in mediating extreme flow events (reviewed in Belsky *et al.* 1999 and Fleischner 1994).

Reduced stability of streambanks associated with loss of riparian vegetation can lead to channel incision or "downcutting" during periods of high runoff. In naturally functioning systems, riparian vegetation stabilizes streambanks, slows the flow of water during high flow events, and allows waters to spread out over the floodplain and recharge subsurface aquifers (Elmore 1992). Moreover, riparian vegetation facilitates sediment deposition and bank building, increasing the

capacity of the floodplain to store water, which is then slowly released as baseflow during the drier seasons (Elmore and Beschta 1987). Downcutting effectively separates the stream channel from the floodplain, allowing flood waters to be quickly routed out of the system and leading to lowering of the water table (Platts 1991; Elmore 1992; Armour *et al.* 1994). Consequently, summer streamflows may decrease although total water yield increases in response to vegetation removal (Elmore and Beschta 1987). Li *et al.* (1994) found that streamflow in a heavily grazed eastern Oregon stream became intermittent during the summer, while a nearby, well-vegetated reference stream in a similar-sized watershed had permanent flows. They suggested that the difference in flow regimes was a consequence of diminished interaction between the stream and floodplain with resultant lowering of the water table.

4. Effects on Sediment Transport

The presence of livestock in the riparian zone increases sediment transport rates by increasing both surface erosion and mass wasting (Platts 1991; Marcus *et al.* 1990; Heady and Child 1994). Devegetation and exposure of soil by grazing helps to detach soil particles during rainstorms, thus increasing overland sediment transport. Rills and gullies often form in areas denuded by livestock trails or grazing, resulting in increased channelized erosion (Kauffman *et al.* 1983). As gullies expand and deepen, streams downcut, the water table drops, and sediments are transported to depositional areas downstream (Elmore 1992; Fleischner 1994; Henjum *et al.* 1994). Stream downcutting leads to further desertification of the riparian area and promotes soil denudation and the establishment of xeric flora. This also increases the potential for soil erosion. Some evidence suggests that significant channel downcutting in the Southwest occurred before the introduction of livestock (Karlstrom and Karlstrom 1987 in Fleischner 1994); however, studies in eastern Oregon and northern California implicate livestock as a major cause of downcutting (Dietrich *et al.* 1993; Peacock 1994).

Mass wasting of sediment occurs along stream banks where livestock trample overhanging cut banks (Behnke and Zarn 1976; Platts and Raleigh 1984; Fleischner 1994). Grazing also removes vegetation that stabilizes streambanks (Platts 1991). Where banks are denuded, undercutting and sloughing occurs, increasing sediment loads, filling stream channels, changing pool-riffle ratios, and increasing channel width (Platts 1981 in Fleischner 1994).

5. Effects on Thermal Energy Transfer and Stream Temperature

Riparian vegetation shades streams and regulates stream temperatures. On rangelands east of the Cascades, black cottonwood, mountain alder and quaking aspen are the dominant deciduous tree species in natural communities, whereas west of the Cascades, black cottonwood, red alder and big leaf maple are dominant (Kauffman 1988). Shrubby vegetation, such as willows, may also be an important source of shade along smaller streams and in mountainous areas (Henjum *et al.* 1994), and even tall grasses can provide some measure of shade along narrow first and second-order streams (Platts 1991).

The removal of riparian vegetation along rangeland streams can result in increased solar radiation and thus increased summer temperatures. Li (1994) noted that solar radiation reaching the channel of an unshaded stream in eastern Oregon was six times greater than that reaching an adjacent, well-shaded stream and that summer temperatures were 4.5 °C warmer in the unshaded tributary. Below the confluence of these two streams, reaches that were unshaded were significantly warmer than shaded reaches both upstream and downstream. A separate comparison of water temperatures at two sites of similar elevation in watersheds of comparable size found temperature differences of 11°C between shaded and unshaded streams (Li 1994). Warming of streams from loss of riparian vegetation is likely widespread in eastern Washington and may be particularly acute because of low summer flows and many cloud-free days.

The effects of a riparian canopy in winter on stream temperatures are less well understood and various studies have shown increases, decreases, and no change in water temperature following removal of a riparian canopy (reviewed in Beschta *et al.* 1987). Riparian cover can inhibit energy losses from evaporation, convection, and long-wave radiation during the winter. Several authors have suggested that removal of vegetation can increase radiative heat loss and add to the formation of anchor ice (Beschta *et al.* 1991; Platts 1991; Armour *et al.* 1994). This is most likely to occur in regions where skies are clear on winter nights and where snow-cover is inadequate to blanket and insulate streams (Beschta *et al.* 1987), primarily in mountainous regions.

Alteration of stream temperature processes may also result from changes in channel morphology. Streams in areas that are improperly grazed are wider and shallower than in ungrazed systems, exposing a larger surface area to incoming solar radiation (Bottom *et al.* 1985; Platts 1991). Wide, shallow streams heat more rapidly than narrow, deep streams (Brown 1980). Similarly, wide, shallow streams may cool more rapidly, increasing the likelihood of anchor ice formation. Reducing stream depth may expose the stream bottom to direct solar radiation, which may allow greater heating of the substrate and subsequent conductive transfer to the water.

6. Effects on Nutrients and Other Solutes

Livestock activities can directly affect nutrient dynamics through several mechanisms. The removal of riparian vegetation by grazing reduces the supply of nutrients provided by organic leaf litter. Livestock also redistribute materials across the landscape. Because riparian areas are favored by cattle and sheep, nutrients eaten elsewhere on the range are often deposited in riparian zones or near other attractors, such as salt blocks (Heady and Child 1994). The deposition of nutrients in riparian areas increases the likelihood that elements such as nitrogen and phosphorous will enter the stream. Nutrients derived from livestock wastes may be more bioavailable than those bound in organic litter. Elimination of the cryptogamic crust by livestock may also alter nutrient cycling in arid and semi-arid systems. These microbiotic crusts complete most of the nitrogen fixation in desert soils (Rychert *et al.* 1978). Loss of these crusts can reduce the availability of nitrogen for plant growth, potentially affecting plant biomass in uplands (Kauffman and Pyke, in press; Belsky *et al.* 1999, Fleischner 1994).

Riparian areas play a major role in regulating the transportation and transformation of nutrients and other chemicals. As stream channels incise and streams are separated from their floodplains, soil moisture is reduced, which in turn alters the quantity and form of nutrients and their availability to aquatic communities. In the anaerobic environments of saturated soils, microbial activity transforms nitrate nitrogen (NO_3) into gaseous nitrous oxide (N_2O) and elemental nitrogen (N_2) liberated to the atmosphere (Green and Kauffman 1989). Under drier soil conditions (oxidizing environments), denitrification does not occur and nitrate-nitrogen concentrations in the soil increase. Because nitrate is negatively charged, it is readily transported by subsurface flow to the stream channel (Green and Kauffman 1989). Thus, by altering the hydrologic conditions in the riparian zone, grazing can increase how much nitrate nitrogen is released to streams. Excessive nitrate concentrations encourage algal growth, increase turbidity, and may cause oxygen depletion because of increased biochemical oxygen demand.

The form of other elements including manganese, iron, sulfur, and carbon also depends on the redox potential of soils. In their reduced form, manganese, iron, and sulfur can be toxic to plants at high concentrations (Green and Kauffman 1989). Obligate and facultative wetland plant species have special adaptations for coping with these reduced elements that allow them to survive where more xeric plants cannot. Thus, changes in hydrologic condition caused by downcutting can modify the form of elements available to plants, altering competitive interactions between plants and changing riparian plant communities.

7. Effects of Vegetation Management

Fertilizers, herbicides, mechanical treatments, and prescribed fire are commonly used in rangeland management to alter vegetation in favor of desired species. In principle, the potential effects of these activities on salmonids and their habitats are no different from similar activities in forested environments. However, because the physical and biological processes that regulate the delivery of water, sediments, and chemicals to streams differ on forests and rangelands, so may be the response of aquatic ecosystems.

Fertilizers are used on rangelands to increase forage production, improve nutritive quality of forage, and enhance seedling establishment, although the high costs and varied results have led to a decline in fertilizing rangeland in the past 20 years (Heady and Child 1994). Fertilizers that reach streams through direct application or runoff can adversely affect water quality. Nutrient enrichment (especially nitrogen) promotes algal growth, which in turn can lead to oxygen depletion as algae die and decompose. Conversely, fertilizer applied to rangelands may reduce sedimentation, hydrologic, and temperature effects by stimulating recovery of vegetation, including woody riparian shrubs.

Herbicides are typically used to target unpalatable or noxious weeds that compete with desired forage species. Many herbicides commonly used in forestry (e.g., 2,4-D, picloram, glyphosate, triclopyr) are used in range management as well, although other highly selective herbicides may

be used to control particular weeds common to rangelands, including unpalatable woody shrubs. Direct toxic effects on aquatic biota may occur where herbicides are applied directly to stream channels; however, risks of contamination can be reduced if adequate no-spray buffers are maintained (Heady and Child 1994). Herbicide applications to upland areas may decrease total ground cover, increasing the potential for surface erosion. In the riparian zone, use of herbicides may reduce production of deciduous trees and shrubs, opening streams to greater direct solar radiation, which in turn leads to elevated stream temperatures and increased algal production. These conditions can lead to insufficient nighttime dissolved oxygen concentrations and afternoon gas supersaturation. The loss of riparian vegetation also decreases the amount of organic litter and large wood delivered to streams. Furthermore, without the root structure of woody vegetation, banks are prone to collapse, increasing sedimentation and reducing cover for fish.

The influence of mechanical treatment and prescribed fire on aquatic ecosystems in rangelands depends on the type and intensity of disturbance. The use of tractors with dozer blades, brush rakes, cables, or rolling cutters for vegetation removal all can lead to compaction of rangeland soils (Heady and Child 1994), thus increasing surface runoff and erosion. Disking of soils may break up impervious soils and allow greater infiltration of water. Unless the area is rapidly revegetated, raindrop splashes on exposed soils are likely to increase surface erosion and increase sediment delivery to streams. Disking and dozer use also rearranges soil layers, mixing topsoil with woody debris, which may affect reestablishment of vegetation. Positive effects of mechanical vegetation removal are also possible. Removal of vegetation with high evapotranspiration rates (e.g., juniper woodlands that have encroached because of grazing and lack of wildfires) may potentially increase water available during the summer, although documentation of this effect is poor. Prescribed fire is most likely to affect aquatic ecosystems through increased surface runoff and erosion resulting from the removal of vegetation and formation of hydrophobic soils.

In summary, manipulations of vegetation on rangelands can influence salmonid habitats through both direct and indirect pathways. These changes may harm or benefit salmonids depending on whether temperature, spawning sites, cover, or food limits the production of salmonids. Salmonid abundance will decrease if the increased invertebrate production is offset by undesirable alterations in the benthos assemblage to less nutritious species, reduced cover, increased sedimentation, and lower water quality.

8. Effects on Physical Habitat Structure

Livestock-induced changes in physical structure within streams result from the combined effects of modified hydrologic and sediment transport processes in uplands and the removal of vegetation within the riparian zone. Platts (1991) and Elmore (1992) reviewed effects of grazing on channel morphology and are the sources of most information presented below. Loss of riparian vegetation from livestock grazing generally leads to stream channels that are wider and shallower than those in ungrazed or properly grazed streams (Hubert *et al.* 1985; Platts and

Nelson 1985a, 1985b in Marcus *et al.* 1990). Loss of riparian root structure promotes greater instability of stream banks, which reduces the formation of undercut banks that provide important cover for salmonids (Henjum *et al.* 1994). Furthermore, increased deposition of fine sediments from bank sloughing may clog substrate interstices and reduce both invertebrate production and the quality of spawning gravels. Over the long-term, reductions in instream wood diminish the retention of spawning gravels and decrease the frequency of pool habitats. In addition, the lack of structural complexity allows greater scouring of streambeds during high-flow events, which can reduce gravels available for spawning and cause channel downcutting.

9. Effects on Stream Biota

As with forest practices, removal of riparian vegetation by livestock can fundamentally alter the primary source of energy in streams. Reduction in riparian canopy increases solar radiation and temperature, and thus stimulates production of periphyton (Lyford and Gregory 1975). In a study of seven stream reaches in eastern Oregon, Tait *et al.* (1994) reported that thick growths of filamentous algae encrusted with epiphytic diatoms were found in reaches with high incident solar radiation, whereas low amounts of epilithic diatoms and blue-green algae dominated in shaded reaches. Periphyton biomass was significantly correlated with incident solar radiation.

While densities of macroinvertebrates in forested streams typically increase in response to increased periphyton production, the effect of stimulated algal growth in rangeland streams is less clear. Tait *et al.* (1994) found that biomass, but not density, of macroinvertebrates was greater in reaches with greater periphyton biomass. The higher biomass was a consequence of many *Dicosmoecus* larvae, a large-cased caddisfly, that can exploit filamentous algae. Consequently, any potential benefits of increased invertebrate biomass to organisms at higher trophic levels, including salmonids, may be small, because these larvae are well protected from fish predation by their cases. Tait *et al.* (1994) suggest that these organisms may act as a trophic shunt that prevents energy from being transferred to higher trophic levels.

Evidence of negative effects of livestock grazing on salmonid populations is largely circumstantial, but is convincing nonetheless. Platts (1991) found that in 20 of 21 studies identified, stream and riparian habitats were degraded by livestock grazing, and habitats improved when grazing was prohibited in the riparian zone. Fifteen of the 21 studies associated decreasing fish populations with grazing. Although they caution that some of these studies may be biased because of a lack of grazing history, the negative effects of grazing on salmonids seem well supported. Storch (1979) reported that in a reach of Camp Creek, Oregon, passing through grazed areas, game fish made up 77 percent of the population in an enclosure, but only 24 percent of the population outside the enclosure. Platts (1981) found fish density to be 10.9 times higher in ungrazed or lightly grazed meadows of Horton Creek, Idaho, compared with an adjacent heavily grazed reach. Within an enclosure along the Deschutes River, Oregon, the fish population shifted from predominately dace (*Rhinichthys* sp.) to rainbow trout over a ten-year

period without grazing (Claire and Storch 1983). Platts (1991) cited other examples of improved habitat conditions resulting in increased salmonid populations.

2. Croplands

Crop production is the third most common use of non-federal land in Washington State, following grazing and timber production. Approximately half of the non-timbered private lands are devoted to crop production, with another 5 million acres in pasture or hay production. Of the harvested cropland, wheat accounts for 43 percent and hay for 39 percent, found mostly in eastern Washington. The remaining 18 percent is mostly barley, vegetables, orchards, oats, and nursery and greenhouse crops, in that order (USDA 1992).

Farming and agricultural practices result in massive alterations of the landscape, frequently resulting in long-term impacts to the aquatic and riparian ecosystems. Usually, the effects of agriculture on the land surface are more severe than logging or grazing because vegetation removal is permanent and disturbances to soil often occur several times per year. Crop production often takes place on the historical floodplains of river systems, where it has a direct impact on stream channels and riparian functions. In the Pacific Region, 21 percent of the cropland is considered “floodprone,” that is, lowland and relatively flat areas adjoining inland and coastal waters such as streams, rivers, lakes and estuaries (USDA 1989). Irrigated agriculture frequently requires the diversion of surface waters, which decreases water availability and quality for salmonids and other aquatic species.

In Washington, the Puget Sound and the Yakima River Basins were selected as two of 50 of the Nation’s largest river basins for inclusion in the National Water-Quality Assessment (NAWQA) program. Chemicals (primarily herbicides and fertilizers) were detected in 56 percent of the agricultural and 46 percent of the urban sites tested and approximately 20 percent of the wells tested within the upper Columbia basin exceeded the drinking water standards for nitrates (USGS 1999). The compounds detected most frequently were atrazine (38.2%), deethylatrazine (34.2%), simazine (18.0%), metolachlor (14.6%), and prometon (13.9%). Overall, nutrient levels within the Yakima drainage and the upper Columbia Basin exceeded the national median with nearly half of the sites falling in the upper 25th percentile of all NAWQA sites sampled (USGS 1999). Elevated nutrient concentrations, primarily caused by fertilizer application on fields upstream of the sample sites, contribute to excessive growth of aquatic plants and reduced levels of dissolved oxygen, which can adversely affect fish.

The loss of riparian vegetation, as a direct result of development and agricultural practices, has resulted in the majority of streams having less than 20 percent canopy cover and an average of 70 percent bank erosion (USGS 1999). The cumulative effects of channel alterations, water withdrawals, loss of streamside vegetation, elevated temperatures, and high nutrient and sediment loadings, resulted in 44 percent of the study sites having severely degraded or unsuitable habitat conditions for many native species. Furthermore, the NAWQA project examining the Central

Columbia Plateau in Washington and Idaho noted that present-day grazing and cropping practices are limiting natural recovery of the vegetation (Williamson *et al.* 1998).

The assessment showed that fish communities and instream and riparian habitat quality in agricultural portions of the basin ranked among the worst found when compared to other NAWQA sites (Wentz *et al.* 1998). Qualitative summaries of the historical effects of agriculture on aquatic ecosystems have been reported by Smith (1971), Cross and Collins (1975), Gammon (1977), and Menzel *et al.* (1984).

1. Effects on Vegetation

In Washington and throughout the west, natural grasslands, woodlands and wetlands have been eliminated to produce domestic crops. Ninety-two percent of the original fire-maintained prairies and floodplain forests of the Puget Trough have been replaced with croplands and urban development (Dunn 1997; Crawford 1997). By the late 1970's, more than 40 percent of the tidal marshes and 75 percent of the tidal swamps in the Pacific Northwest were lost, primarily due to diking (Thomas 1983). Wetland areas in most estuaries have been reduced by 50 to 95 percent due to conversion for agricultural and urban use (Boule and Bierly 1987). Replacement of natural forest and shrubland vegetation with annual crops frequently results in large areas of tilled soil that become increasingly compacted by machinery and are only covered with vegetation for part of the year. Commonly, little or no riparian vegetation is retained along streams as farmers attempt to maximize acreage in production. Although some agricultural lands may be restored to more natural communities, cropland conversion is usually a permanent alteration of the landscape.

2. Effects on Soils

Agricultural practices involves repeated tillage, fertilization, irrigation, pesticide application, and harvesting of the cropped acreage. The repeated mechanical mixing, aeration, and introduction of fertilizers or pesticides significantly alter physical soil characteristics and soil microorganisms. Further, tillage renders a uniform characteristic to soils in the cropped areas. Although tillage aerates the upper soil, compaction of fine textured soils typically occurs just below the depth of tillage, altering the infiltration of water to deep aquifers. Other activities requiring farm machinery to traverse the cropped lands, and roads along crop margins, causes further compaction, reducing infiltration and increasing surface runoff. Where wetlands are drained for conversion to agriculture, organic materials typically decompose, significantly altering the character of the soil. In extreme cases, the loss of organic materials results in "deflation," the dramatic lowering of the soil surface. Soil erosion rates are generally greater from croplands than from other land uses but vary with soil type and slope. The estimated average annual erosion measured on agricultural lands in Oregon was 5.7 tons per acre (USDA 1989).

3. Effects on Hydrology

Changes in soils and vegetation on agricultural lands typically result in lower infiltration rates, which yield greater and more rapid runoff. For example, Auten (1933) suggested that forested land may absorb fifty times more water than agricultural areas. Loss of vegetation and soil compaction increase runoff, peak flows, and flooding during wet seasons (Hombeck *et al.* 1970). Reduced infiltration and the rapid routing of water from croplands may also lower the water table, resulting in lower summer base flows, higher water temperatures, and fewer permanent streams. Typically, springs, seeps, and headwater streams dry up and disappear, especially when wetlands are ditched and drained.

Water removed from streams and spread on the land for irrigated agriculture reduces streamflows, lowers water tables, and leaves less water for fish. Often the water is returned considerable distances from where it was withdrawn, and the return flows typically raise the salinity and temperature in receiving streams. Examples of this occur in many rivers in eastern Washington. The flows of these rivers are naturally low in late summer, but the additional losses from irrigation accentuate low flows. Reductions in summer base flows greatly degrade water quality because the water warms more than normal and causes increased evaporation, which concentrates dissolved chemicals and increases the respiration rates of aquatic life.

Streams are typically channelized in agricultural areas, primarily to reduce flood duration and to alter geometry of cropped lands to improve efficiency of farm machinery. Because peak flows pass through a channelized river system more quickly, downstream flood hazards are increased (Henegar and Harmon 1971). When channelization is accompanied by widespread devegetation, the severity of flooding is increased, such as occurred in the Mississippi Valley in 1993. On the other hand, channelization of streams leads to decreases in summer base flows because of reduced groundwater storage (Wyrick 1968), which can limit habitat availability for fish and increase crowding and competition. In more extreme cases, streams may dry completely during droughts (Gorman and Karr 1978; Griswold *et al.* 1978).

4. Effects on Sediment Transport

Because of the intensity of land use, agricultural lands contribute substantial quantities of sediment to streams. The Soil Conservation Service (1984) estimated that 92 percent of the total sediment yields in the Snake and Walla Walla River basins of southeastern Washington resulted from sheet and rill erosion from croplands that accounted for only 43 percent of the total land area. The loss of vegetative cover increases soil erosion because raindrops are free to detach soil particles (splash erosion). Fine sediments mobilized by splash erosion fill soil interstices, which reduces infiltration, increases overland flow, and adds to sheet and rill erosion. Agricultural practices typically smooth and loosen the land surface, enhancing the opportunity for surface erosion. When crop lands are left fallow between cropping seasons, excessive erosion can greatly increase sediment delivery to streams (Soil Conservation Service 1984). Mass failures are probably rare on most agricultural lands because slopes are generally gentle; however, sloughing of stream banks is a common occurrence in riparian zones in response to vegetation removal.

5. Effects on Thermal Energy Transfer and Stream Temperature

Removal of riparian forests and shrubs for agriculture reduces shading and increases wind speeds, which can greatly increase water temperatures in streams passing through agricultural lands. In addition, bare soils may retain greater heat energy than vegetated soils, thus increasing conductive transfer of heat to water that infiltrates the soil or flows overland into streams. In areas of irrigated agriculture, temperatures increases during the summer are exacerbated by heated return flows (Dauble 1994).

6. Effects on Nutrient and Solute Transport

Agricultural practices substantially modify the water quality of streams. Omernik (1977), in a nationwide analysis of 928 catchments, found that streams draining agricultural areas had mean concentrations of total phosphorus and total nitrogen 900 percent greater than those in streams draining forested lands. Smart *et al.* (1985) found that water quality of Ozark streams was more strongly related to land use than to geology or soil. Exponential increases in chlorine, nitrogen, sodium, phosphorus, and chlorophyll-a occurred with increases in percent pasture in streams draining both forested and pastured catchments, and fundamental alterations in chemical habitats resulted as the dominant land use changed from forest to pasture to urban. Stimulation of algal growth by nutrient enrichment from agricultural runoff may affect other aspects of water quality. As algal blooms die off, oxygen consumption by microbial organisms is increased and can substantially lower total dissolved oxygen concentrations in surface waters (Waldichuk 1993). Nutrient enrichment from agricultural runoff has been found to significantly affect water quality in two rivers in interior British Columbia. Die-off of nutrient-induced algal blooms resulted in significant oxygen depletion (concentrations as low as 1.1 mg/L^{-1}) in the Serpentine and Nicomekl rivers during the summer, which in turn caused substantial mortality of coho salmon.

7. Effects of Fertilizer and Pesticide Use

The Puget Sound Basin National Water-Quality Assessment team compiled historical data on nutrient concentrations and streamflows for 22 rivers and streams in the Puget Sound Basin. The data were used to estimate loads and yields of inorganic nitrogen (nitrate, nitrite, and ammonia), organic nitrogen, and total phosphorus for the period 1980-1993 (Embrey and Inkpen, in press). The report estimates that approximately 11,000 tons of inorganic nitrogen and 2,100 tons of phosphorus are transported by rivers and streams to Puget Sound every year. The Samish and Nooksack River basins are dominated by agriculture. These two basins receive the largest nutrient inputs (up to $10 \text{ (tons/mi}^2\text{)/yr}$ of nitrogen and up to $1.5 \text{ (tons/mi}^2\text{)/yr}$ phosphorus), 90 percent of which comes from animal manures and agricultural fertilizers (USGS 1999). Similar findings were documented for the upper Columbia River basin. Concentrations of nitrates in surface waters in the Palouse study unit were highest during winter when storm runoff transports chemicals from agricultural fields to the streams after fertilizers have been applied to the fields in

the fall. The studies also found that sediment erosion has degraded instream habitat for fish and other aquatic life and has transported some long-banned but persistent pesticides (such as DDT) to streams; concentrations of these pesticides or total PCBs exceeded guidelines for streambed sediment at 22% of the sites sampled (USGS 1999). Salmon deaths have occurred due to accidental contamination of pesticides, and sublethal concentrations have been implicated in a wide range of behavioral, immunological, and endocrine disfunctions, and indirect effects such as interference with food webs (Botkin *et al.* 1995; Ewing 1999).

Unlike native vegetation, agricultural crops require substantial inputs of water, fertilizer, and pesticides to thrive. Currently used pesticides, although not as persistent as previously-used chlorinated hydrocarbons, are still toxic to aquatic life. Where pesticides are applied at recommended concentrations and rates, and where there is a sufficient riparian buffer, the toxic effects to aquatic life may be small. However, agricultural lands are also characterized by poorly-maintained dirt roads and ditches that, along with drains, route sediments, nutrients, and pesticides directly into surface waters. Thus, roads, ditches, and drains have replaced headwater streams but, unlike natural channels which filter and process pollutants, these constructed systems deliver them directly to surface waters (Larimore and Smith 1963).

8. Effects on Physical Habitat Structure

Agricultural practices typically include stream channelization, ditch clean-out (removing woody material and increasing sediments), construction of revetments (bank armoring), and removal of natural riparian vegetation. Each of these activities reduces physical habitat complexity, decreases channel stability, and alters the food base of the stream (Karr and Schlosser 1978). Natural channels in easily eroded soils often braid and meander, creating considerable channel complexity and regular recruitment and accumulations of fallen trees. Large wood helps create deep, persistent pools (Hickman 1975) and meander cutoffs. In contrast, channelization lowers the base level of tributaries, stimulating their erosion (Nunnally and Keller 1979). The channelized reach becomes wider and shallower, unless it is revetted, in which case bed scour occurs that leads to channel downcutting or armoring. Channel downcutting leads to a further cycle of tributary erosion. Richards and Host (1994) reported significant correlations between increased agriculture at the catchment scale and increased stream downcutting.

9. Effects on Stream Biota

Agricultural practices also cause biological changes in aquatic ecosystems. In two states typified by extensive agricultural development and with extensive statewide ecological stream surveys, instream biological criteria were not met in 85 percent of the sites (Ohio EPA 1990; Maxted *et al.* 1994a). Nonpoint sources of nutrients and physical habitat degradation were identified as causes of much of the biological degradation. In another study, Maxted *et al.* (1994b) also showed that shading had marked effects on stream temperatures and dissolved oxygen concentrations. In some agricultural stream reaches without riparian vegetation, the extremes exhibited in both

temperature and dissolved oxygen would preclude the survival of all but the most tolerant organisms. Higher temperatures increase respiration rates of fish, increasing oxygen demand just when oxygen is depleted by stimulated plant respiration at night. Smith (1971) reported that 34 percent of native Illinois fish species were extirpated or decimated, chiefly by siltation, and lowering of water tables associated with drainage of lakes and wetlands. Although point sources were described by Karr *et al.* (1985) as having intensive impacts, nonpoint sources associated with agriculture were considered most responsible for declines or extirpations of 44 percent and 67 percent of the fish species from the Maumee and Illinois drainages, respectively. Sixty-three percent of California's native fishes are extinct or declining (Moyle and Williams 1990), with species in agricultural areas being particularly affected. Nationwide, Judy *et al.* (1984) reported that agriculture adversely affected 43 percent of all waters and was a major concern in 17 percent of the Nation's waters.

Modification of physical habitat structure has been linked with changes in aquatic biota in streams draining agricultural lands. Snags are critical for trapping terrestrial litter that is the primary food source for benthos in small streams (Cummins 1974), and as a substrate for algae and filter feeders in larger rivers. Behnke *et al.* (1985) describe the importance of snags to benthos and fish in rivers with shifting (sand) substrates. Such systems, typical of agricultural lands, support the majority of game fish and their prey. Marzolf (1978) estimates 90 percent of macroinvertebrate biomass was attached to snags. Hickman (1975) found that snags were associated with 25 percent higher standing crops for all fish and 51 percent higher standing crops for catchable fish. Fish biomass was 4.8 to 9.4 times greater in a stream side with instream cover than in the side cleared of all cover (Angermeier and Karr 1984). Gorman and Karr (1978) reported a correlation of 0.81 between fish species diversity and habitat diversity (substrate, depth, velocity). Shields *et al.* (1994) found that incised channels in agricultural regions supported smaller fishes and fewer fish species.

On a larger scale, habitat and reach diversity must be great enough to provide refugia for fishes during temperature extremes, droughts, and floods (Matthews and Hems 1987). If refugia are present, fishes in agricultural streams can rapidly recolonize disturbed habitats and reaches. However, loss of refugia, alterations in water tables, simplifications of channels, and elimination of natural woody riparian vegetation symptomatic of agricultural regions create increased instability and results in stream degradation (Karr *et al.* 1983).

Effects of the Action

Overview of effects

The purpose of the CREP program is to contribute to the restoration of natural habitat conditions in riparian and wetland areas on private agricultural lands in Washington for the benefit of listed salmonids. If implemented properly, the Services expect that the program will be successful in

meeting this goal. However, implementation of certain restoration practices and specific projects may cause some short- and long-term adverse effects and may take some listed species even though the projects will eventually provide important long-term benefits. Most of these potential adverse effects have been eliminated or minimized through application of the BMPs described in the BA. Where necessary, the Services have also developed Reasonable and Prudent Measures and Terms and Conditions to further minimize the potential for take.

The FSA has organized the proposed CREP program into six categories of project activities. An overview of the potential impacts associated with each of these six project groups is described below and in Table 3.

1. Streambank shaping and revegetation

Streambank shaping activities of less than 30 linear feet could cause temporary decreases in water quality (sedimentation and turbidity) and may impact existing riparian and upland vegetation. However, any such impacts will be temporary in nature and eliminated through various stabilization techniques and follow-up vegetation planting. Any excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in streams. This activity could result in a small but unquantifiable level of harm to listed aquatic species due to stream sediment impacts. On projects that propose more than 30 linear feet of streambank shaping, FSA will carry out an additional site-specific consultation with the Services regarding the harm or other forms of take that could result from the action.

Disturbances of the stream substrates associated with instream use of heavy equipment have been documented to require decades to pass the sediment through a watershed (Madej 1978, 1982 in Montgomery and Buffington 1993). Coarse sediment is generally deposited within a meander or two of the project site. Sand and silts generally travel during higher flows and may be carried up to two miles downstream.

2. Grading/leveling/filling/seedbed preparation in riparian areas

Site preparation work will result in temporary removal of vegetation in marginal pastureland areas. Soil disturbance will occur on some sites, but BMPs, distance of these practices to streams, and the limited nature of earth moving activities will avoid most potential impacts to water quality. This activity may include the construction of small (<3 feet) mounds for planting of trees in wet sites or areas of dense competing vegetation. Revegetation of disturbed sites will ensure that any impacts are of limited duration. This activity could result in a small but unquantifiable level of harm to listed aquatic species due to stream sediment impacts. The same downstream effects of sediments moving through the system as described in the streambank shaping section apply to this activity.

3. Planting of grass, shrubs and trees

Revegetation activities will cause only minor disturbances to soils, since nearly all plantings will be done by hand. Plant growth in these disturbed sites will be rapid because planting activities will only occur during optimal seasonal growth periods for the respective plant species involved. This activity is not likely to result in take of listed species.

4. Control or removal of invasive plant species outside of streambank areas

BMPs related to handling and application of chemicals are likely adequate to minimize any water quality impacts related to these activities. Assuming FSA is successful at ensuring that pesticides and other chemicals do not enter the water body, this activity will result in no adverse effects to listed species. If pesticides do enter the water body or are not used in accordance to label specifications, this activity could result in adverse effects to listed species.

5. Installation of livestock exclusion fencing, off-channel livestock watering facilities and livestock stream crossings

Installation of fences and watering facilities in upland habitats will result in short-term loss of vegetation along the fence line and in the vicinity of watering facilities. Installation of livestock water crossings across small streams could result in an increase in sedimentation in the short- and long-term. Revegetation efforts and exclusion of livestock from riparian environments will reduce these impacts in the long term. In addition, riparian buffer zones between streambanks and fence lines will be planted with vegetation. Reestablishment of the riparian vegetation will provide streambank stabilization, reduce sedimentation of adjacent streams, increase stream shading, improve wildlife habitat, reduce nutrient inflow from adjacent agricultural lands and provide a future source of large woody debris. Installation of livestock crossing facilities may cause harm to a small but unquantifiable number of listed fish species if installation activities increase sediment inputs into the stream; relevant BMPs should minimize, but may not entirely eliminate, this potential impact. The same downstream effects of sediments moving through the system as described in the streambank shaping section apply to this activity.

Table 3. Potential adverse impacts to listed and proposed species by CREP program activities as described in the BA. Effects to listed species including may affect, but not likely to adversely affect (NLAA) and likely to adversely affect (LAA) are listed in the table below.

CREP Activity	Description	Impacts			
		Fish	Plants	Birds	Mammals
1. Streambank shaping and revegetation Activity will occur on less than 5% of CREP project area.	Shape banks to address erosion concerns. Could temporarily increase siltation, impact natural stream processes, and remove natural vegetation.	Short-term LAA Some potential to take locally occurring species	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed
2. Grading, leveling, filling, seedbed preparation in riparian areas	Installation of riparian buffer and filter strips. Some minor earthmoving. Could temporarily increase siltation.	Short-term LAA Application of BMPs may result in some take of locally occurring species if sediment inputs not adequately controlled.	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed
3. Planting of grass, shrubs, and trees.	Planting of vegetation according to standards in the riparian buffer, filter strip, and	NLAA Application of BMPs will result in no	NLAA No Incidental Take if BMPs are	NLAA No Incidental Take if BMPs are	NLAA No Incidental Take if BMPs are

CREP Activity	Description	Impacts			
		Fish	Plants	Birds	Mammals
	riparian herbaceous practices.	take of species.	followed	followed	followed
4. Control or removal of invasive plants.	Mechanical, biological, and chemical control of invasive plants. Herbicides will only be applied by hand to minimize the potential for drift and direct input of chemicals into the water body.	Application of BMPs will result in no take of species if chemicals do not enter water body. LAA if chemicals enter the water body.	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed
5. Installation of livestock fencing, off-channel watering facilities, and livestock stream crossings. Ground-disturbing activity will occur on less than 5% of CREP project area.	Install fencing, livestock watering facilities, and stream crossings to eliminate cattle from stream areas. Could temporarily increase siltation, impact natural stream processes, and remove natural vegetation.	LAA Some potential to take locally occurring species when installing livestock crossings.	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed	NLAA No Incidental Take if BMPs are followed

CREP Activities Not Likely to Adversely Affect Listed Species

The Services agree with FSA that many CREP activities are not likely to adversely affect listed or proposed species. These types of activities are described below.

Listed and Proposed Fish: The Services concur with FSA that the following CREP activities are not likely to adversely affect listed or proposed fish species because they will avoid the addition of significant amounts of sediment into fish habitats, they will not allow for the introduction of toxic pesticides or herbicides into these same habitats, and these actions are of low potential to cause other adverse impacts to listed or proposed fishes or their habitats:

1. The Riparian Forest Buffer Practice and Riparian Herbaceous Cover Practice when:
 1. planting is done by hand and is outside of bankfull edge;
 - b. there is no grading or shaping of the streambank;
 3. chemical pesticides do not enter the stream (i.e., noxious weeds are removed by mechanical means or with chemicals applied with hand sprayers at a sufficient distance from the water body); and
 - d. native species are utilized as described in the BA (BMP #17) and consistent with President Clinton's Executive Order 13112 (February 3, 1999)(see below). It is our opinion that use of non-native hybrid poplars is inappropriate under this program.
2. The Filter Strip Practice when it is installed upslope of an installed Riparian Forest Buffer or Riparian Herbaceous Cover and consistent with the BMPs in the BA.
3. Installation of livestock exclusion fencing when it is installed outside of bankfull edge and requires no instream crossings.

Listed and Proposed Plants: The CREP may affect three listed or proposed plant species (Table 2). These species are limited in their distribution, and many projects may be quickly screened to determine if there is any likelihood of affecting a listed or proposed plant. If a CREP project site occurs within a location, mapped soil unit, or soil series or type as identified in Table 2, the project site must be surveyed by a qualified botanist in the appropriate season to determine if any listed plant species are present. The application of the CREP program is not likely to adversely affect listed and proposed plants because the surveys are designed to avoid any negative impacts to listed and proposed plants through project redesign.

Listed Birds: The application of the Washington CREP program is not likely to adversely affect listed birds because FSA has agreed to the following conditions:

1. For the bald eagle, the actions occur greater than ½ mile from any eagle nest. For any project within ¼ mile non-line-of-sight or ½ mile line-of-sight of an eagle nest identified by WDFW, no activities producing noise above ambient levels will occur at the site from January 1 to August 31. If a proposed activity is near a bald eagle nest and must occur during the restricted period, site-specific consultation with USFWS will be initiated to evaluate the potential for adverse effects.

For nest sites located within areas of relatively high levels of disturbance (traffic, farm activities, urban areas, etc), the buffer distance may be negotiated and activities covered programmatically on a case by case basis after coordinating with the USFWS.

Listed Mammals: The application of the entire CREP program is not likely to adversely affect the Columbian white-tailed deer because the type of activities being considered would be

considered a beneficial effect to this species due to the improvement of riparian habitat used by the deer. In addition, FSA has agreed to the following condition:

1. Fencing projects on Puget Island, the Hunting Islands, Price Island, and 2 miles inland from the Columbia River between 2 miles east of Cathlamet and 2 miles west of Skamokawa Creek in Wahkiakum County will use only 3-strand barbed wire.

Most of the above actions are not likely to adversely affect aquatic listed species because they will occur outside of the bankfull edge of a stream. Activities occurring within the bankfull edge may result in short-term adverse effects and take of listed species; these are discussed below.

CREP Activities That May Adversely Affect Listed Species

In general, long-term effects resulting from CREP Program activities are expected to be beneficial, as the intent of the program is to restore natural stream functions. The BA stated that CREP projects may affect listed, proposed, and candidate species but are generally "not likely to adversely affect" because operational procedures (BMPs and the Services' guidance) will minimize, to the extent practicable, the effects of specific actions. The Services generally concur with this conclusion, but under some circumstances we expect that some short-term adverse effects may occur during project implementation as described below.

Listed and Proposed Fish: All 17 listed or proposed fish species addressed in this consultation may be adversely affected in the short-term by projects designed to provide long-term benefits. These activities include bank stabilization or shaping, construction of livestock crossing facilities, preparation of planting areas, and the potential for accidental leaching of chemicals into waterways. These activities could have direct or indirect, negative short-term impacts to fish during critical life stages such as migration, breeding/spawning, and juvenile rearing. Effects may result in disturbance, displacement, or alteration of habitats. Such impacts include physical interaction with eggs or alevin in the gravels, juveniles, adults, or short-term sedimentation during any instream or near stream restoration work.

Projects implemented under CREP may involve the use of certain herbicides, pesticides and fertilizers in a variety of the practices approved for use in the program in order to facilitate the establishment of the riparian buffers. The use of chemicals to control competing vegetation is a last resort after manual control methods have failed. The FSA provided materials data sheets and environmental studies for the use of 7 herbicides in the CREP program (most common trade names are listed in parentheses): Triclopyr (Crossbow, Garlon), sulfometuron-methyl (Oust), glyphosate (Roundup, Rodeo), oxyfluore (Goal), atrazine, 2, 4-D, and hexazinone (Pronone). Although these chemicals have been found by the EPA to be relatively environmentally benign, more refined toxicity ratings and long-term effects studies of agricultural chemicals on listed species are currently ongoing. Recent data indicates that the standard EPA ratings and tests which are conducted to approve chemicals for the market are inadequate at determining sub-

lethal effects on aquatic and terrestrial organisms of concern. In addition, several studies indicate that the surfactants or carriers used in the application of some chemicals are as toxic as the active ingredient itself. In evaluating the list of chemicals proposed for use in the CREP program, the Services prefer the use of the 5 chemicals and formulations listed in BMP #10, but have strong reservations on the use of Atrazine, Hexazinone, the ester formulation of 2,4-D, and the Garlon-4 formulation of Triclopyr. In addition, the Services prefer the formulation of glyphosate used in Rodeo over Roundup because of the toxicity ratings of the latter on aquatic organisms.

Although the Services are primarily concerned that pesticides or other chemicals may on occasion enter the water body and will directly or indirectly impact listed fish, several of the CREP chemicals have been shown to be lethal to migratory songbirds, amphibians, and/or mammals, including atrazine, triclopyr (Garlon 4 formulation), and the ester formulations of 2,4-D (Department of Ecology 1999; USFWS 2000). Because all of the CREP herbicides have the potential to be lethal to the three listed plants, botanical surveys will be required in areas where habitat for these species occurs and no chemicals will be used at these sites. If the BMPs and terms and conditions are implemented, the Services concur that application of chemicals at the lowest application rate consistent with the intended purpose using spot application with a low-pressure hand sprayers away from the water body is not likely to adversely affect listed species. If FSA expects that some CREP participants will use other application methods that have a higher likelihood of impacting listed species, we assume that “agency personnel” referred to in BMP #9 includes the Services and that we are able to review these projects prior to implementation.

The impacts of these activities will be minimized through the use of BMPs in the BA and guidelines in the Pesticides Application Handbook, as appropriate. The Services believe that any short-term negative impacts are outweighed by the long-term beneficial effects of the proposed action.

Fish Critical Habitat: These activities may also adversely affect listed or proposed critical habitat for listed fishes (see Table 1). These effects would most likely be in the form of short-term adverse effects (e.g., sedimentation) due to activities aimed at long-term habitat benefits.

Critical habitat comprises physical and biological habitat features which are essential to the conservation of a given species. Designated or proposed critical habitat supplies sufficient amounts of space, food, water, oxygen, light, and cover; identifies sites suitable for spawning, rearing, and historic distribution; and determines which areas are ecologically significant. The Washington CREP may adversely affect designated or proposed critical habitat for all of these fishes due to short-term disturbance of some or all of the above mentioned physical and biological habitat features. However, consistent with the goal of CREP to restore degraded habitats, adverse effects would be of short duration and would be substantially outweighed by the beneficial long-term effects of habitat restoration.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Biological Opinion. Future Federal actions that are unrelated to FSA's CREP are not considered in this section because they require separate consultation under Section 7 of the ESA.

Currently, about 37% of Washington's land base is being used for agriculture. Approximately 74% of water use state-wide is used by agriculture. Few activities associated with agricultural land use require federal permits. Major historical impacts of agricultural activities have been increased sediment loading, loss of riparian vegetation, loss of productive side-channel habitat, pesticide contamination and excess nutrient loading. Many of these impacts continue to occur today.

In 1999, the State of Washington published a *Statewide Strategy to Recover Salmon* (State of Washington 1999) intended as a guide for salmon recovery. Included in that document is an agricultural strategy to improve fish habitat. This strategy (which includes the CREP program as a cornerstone), if implemented, could gradually reduce many of the impacts identified above. Also in 1999, a state led effort began to devise an Agriculture, Fish and Water initiative. This initiative is in the beginning stages at this time, but holds promise to result in reductions in agricultural impacts across the State.

For actions on non-Federal lands which the landowner or administering non-Federal agency believes are likely to result in adverse effects to listed species or their habitat, the landowner or agency should work with the Services to obtain any necessary incidental take permits under section 10 of the ESA, which requires submission of a habitat conservation plan.

Significant improvement in listed and proposed anadromous salmonid reproductive success on non-Federal lands is unlikely without meaningful changes in agricultural land and water management practices. Until improvements in non-Federal land management practices are accomplished, the Services assume that future private and state actions will continue at similar intensities as in recent years, or will increase.

Conclusion

The Services have determined, based on the information, analysis, and assumptions described in this Opinion, that FSA's proposed Washington Conservation Reserve Enhancement Program is not likely to jeopardize the continued existence of the listed and proposed species under the respective jurisdictions of NMFS and USFWS shown in Table 1. In arriving at this determination, the Services considered the current status of the listed and proposed species; environmental baseline conditions; the direct and indirect effects of approving the action; and the cumulative effects of actions anticipated in the action area. The Services have evaluated the

proposed action and found that it would cause short-term adverse degradation of some environmental baseline indicators for listed and proposed fishes. Since the CREP program is designed to restore habitat conditions, the effects are expected to be beneficial over the long term.

The short-term effects of the proposed action would not reduce pre-spawning survival, egg-to-smolt survival, or upstream/downstream migration survival rates to a level that would appreciably diminish the likelihood of survival and recovery of proposed or listed fishes, nor is it likely to result in destruction or adverse modification of critical habitats.

CREP represents an important contribution to the recovery of listed salmonids in Washington. Although the Services believe that the implementation of CREP will result in overall benefit to listed and proposed salmonids and their habitats, the reasons for the declines of salmonid fishes in the Pacific Northwest are varied and complex, and this program alone will not be sufficient to achieve recovery. The restoration activities are expected to meet the objectives of the Washington CREP program, particularly if the landowners maintain the riparian buffers beyond the 15 year contract agreement. The ecological functions provided by the conservation practices implemented as part of CREP will be evaluated through the implementation of the MOU between NRCS, USFWS, NMFS, EPA, and the State of Washington.

The biological opinion is rendered on the effects of the proposed activities within the riparian zone and is not, per se, an opinion on the adequacy of the buffer to meet all of the requirements for listed species. Both Services have determined that the riparian restoration activities, if installed in accordance with the criteria outlined in the Washington CREP, work towards recovering listed and proposed salmonids and are designed to provide the majority of riparian functions, particularly if maintained beyond the length of the contract (15 years). The CREP buffers would also serve to significantly minimize or eliminate potential effects to listed salmonids from activities that are conducted on lands beyond the buffer, such as livestock grazing, working fields, and proper use of chemicals on crops. Landowners who enroll in and implement the CREP program will be in compliance with the Endangered Species Act for activities that are addressed in this consultation. However, a forested riparian zone may not be adequate to reduce the effects of other farm practices on listed species, such as water withdrawals, drainage and irrigation, or activities that impact water quality or affect habitat for listed species.

If the FSA should seek a concurrence on the adequacy of the width of the riparian forest buffer, an analysis on how various forest buffer widths provide different levels of riparian and aquatic ecological functions would be needed. For example, a functional forested buffer width of one-half a site-potential tree height may provide adequate bank stability during normal high water events and most of the organic material input from litter fall, but may only meet 70 percent of the requirements for shade or the potential for recruitment of large wood into the channel. Similarly, buffer widths of three-quarters of a site potential tree height likely provide most of the riparian functions relating to bank stability, shade, leaf litter, filtration, etc., but may not be fully adequate in meeting long-term recruitment of large wood within the channel migration zone. If one of the

limiting factors for restoring listed fish species is instream habitat complexity and the amount of large woody material, the analysis would need to demonstrate how the riparian buffer, in conjunction with other restoration activities, would adequately meet this criteria. The analysis should also address what functions can be achieved in the relatively short time period of the program (15 years) and how the CREP program might be enhanced to ensure that the buffers are maintained to meet the long term recovery goals outlined in the program objectives.

INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, or sheltering (64 Fed. Reg. 60727; 1999). Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Under the terms of section 7(b)(4) and section 7(a)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Sections 7(b)(4) and 7(o)(2) of the Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act requires a Federal permit for removal and possession of endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth mandatory terms and conditions required to accomplish the reasonable and prudent measures.

Amount of take anticipated

Certain site-specific actions associated with the Washington CREP program may incidentally take an unquantifiable number of listed fish species shown in Table 1. The amount of take is anticipated to be small and of a temporary nature. Designated critical habitat for listed salmonids may be adversely affected by CREP project implementation, but the negative effects are expected to be short-term. The potential for take has been substantially reduced through the application of

the BMPs. The Services have determined that the level of anticipated take resulting from implementation of the Washington CREP is not likely to jeopardize any of the species nor adversely modify designated critical habitats shown in Table 1.

It is difficult to detect take of salmonids or other aquatic species, even where they are known to occur. The presence of aquatic vegetation, stream flow, and rapid rates of decomposition make finding an incidentally taken individual fish extremely unlikely, and effects such as interfering with feeding may be even more difficult to detect. Furthermore, beneficial effects of management actions are largely unquantifiable in the short term and may only be measurable as long-term effects on the species' habitat or population levels. Although the Services expect incidental take of salmonids to occur from the "likely to adversely affect" actions addressed in this consultation, the best scientific and commercial data available are not sufficient to enable the Services to estimate the number of individuals that would likely be taken incidentally in association with actions implemented in the Washington CREP program. Therefore, the Services can only quantify incidental take using surrogate units of measure for each CREP activity that may result in adverse effects to listed species. For example, the unit of measure for bank stabilization would be expressed as number of miles affected for each site, while planting and control of unwanted vegetation could be measured as acres or miles of riparian area treated. Actions within the riparian area will be highly variable and effects on the aquatic environment will depend on such things as the width of the planted buffer and whether both or only one side of the stream is treated. Actions which may be repeated several times over the course of the program could result in repeated incidental take for the same area.

Although there is no way to evaluate an accurate level of take because the program is dependent on voluntary applications from private citizens, the action agencies can determine the maximum amount of incidental take that is likely to occur if all of the areas that are eligible under the CREP program are treated.

The Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. §§ 668-668d), if implementation of the CREP program is in compliance with the terms and conditions specified herein.

Table 4: Anticipated levels of incidental take from implementation of the Washington CREP program. Up to 100,000 acres (or approximately 4,000 miles) of riparian area are approved for treatment under the program. Anticipated levels of incidental take associated with each of the activities listed below represent the amount of disturbance for each site within the areas identified under the CREP program over the entire life of the program (15 years).

CREP Activity	Description	Anticipated Maximum Stream Miles within which Take May Occur over 15 years	Estimated Annual Miles within which Take May Occur
1. Streambank shaping and revegetation Activity will occur on less than 5% of the total 4,000 miles eligible.	Shape banks to address erosion concerns. Could temporarily increase siltation, impact natural stream processes, and remove natural vegetation. Downstream impacts may occur up to 2 miles from the project site	200	13
2. Riparian buffer planting and seedbed preparation in riparian areas Target is 2,700 miles of stream restoration over the next 15 yrs	Installation of riparian buffer and filter strips. Some minor earthmoving. Could temporarily increase siltation.	2,700	213
3. Installation of livestock fencing, off-channel watering facilities, and livestock stream crossings. Activity will occur on less than 5% of the total 4,000 miles eligible.	Install fencing, livestock watering facilities, and stream crossings to eliminate cattle from stream areas. Could temporarily increase siltation, impact natural stream processes, and remove natural vegetation. Downstream impacts may occur up to 2 miles from the project site	200	13

Reasonable and prudent measures

The measures described below are non-discretionary. They must be implemented as binding measures for the exemption in section 7(a)(2) to apply. The FSA has the continuing duty to regulate the activities covered in this incidental take statement. If the FSA fails to require the applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(a)(2) may lapse. The Services believe that activities carried out in a manner consistent with the BMPs and these Reasonable and Prudent Measures, except those otherwise identified, will not necessitate further site-specific consultation. Activities which differ from the BMPs or RPMs will require further consultation.

The Services believe that the following reasonable and prudent measures are necessary and appropriate to minimize the likelihood of take of listed fish resulting from implementation of the Washington CREP. Should additional habitat inhabited by listed species be designated as critical habitat, these reasonable and prudent measures would also minimize adverse effects to that habitat.

The FSA shall:

1. Ensure the development and implementation of a comprehensive monitoring program to assess the effectiveness of the CREP in meeting its objectives;
2. Avoid take of listed species in any restoration activities that are part of the Washington CREP;
3. Manage herbicides, pesticides and other chemicals as needed to ensure that no degradation of water quality, aquatic habitats and wetlands occurs in the activity area and downstream;
4. Locate, design and maintain livestock crossings or fords as necessary to minimize degradation of riparian and aquatic habitats in the activity area and downstream; and
5. Minimize take associated with instream work or ground-disturbing activities within the riparian zone proposed in the CREP BA (i.e., streambank stabilization, site-preparation, off-channel livestock watering facilities, and livestock crossings) by applying appropriate timing restrictions.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FSA must also comply with the following terms and conditions, which implement the reasonable and prudent measures. These terms and conditions are non-discretionary.

1. To implement Reasonable and Prudent Measure #1, above, the FSA shall:

Provide NMFS and USFWS with a yearly monitoring report describing the success with which the Washington CREP meets the program objectives. This report will include implementation and effectiveness monitoring components.

Implementation Monitoring The annual implementation monitoring report shall focus on summarizing CREP enrollment, including: the level of program participation; the total acres and average widths enrolled in each of the component conservation practices; the total number of acres and distribution of successfully implemented conservation practices; a summary of non-Federal CREP program expenditures; and recommendations to improve the quality of the monitoring program. The Services are particularly interested in an accounting of CREP projects which include streambank stabilization. For those projects, include the following information in the monitoring report: the number of such projects each year, the justification for the work, materials used, size of the project, whether one or both banks were stabilized, and a narrative assessment of each project's effects on natural stream function.

Effectiveness Monitoring This component of the annual report will assess habitat trends as a result of CREP participation, and will specifically focus on the six objectives of the Washington CREP as defined by FSA:

1. Ensure that 100 percent of the area enrolled for the riparian forest practice are restored to a properly functioning condition in terms of distribution and growth of woody plant species.
- B. Reduce sediment and nutrient pollution from agricultural lands adjacent to the riparian buffers by more than 50 percent.
3. Ensure that adequate vegetation is established on enrolled riparian areas to stabilize 90 percent of stream banks under normal (non-flood) water conditions.
- D. Ensure that vegetation adequate to reduce the rate of stream water heating to ambient levels is achieved on all riparian buffer lands.

5. Provide a contributing mechanism for farmers and ranchers to meet the water quality requirements established by the Federal Water Pollution Control Act and Washington State's Department of Ecology agricultural water quality laws.
- F. Provide adequate riparian buffers on at least 2,700 miles of stream to permit natural restoration of stream hydraulic and geomorphic characteristics which meet the habitat requirements of salmon and trout.

The FSA shall ensure the design and implementation of a scientifically credible, statistically robust monitoring plan that focuses on the six objectives listed above. The CREP effectiveness monitoring program will use a standardized design and single set of protocols to facilitate data analysis and interpretation. This monitoring program may make use of existing monitoring efforts if those results do not violate the scientific or statistical credibility of the CREP monitoring program and can provide data specific to CREP objectives. FSA will develop this quantitative monitoring program in consultation with a biostatistician to ensure that the monitoring design and protocols will adequately assess CREP effectiveness in achieving its objectives.

The annual report shall be submitted to:

Stephen W. Landino, Branch Chief
National Marine Fisheries Service
510 Desmond Drive SE
Lacey, WA 98503

and

Gerry M. Jackson, Manager
U.S. Fish and Wildlife Service
Western Washington Office
510 Desmond Drive SE
Lacey, WA 98503

Implementation of a monitoring program will reduce take associated with CREP actions by ensuring that BMPs are carried out as stated in the BA and in this Biological Opinion. Implementation and effectiveness monitoring will determine whether BMPs provide the expected level of protection to listed species. If monitoring indicates that BMPs are not adequate to protect listed species, this information can be used as feedback to improve the program.

2. To implement Reasonable and Prudent Measure #2, above, the FSA shall:

Consult with field biologists from WDFW and the Services to review site-specific streambank stabilization and livestock crossings that include the operation of heavy equipment and may contribute sediments to the stream or result in the damage of desirable riparian vegetation. All instream operations will require a hydraulics permit and must meet the state's site-specific instream timing restrictions.

3. To implement Reasonable and Prudent Measure #3, above, the FSA shall:

Include the following terms and conditions in each project specification calling for pesticides or other chemical applications.

- A. Few of the many registered pesticides have been subject to section 7 consultation under the Act. For some of those that have, the EPA has produced supplemental endangered species label guidelines. For all CREP projects, follow all EPA guidelines addressing threatened and endangered species (e.g., listed plants in Willapa Hills, Clark, and Okanogan counties).
- B. All chemical applicators shall follow label specifications and guidelines outlined in the Washington Pesticide Application Manual.
- C. When operating within 25 feet of water (including streams, ponds, seeps, springs, bogs, wetlands, standing water ponds, and riparian areas), applicators will conduct a special, site-specific evaluation and will follow the guidelines outlined in BMP #10 for the 7 chemicals used in the CREP program. These pesticides will be applied at the lowest application rate consistent with the intended purpose.

4. To implement Reasonable and Prudent Measure #4, above, the FSA shall:

Include the following terms and conditions in each project specification calling for livestock crossings or fords. Livestock crossings, or fords, are intended to provide a stabilized area to provide access across a riparian buffer and waterway for livestock and farm equipment.

- 1. Do not place crossings in areas where listed salmonids spawn or are suspected of spawning, or within a reasonable distance (e.g., 100 feet) upstream of such areas where impacts to spawning areas may occur.
- B. Minimize the number of crossings.
- 3. Design and construct or improve essential crossings to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and to prevent the diversion of streamflow out of the channel and down the road if there is crossing failure.

- A. Stabilize bank cuts, if any, with vegetation and protect approaches and crossings with river rock (not crushed rock) when necessary to prevent erosion.
- 4. Ensure that livestock crossings in and of themselves do not create barriers to the passage of adult and juvenile fish.
- 5. To implement Reasonable and Prudent Measure #5, above, the FSA shall:

Implement instream work consistent with WDFW's Hydraulic Code, available on the web in *Gold and Fish - Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (see WDFW's Web Page at www.wa.gov/wdfw/hab/goldfish/goldfish.htm - location and timing requirements section for the most current version of these guidelines).

The incidental take statement included in this Biological Opinion is limited to the Act. It does not constitute an exemption for non-listed migratory birds and bald and golden eagles from the prohibitions of take under the Migratory Bird Treaty Act of 1918, as amended (U.S.C. 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (U.S.C. 668-668d), or any other Federal statutes.

The Services should be notified within three (3) working days upon locating a dead, injured, or sick endangered or threatened species specimen. Initial notification must be made to the nearest Fish and Wildlife Service Law Enforcement Office. Notification must include the date, time, precise location of the injured animal or carcass, and any other pertinent information. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered and threatened species or preservation of biological materials from a dead animal, the finder has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Contact our Law Enforcement Office at (425) 883-8122 or the Western Washington Office at (360) 753-9440.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. The term "conservation recommendations" is defined as suggestions from the Services regarding discretionary agency activities to: 1) minimize or avoid adverse effects of a

proposed action on listed species or critical habitat; 2) conduct studies and develop information; and 3) promote the recovery of listed species. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the FSA's 7(a)(1) responsibilities.

The Services recommend that the following conservation measures be implemented:

2. **Work with NRCS and the Washington State Conservation Service and other partners to ensure the long-term viability of CREP riparian buffers.**

The services are concerned that some riparian forest buffers may be designed to encourage subsequent timber harvest in the buffers. Such an approach is inconsistent with the basic intent of the CREP program.

The Services are concerned about the long-term viability of the CREP riparian buffers and exactly how the NRCS Riparian Forest Buffer Standard will apply to agricultural lands enrolled in CREP. The science is clear that maintenance of these buffers beyond the 10 to 15-year enrollment period is critical to the long-term recovery of listed salmon and trout. Although some short-term benefits will accrue within the first few years of buffer installation, many of the habitat attributes most important to salmonids (e.g., large trees, improved stream morphology, etc.) will not fully develop in 10 or 15 years. In addition, the target fish populations will require more time to respond to improved conditions and reverse the declining trend in numbers.

If future timber harvest were allowed in the riparian zone, it could result in substantial Federal CREP funds being spent to install riparian habitat features that are subsequently removed before they reach their full potential to improve salmonid habitat. This outcome would be an unwise use of limited Federal conservation funds.

The Services therefore recommend that FSA and State agencies not relax existing forest practice standards to encourage participation in the CREP program. Instead, the Washington Department of Natural Resources and other participating agencies should fully inform landowners that salmonid recovery will likely require longer term commitments to be successful. FSA and the State should focus efforts on encouraging willing landowners to retain these important buffers beyond the enrollment period, and they should not take action that would in fact encourage buffer removal.

2. **Widen riparian buffers.**

The width of riparian buffers are currently limited to 150 feet. The Services recommend that greater riparian buffer widths (possibly tied to floodplain boundaries) be routinely encouraged in CREP contracts in order to maximize the development of fully formed and functional riparian areas under CREP.

3. **Use native vegetation.**

The BA states that native vegetation will be used for plantings (BMP #17). The Services support FSA's stated desire to use native vegetation, especially given President Clinton's recent Executive Order 13112 addressing invasive species and the restoration of native species. The Service believes that use of hybrid poplar is inappropriate for the CREP program and is inconsistent with Executive Order 13112. The Service assumes "feasible" means that appropriate native stock are available to meet the CREP project needs in sufficient quantities and at a reasonable cost. Use of non-native stock or seed should only occur after a good faith attempt has been made to locate native materials.

4. **Conduct a sustainable agriculture analysis.**

FSA, in coordination with other USDA agencies and programs, should continue and expand efforts to provide information and technical assistance that will allow agricultural producers and other interested parties to evaluate alternative conservation systems necessary to recover declining aquatic species and their habitats, and costs associated with those systems, in a timely manner.

Short-term land retirement programs such as CREP are costly and cannot fully address the need for more sustainable agricultural practices that fully integrate environmental, economic and social needs. The CREP Co-op Agreement concerning USDA's commitment to the Washington CREP included provisions for development of land and water conservation plans.

Most producers are motivated to choose management options that maximize profits. Impacts to declining species are not reflected in market signals, however, so conflicts arise between production and species needs. Giving producers information about government programs and conservation systems that not only meet the requirements of the Act but can be relied on to produce consistent, acceptable crop yields is very likely to increase their acceptance of conservation practices as part of their overall farm or ranch management system. Thus, developing such information for Washington's many distinct growing areas is an urgent and high priority need.

USDA has the capacity to develop innovative research and technology transfer tools that will provide agricultural producers in Washington with the tools they need to protect and restore aquatic ecosystems while achieving more cost-efficient production and increased profitability. For example, the Solutions to Environmental and Economic Problems (STEEP) project conducted in the Pacific Northwest which began in 1975 to develop and accelerate adoption of wheat production practices that control soil erosion became a national model for unified regional research and information transfer. A similar program is now needed to solve problems related to the environmental and socioeconomic impacts of alternative conservation systems necessary to

restore riparian and aquatic habitats and increase salmonid survival. Three specific information and technical assistance needs are:

- Development of geographic and sector specific conservation systems to meet the needs of listed species while ensuring agricultural productivity.
- Analyses of socioeconomic barriers to the adoption of conservation systems, such as conflicts between conservation and production goals, agricultural traditions, and producer assumptions about cost and risk aversion.
- Development of a market-based strategy to deliver new riparian and aquatic conservation systems to Washington's diverse agricultural sectors.

5. **Implement additional conservation incentives.**

FSA, in coordination with other USDA agencies and programs, should continue and expand efforts to make adoption of alternative riparian and aquatic conservation systems necessary to recover declining aquatic species and their habitats more cost effective for agricultural producers.

The Washington CREP provides a substantial incentive for enrollment of certain acreage under the program. After these short-term contracts expire, however, the future use of enrolled acres will depend primarily on economics and related factors. Among other considerations will be the compatibility of permanent vegetative cover with existing use of adjacent land; the desirability and cost of conversion from crop production to other land uses such as grazing, forestry, or urbanization; geographic isolation of various tracts; and the availability of other incentives to continue conservation systems.

CREP and other conservation provisions of the Federal Agricultural Improvement and Reform Act of 1996 (the 1996 Farm Bill) were specifically designed to address high priority conservation needs. Administration of those programs by FSA, NRCS and other partners make a vital contribution to national environmental goals. However, authorization and funding for those programs will expire in 2002. Moreover, Farm Bill programs specifically targeted for conservation represent only a small fraction of the total number of agricultural programs available to producers. Many other agricultural programs administered by FSA and other USDA agencies, such as marketing, commodity and loan programs, may also have a significant direct or indirect effect on the likelihood of producers adopting conservation systems that would improve the survival of listed salmonids.

In view of the need for additional incentives to continue and expand existing conservation program benefits and achieve permanent adoption of sustainable agricultural practices and conservation systems, it is important that FSA, in coordination with other USDA agencies,

investigate opportunities to include conservation incentives as part of other agricultural programs. Examples of expanded incentive opportunities include enhanced program benefits, premiums, purchasing preference or promotional assistance for beneficiaries who adopt appropriate conservation systems; targeted research, education or demonstration programs; and other “debt for nature” ideas. Alternatively, USDA should develop conservation-based eligibility criteria for its agricultural programs. Examples of FSA and other USDA programs to include in this investigation are:

- FSA programs to provide farm and commodity loans, dairy price support, domestic and foreign food assistance, catastrophic crop insurance and crop disaster assistance, emergency assistance for farmers in declared disaster areas, and farm ownership.
- Foreign Agricultural Service programs to provide incentives for eligible promotions and develop foreign markets for agricultural commodities.
- Risk Management Agency programs to provide crop insurance and other risk management assistance.
- Agricultural Marketing Service programs to provide marketing incentives through Marketing, Promotion and Information Boards.
- NRCS programs to provide conservation technical assistance, carry out the Conservation Farm Option pilot and other conservation provisions of the 1996 Farm Bill, reach out to socially disadvantaged farmers and ranchers, farmland protection, reduced flood risk, forestry incentives, and promotion of sustainable agricultural systems.

6. Expand geographic boundaries of CREP.

To further meet FSA's section 7(a)(1) requirement under the Act to utilize its authorities to conserve listed species, FSA should expand the geographic boundaries of the Washington CREP program to include all Washington basins, and not just those inhabited by listed salmonids. This would allow farmers and ranchers in other watersheds to enroll in CREP and do their part to protect other listed and/or rare aquatic species. In some cases, expansion of the CREP program could play an important role in helping to conserve otherwise rare species prior to the need to list them as threatened or endangered.

7. Validation Monitoring

Design and implement a long-term validation monitoring program to document the overall impact of the CREP on fish species of concern. The objective of this component of the monitoring program would be a quantitative comparison of salmon and trout habitat

characteristics and salmonid population trends in streams where there is enrollment in this program with similar streams where program participation is not significant.

8. Enhanced Plant Conservation

Currently, the CREP proposed action calls for designing CREP projects such that they “avoid” impacts to listed or proposed plant species. While this will likely result in a reduced consultation workload for USFWS through avoidance of impacts to these species, it may also result in missed opportunities to conserve these species by providing protection within, for example, wetland areas or riparian buffers developed or protected through CREP. Consequently, USFWS recommends that FSA encourage CREP participants and implementing agencies to consider conservation measures for these plants through follow-up, site-specific consultations where CREP projects might benefit the plant species addressed in Table 2 of this Biological Opinion. The USFWS will be glad to provide technical assistance in the design of such projects.

In order for the Services to be kept informed of actions minimizing or avoiding adverse effects, or those that benefit listed species or their habitats, the Services request notification of the implementation of any conservation recommendations.

REINITIATION OF CONSULTATION

This concludes formal consultation on the Oregon Conservation Reserve Enhancement Program.

As required by 50 CFR Part 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations that are causing such take must be stopped, and formal consultation must be reinitiated. If you have questions regarding this Biological Opinion, please contact Martha Jensen at the U.S. Fish and Wildlife Service (360/753-9000) or Gordy Zillges at the National Marine Fisheries Service (360/753-9090).

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APPENDIX D: FSA HANDBOOK CONSERVATION PRACTICES

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APPENDIX E: STATE SPECIES OF CONCERN

Table E.1. State Species of Concern (Current through July 1, 2005).

COMMON NAME	SCIENTIFIC NAME	ANIMAL TYPE	STATE STATUS	FEDERAL STATUS
ALEUTIAN CANADA GOOSE	<i>Branta canadensis leucopareia</i>	Bird	ST	FCo
AMERICAN PEREGRINE FALCON	<i>Falco peregrinus anatum</i>	Bird	SS	FCo
AMERICAN WHITE PELICAN	<i>Pelecanus erythrorhynchos</i>	Bird	SE	none
ARCTIC PEREGRINE FALCON	<i>Falco peregrinus tundrius</i>	Bird	SS	FCo
BALD EAGLE	<i>Haliaeetus leucocephalus</i>	Bird	ST	FT
BELLER'S GROUND BEETLE	<i>Agonum belleri</i>	Beetle	SC	FCo
BLACK RIGHT WHALE	<i>Balaena glacialis</i>	Mammal	SE	FE
BLACK ROCKFISH	<i>Sebastes melanops</i>	Fish	SC	none
BLACK-BACKED WOODPECKER	<i>Picoides arcticus</i>	Bird	SC	none
BLACK-TAILED JACK RABBIT	<i>Lepus californicus</i>	Mammal	SC	none
BLUE WHALE	<i>Balaenoptera musculus</i>	Mammal	SE	FE
BOCACCIO ROCKFISH	<i>Sebastes paucispinis</i>	Fish	SC	none
BRANDT'S CORMORANT	<i>Phalacrocorax penicillatus</i>	Bird	SC	none
BROWN PELICAN	<i>Pelecanus occidentalis</i>	Bird	SE	FE
BROWN ROCKFISH	<i>Sebastes auriculatus</i>	Fish	SC	FCo
BRUSH PRAIRIE POCKET GOPHER	<i>Thomomys talpoides douglasi</i>	Mammal	SC	none
BULL TROUT	<i>Salvelinus confluentus</i>	Fish	SC	FT
BULL TROUT (COASTAL/PUGET SOUND)	<i>Salvelinus confluentus</i>	Fish	SC	FT
BULL TROUT (COLUMBIA BASIN)	<i>Salvelinus confluentus</i>	Fish	SC	FT

BURROWING OWL	<i>Athene cunicularia</i>	Bird	SC	FCo
CALIFORNIA FLOATER	<i>Anodonta californiensis</i>	Mollusk	SC	FCo
CALIFORNIA MOUNTAIN KINGSSNAKE	<i>Lampropeltis zonata</i>	Reptile	SC	none
CANARY ROCKFISH	<i>Sebastes pinniger</i>	Fish	SC	none
CASCADE TORRENT SALAMANDER	<i>Rhyacotriton cascadae</i>	Amphibian	SC	none
CASSIN'S AUKLET	<i>Ptychoramphus aleuticus</i>	Bird	SC	FCo
CATHLAMET POCKET GOPHER	<i>Thomomys mazama louiei</i>	Mammal	SC	FC
CHINA ROCKFISH	<i>Sebastes nebulosus</i>	Fish	SC	none
CHINOOK SALMON (LOWER COLUMBIA)	<i>Oncorhynchus tshawytscha</i>	Fish	SC	FT
CHINOOK SALMON (PUGET SOUND)	<i>Oncorhynchus tshawytscha</i>	Fish	SC	FT
CHINOOK SALMON (SNAKE R. FALL)	<i>Oncorhynchus tshawytscha</i>	Fish	SC	FT
CHINOOK SALMON (SNAKE R. SP/SU)	<i>Oncorhynchus tshawytscha</i>	Fish	SC	FT
CHINOOK SALMON (UPPER COLUMBIA SP)	<i>Oncorhynchus tshawytscha</i>	Fish	SC	FE
CHINQUAPIN HAIRSTREAK	<i>Habrodais grunus</i>	Butterfly	SC	none
CHUM SALMON (HOOD CANAL SU)	<i>Oncorhynchus keta</i>	Fish	SC	FT
CHUM SALMON (LOWER COLUMBIA)	<i>Oncorhynchus keta</i>	Fish	SC	FT
COHO SALMON (LOWER COLUMBIA/SW WA)	<i>Oncorhynchus kisutch</i>	Fish	none	FC
COLUMBIA RIVER TIGER BEETLE	<i>Cicindela columbica</i>	Beetle	SC	none
COLUMBIA SPOTTED FROG	<i>Rana Luteiventris</i>	Amphibian	SC	FCo
COLUMBIA TORRENT SALAMANDER	<i>Rhyacotriton kezeri</i>	Amphibian	SC	FCo
COLUMBIAN WHITE-TAILED DEER	<i>Odocoileus virginianus leucurus</i>	Mammal	SE	FE

COMMON LOON	<i>Gavia immer</i>	Bird	SS	none
COMMON MURRE	<i>Uria aalge</i>	Bird	SC	none
COPPER ROCKFISH	<i>Sebastes caurinus</i>	Fish	SC	FCo
DUNN'S SALAMANDER	<i>Plethodon dunni</i>	Amphibian	SC	none
EULACHON	<i>Thaleichthys pacificus</i>	Fish	SC	FC
FERRUGINOUS HAWK	<i>Buteo regalis</i>	Bird	ST	FCo
FIN WHALE	<i>Balaenoptera physalus</i>	Mammal	SE	FE
FISHER	<i>Martes pennanti</i>	Mammal	SE	FCo
FLAMMULATED OWL	<i>Otus flammeolus</i>	Bird	SC	none
GIANT COLUMBIA RIVER LIMPET	<i>Fisherola nuttalli</i>	Mollusk	SC	none
GIANT COLUMBIA SPIRE SNAIL	<i>Fluminicola columbiana</i>	Mollusk	SC	FCo
GOLDEN EAGLE	<i>Aquila chrysaetos</i>	Bird	SC	none
GRAY WHALE	<i>Eschrichtius robustus</i>	Mammal	SS	none
GRAY WOLF	<i>Canis lupus</i>	Mammal	SE	FT
GRAY-TAILED VOLE	<i>Microtus canicaudus</i>	Mammal	SC	none
GREAT ARCTIC	<i>Oeneis nevadensis gigas</i>	Butterfly	SC	none
GREEN SEA TURTLE	<i>Chelonia mydas</i>	Reptile	ST	FT
GREENSTRIPED ROCKFISH	<i>Sebastes elongatus</i>	Fish	SC	none
GRIZZLY BEAR	<i>Ursus arctos</i>	Mammal	SE	FT
HARLEQUIN DUCK	<i>Histrionicus histrionicus</i>	Bird	none	none
HATCH'S CLICK BEETLE	<i>Eanus hatchii</i>	Beetle	SC	FCo
HUMPBACK WHALE	<i>Megaptera novaeangliae</i>	Mammal	SE	FE

ISLAND MARBLE	<i>Euchloe ausonides insulanus</i>	Butterfly	SC	FCo
JOHNSON'S HAIRSTREAK	<i>Mitoura johnsoni</i>	Butterfly	SC	none
JUNIPER HAIRSTREAK	<i>Mitoura grynea barryi</i>	Butterfly	SC	none
KEEN'S MYOTIS	<i>Myotis keenii</i>	Mammal	SC	none
KILLER WHALE	<i>Orcinus orca</i>	Mammal	SE	none
LAKE CHUB	<i>Couesius plumbeus</i>	Fish	SC	none
LARCH MOUNTAIN SALAMANDER	<i>Plethodon larselli</i>	Amphibian	SS	FCo
LEATHERBACK SEA TURTLE	<i>Dermochelys coriacea</i>	Reptile	SE	FE
LEOPARD DACE	<i>Rhinichthys falcatus</i>	Fish	SC	none
LEWIS' WOODPECKER	<i>Melanerpes lewis</i>	Bird	SC	none
LOGGERHEAD SEA TURTLE	<i>Caretta caretta</i>	Reptile	ST	FT
LOGGERHEAD SHRIKE	<i>Lanius ludovicianus</i>	Bird	SC	FCo
LONG-HORNED LEAF BEETLE	<i>Donacia idola</i>	Beetle	SC	none
LYNX	<i>Lynx canadensis</i>	Mammal	ST	FT
MAKAH (QUEEN CHARLOTTE) COPPER	<i>Lycaena mariposa charlottensis</i>	Butterfly	SC	FCo
MANN'S MOLLUSK-EATING GROUND BEETLE	<i>Scaphinotus mannii</i>	Beetle	SC	none
MARbled MURRELET	<i>Brachyramphus marmoratus</i>	Bird	ST	FT
MARDON SKIPPER	<i>Polites mardon</i>	Butterfly	SE	FC
MARGINED SCULPIN	<i>Cottus marginatus</i>	Fish	SS	FCo
MAZAMA (WESTERN) POCKET GOPHER	<i>Thomomys mazama</i>	Mammal	SC	FC
MERLIN	<i>Falco columbarius</i>	Bird	SC	none
MERRIAM'S SHREW	<i>Sorex merriami</i>	Mammal	SC	none

MOUNTAIN SUCKER	<i>Catostomus platyrhynchus</i>	Fish	SC	none
NEWCOMB'S LITTORINE SNAIL	<i>Algamorda subrotundata</i>	Mollusk	SC	FCo
NORTHERN ABALONE	<i>Haliotis kamtschatkana</i>	Mollusk	SC	FCo
NORTHERN GOSHAWK	<i>Accipiter gentius</i>	Bird	SC	FCo
NORTHERN LEOPARD FROG	<i>Rana pipiens</i>	Amphibian	SE	FCo
OLYMPIA OYSTER	<i>Ostrea lurida</i>	Mollusk	SC	none
OLYMPIC MUDMINNOW	<i>Novumbra hubbsi</i>	Fish	SS	none
OLYMPIC POCKET GOPHER	<i>Thomomys mazama melanops</i>	Mammal	SC	FC
OREGON SILVERSPOT BUTTERFLY	<i>Speyeria zerene hippolyta</i>	Butterfly	SE	FT
OREGON SPOTTED FROG	<i>Rana pretiosa</i>	Amphibian	SE	FC
OREGON VESPER SPARROW	<i>Pooecetes gramineus affinis</i>	Bird	SC	FCo
PACIFIC COD (S&C PUGET SOUND)	<i>Gadus macrocephalus</i>	Fish	SC	FCo
PACIFIC HAKE (C. PUGET SOUND)	<i>Merluccius productus</i>	Fish	SC	FCo
PACIFIC HARBOR PORPOISE	<i>Phocoena phocoena</i>	Mammal	SC	none
PACIFIC HERRING (CHERRY POINT)	<i>Clupea pallasii</i>	Fish	SC	FC
PACIFIC HERRING (DISCOVERY BAY)	<i>Clupea pallasii</i>	Fish	SC	FC
PACIFIC TOWNSEND'S BIG-EARED BAT	<i>Corynorhinus townsendii townsendii</i>	Mammal	SC	FCo
PALLID TOWNSEND'S BIG-EARED BAT	<i>Corynorhinus townsendii pallescens</i>	Mammal	SC	FCo
PEALE'S PEREGRINE FALCON	<i>Falco peregrinus pealei</i>	Bird	SS	FCo
PEREGRINE FALCON	<i>Falco peregrinus</i>	Bird	SS	FCo
PILEATED WOODPECKER	<i>Dryocopus pileatus</i>	Bird	SC	none
PUGET BLUE	<i>Plebejus icarioides blackmorei</i>	Butterfly	SC	none

PURPLE MARTIN	<i>Progne subis</i>	Bird	SC	none
PYGMY RABBIT	<i>Brachylagus idahoensis</i>	Mammal	SE	FE
PYGMY WHITEFISH	<i>Prosopium coulteri</i>	Fish	SS	none
QUILLBACK ROCKFISH	<i>Sebastes maliger</i>	Fish	SC	FCo
REDSTRIPE ROCKFISH	<i>Sebastes proriger</i>	Fish	SC	none
RIVER LAMPREY	<i>Lampetra ayresi</i>	Fish	SC	FCo
ROCKY MOUNTAIN TAILED FROG	<i>Ascaphus montanus</i>	Amphibian	SC	none
SAGE SPARROW	<i>Amphispiza belli</i>	Bird	SC	none
SAGE THRASHER	<i>Oreoscoptes montanus</i>	Bird	SC	none
SAGE-GROUSE	<i>Centrocercus urophasianus</i>	Bird	ST	FC
SAGEBRUSH LIZARD	<i>Sceloporus graciosus</i>	Reptile	SC	FCo
SANDHILL CRANE	<i>Grus canadensis</i>	Bird	SE	none
SEA OTTER	<i>Enhydra lutris</i>	Mammal	SE	FCo
SEA OTTER	<i>Enhydra lutris lutris</i>	Mammal	SE	none
SEI WHALE	<i>Balaenoptera borealis</i>	Mammal	SE	FE
SHARP-TAILED GROUSE	<i>Tympanuchus phasianellus</i>	Bird	ST	FCo
SHARPTAIL SNAKE	<i>Contia tenuis</i>	Reptile	SC	none
SHELTON POCKET GOPHER	<i>Thomomys mazama couchi</i>	Mammal	SC	FC
SHEPARD'S PARNASSIAN	<i>Parnassius clodius shepardii</i>	Butterfly	SC	none
SHORT-TAILED ALBATROSS	<i>Phoebastria albatrus</i>	Bird	SC	FE
SILVER-BORDERED FRITILLARY	<i>Boloria selene atrocotalis</i>	Butterfly	SC	none
SLENDER-BILLED WHITE-BREASTED NUTHATCH	<i>Sitta carolinensis aculeate</i>	Bird	SC	FCo

SNOWY PLOVER	<i>Charadrius alexandrinus</i>	Bird	SE	FT
SOCKEYE SALMON (OZETTE LAKE)	<i>Oncorhynchus nerka</i>	Fish	SC	FT
SOCKEYE SALMON (SNAKE R.)	<i>Oncorhynchus nerka</i>	Fish	SC	FE
SPERM WHALE	<i>Physeter macrocephalus</i>	Mammal	SE	FE
SPOTTED OWL	<i>Strix occidentalis</i>	Bird	SE	FT
STEELHEAD (LOWER COLUMBIA)	<i>Oncorhynchus mykiss</i>	Fish	SC	FT
STEELHEAD (MIDDLE COLUMBIA)	<i>Oncorhynchus mykiss</i>	Fish	SC	FT
STEELHEAD (SNAKE RIVER)	<i>Oncorhynchus mykiss</i>	Fish	SC	FT
STEELHEAD (UPPER COLUMBIA)	<i>Oncorhynchus mykiss</i>	Fish	SC	FE
STELLER SEA LION	<i>Eumetopias jubatus</i>	Mammal	ST	FT
STREAKED HORNED LARK	<i>Eremophila alpestris strigata</i>	Bird	SC	FC
STRIPED WHIPSNAKE	<i>Masticophis taeniatus</i>	Reptile	SC	none
TAYLOR'S (WHULGE) CHECKERSPOT	<i>Euphydryas editha taylori</i>	Butterfly	SC	FC
TIGER ROCKFISH	<i>Sebastes nigrocinctus</i>	Fish	SC	none
TOWNSEND'S BIG-EARED BAT	<i>Corynorhinus townsendii</i>	Mammal	SC	FCo
TOWNSEND'S GROUND SQUIRREL	<i>Spermophilus townsendii</i>	Mammal	SC	none
TUFTED PUFFIN	<i>Fratercula cirrhata</i>	Bird	SC	FCo
UMATILLA DACE	<i>Rhinichthys umatilla</i>	Fish	SC	none
UPLAND SANDPIPER	<i>Bartramia longicauda</i>	Bird	SE	none
VALLEY SILVERSPOT	<i>Speyeria zerene bremnerii</i>	Butterfly	SC	FCo
VAN DYKE'S SALAMANDER	<i>Plethodon vandykei</i>	Amphibian	SC	FCo
VAUX'S SWIFT	<i>Chaetura vauxi</i>	Bird	SC	none

WALLEYE POLLOCK (SO. PUGET SOUND)	<i>Theragra chalcogramma</i>	Fish	SC	FCo
WASHINGTON GROUND SQUIRREL	<i>Spermophilus washingtoni</i>	Mammal	SC	FC
WESTERN GRAY SQUIRREL	<i>Sciurus griseus</i>	Mammal	ST	FCo
WESTERN GREBE	<i>Aechmophorus occidentalis</i>	Bird	SC	none
WESTERN POND TURTLE	<i>Clemmys marmorata</i>	Reptile	SE	FCo
WESTERN TOAD	<i>Bufo boreas</i>	Amphibian	SC	FCo
WHITE-HEADED WOODPECKER	<i>Picoides albolarvatus</i>	Bird	SC	none
WHITE-TAILED JACK RABBIT	<i>Lepus townsendii</i>	Mammal	SC	none
WIDOW ROCKFISH	<i>Sebastes entomelas</i>	Fish	SC	none
WOLVERINE	<i>Gulo gulo</i>	Mammal	SC	FCo
WOODLAND CARIBOU	<i>Rangifer tarandus</i>	Mammal	SE	FE
YELLOW-BILLED CUCKOO	<i>Coccyzus americanus</i>	Bird	SC	FC
YELLOW EYE ROCKFISH	<i>Sebastes ruberrimus</i>	Fish	SC	none
YELLOWTAIL ROCKFISH	<i>Sebastes flavidus</i>	Fish	SC	none
YELM POCKET GOPHER	<i>Thomomys mazama yelmensis</i>	Mammal	SC	FC
YUMA SKIPPER	<i>Ochlodes yuma</i>	Butterfly	SC	none

Source: (DFW 2006)

¹ **Federal Status:** FE: Federal Endangered; FT: Federal Threatened; FC: Federal Candidate
FCo: Federal Species of Concern

² **State Status:** SE: State Endangered; ST: State Threatened; SC: State Candidate; SS: State Sensitive

APPENDIX F: STATE AND NATIONAL REGISTER OF HISTORIC PLACES

Table F.1. The number of National Register of Historic Places, National Historical Landmarks, and Washington State Heritage Register sites in CREP area counties.

County	National Register of Historic Places	National Historic Landmark	Washington Heritage Register
Asotin	8	0	8
Benton	17	0	28
Chelan	45	0	52
Clallam	29	0	47
Clark	37	0	42
Columbia	20	0	20
Cowlitz	29	0	33
Garfield	3	0	5
Grays Harbor	19	0	25
Jefferson	29	2	84
King	226	6	318
Kitsap	18	3	25
Kittitas	25	0	36
Klickitat	9	0	16
Lewis	40	0	47
Mason	11	0	14
Okanogan	15	0	23
Pacific	18	1	22
Pierce	161	6	190
Skagit	26	1	36
Skamania	1	1	2
Snohomish	46	0	78
Thurston	58	0	83
Wahkiakum	5	0	8
Walla Walla	30	0	36
Whatcom	64	0	75
Whitman	32	0	38
Yakima	64	0	79
TOTAL	1085	20	1470

Source: DAHP, 2005d.

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APPENDIX G: TMDLs SUMMARY

Table F.1. Summary of approved TMDLs in CREP watersheds.

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
Nooksack River	01	Fecal Coliform	20	08-Aug-00
Bellingham Bay	01	Sediment bioassay Mercury Phenol PCBs Zinc Arsenic Lead Copper Wood waste	10	02-Jan-02
Fishtrap Creek	01	Fecal Coliform	Will be modified by Nooksack TMDL	08-Aug-00
Johnson Creek	01	Dissolved Oxygen; Fecal Coliform	8	28-Jun-00
Sumas River	01	Ammonia-N; BOD; Chlorine	3	29-Apr-96
Skagit Basin: * Carpenter Creek * Fisher Creek * Fisher Slough * Nookachamps Creek	03	Fecal Coliform	8	01-Sept- 00
Campbell Lake	03	Total Phosphorus	1	28-Jul-97
Erie Lake	03	Total Phosphorus	1	28-Jul-97
Stillaguamish River & Portage Creek	05	FC, DO, Turbidity, pH, Mercury, Arsenic	46	21-June-05
Snohomish River	07	Dioxin	1	04-Sep-92
Snohomish River Estuary	07	BOD; Ammonia	8	03-Feb-00
Snohomish River Tributaries * Allen Creek * Quilceda Creek * French Creek * Woods Creek * Pilchuck River * Pilchuck River * Marshlands (Wood Creek) {2}	07	Fecal Coliform	8	09-Aug-01
Snoqualmie River	07	Ammonia-N	16	03-Jul-96
		BOD (5-day)	16	
		Fecal Coliform	16	
Ballinger Lake	08	Total Phosphorus	1	08-Apr-93
Cottage Lake	08	Total Phosphorus	1	03-Sep-04
Issaquah Creek Basin	08	Fecal Coliform	3	01-Oct-04

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
Little Bear Creek - Trout Stream - Great Dane Creek - Cutthroat Creek	08	Fecal Coliform	4	01-July-05
Pipers Creek	08	Fecal Coliform	1	08-Apr-93
North Creek	08	Fecal Coliform	1	02-Aug-2002
Duamish and Lower Green River	09	Ammonia-N	2	01-Feb-93
Fenwick Lake	09	Total Phosphorus	1	13-Jan-93
Sawyer Lake	09	Total Phosphorus	1	12-Feb-93
Commencement Bay	10	Dioxin	1	18-Jun-92
Puyallup River	10	Ammonia-N	23	09-Nov-94
		BOD (5-day)	23	
White River Watershed, Upper - Eleanor Creek - Greenwater River - Lightning Creek - Minnehaha Creek - Straight Creek - Pyramid Creek - Pyramid Creek - Slide Creek - Twenty-eight Mile Creek - Unnamed (Brush) - Unnamed (Brush) - West Fork White - West Fork White - Whistler Creek	10	- sediment - sediment - sediment - sediment - temperature - temperature - sediment - sediment - sediment - temperature - sediment - temperature - sediment - temperature	15	11-Aug-2003
South Prairie Creek Wilkeson/Gale Creek	10	Temperature Fecal Coliform Temperature	6	06-Aug-2003

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
Nisqually Watershed • McAllister Creek • Ohop Creek • Red Salmon Creek • Lynch Creek • Wash Creek • Unnamed Tributary to West Red Salmon Creek • Little McAllister Creek • Medicine Creek mouth	11	Fecal Coliform	8	05-Aug-2005
Steilacoom Lake and Chambers Creek	12	Copper	1	14 Feb 99
Wapato Lake	12	Total Phosphorus	1	08-Apr-93
Union River * Bear Creek	15	Fecal Coliform	2	02-Aug-2002
Skokomish River * Purdy Creek * Weaver Creek * Ten Acre Creek * Hunter Creek	16	Fecal Coliform	5	16-Oct-2001
Strait of Juan de Fuca	18	Dioxin	1	14-Jul-92
Dungeness Bay, Expansion	18	Fecal Coliform	7	12-May-04
Matriotti Creek Dungeness River * Meadowbrook Creek * Golden Sands * Cooper Creek * Dungeness River RM 1.0 * Irrigation Ditch 1 * Irrigation Ditch 2	18	Fecal Coliform	7	22-Jul-2002
Humptulips River	22	Temperature	11	08-Aug-2001
Grays Harbor	22	Fecal Coliform	28	09-May-2003
	22	Dioxin	1	02-Jul-92
Wildcat Creek	22	Chlorine; Ammonia-N; Fecal Coliform; BOD (5-day)	4	12-Mar-93
Simpson Timberlands: - Rabbit Creek - Wildcat Creek	22	Temperature	28	17-July-00
Chehalis River	23	Ammonia-N	17	21-Oct-96
		BOD (5-day)	17	
Chehalis River, Upper	23	Fecal Coliform	18	26-Jul-2004

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
Black River	23	Ammonia-N	4	26-Oct-96
		BOD (5-day)	4	
		Total Phosphorus	3	
		Fecal Coliform	5	
Chehalis River, Upper tributaries include:		Temperature	11	4-Dec-01
* Black River	23			
* Lincoln Creek	23			
* Scatter Creek	23			
* Dillenbaugh Creek	23			
* Skookumchuck Cr	23			
* Salzer Creek	23			
* Newaukum River	23			
Chehalis River (re-submit)	23	Dissolved Oxygen	3	05-May-00
Willapa River, Lower * Fork Creek * Willapa River * Willapa River * Half Moon Creek * Mill Creek * Fern Creek * Wilson Creek	24 24	Temperature	7	06-Sep-05
Salmon Creek	28	Turbidity Fecal Coliform	6	05 April 01
Weaver Creek	28	Ammonia-N; BOD (5-day)	2	10-Mar-93
Gibbons Creek	28	Fecal Coliform	1	09-Aug-00
Wind River tributaries include:	29	Temperature	17	08-Aug-02
* Bear Creek	29			
* Cedar Creek	29			
* Compass Creek	29			
* Crater Creek	29			
* East Fork Trout Creek	29			
* Eight Mile Creek	29			

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
* Falls Creek	29			
* Layout Creek	29			
* Little Wind River near mouth	29			
* Martha Creek	29			
* Nine Mile Creek	29			
* Panther Creek	29			
* Planting Creek	29			
* South Fork Falls Creek	29			
* Trout Creek	29			
* Trout Creek above Hemlock Dam	29			
* Trout Creek below Hemlock Dam	29			
* Trout Creek near mouth	29			
* Wind River above Falls Creek	29			
* Wind River above Paradise Creek	29			
* Wind River below Paradise Creek	29			
* Wind River headwater	29			
Little Klickitat River	30	Chlorine; BOD (5-day)	2	08-Apr-93
tributaries include:				
East Prong	30	Temperature	7	30-June-2003
- Butler Creek - Little Klickitat River - West Prong	30			
Blockhouse Creek	30			
Bowman Creek	30			
Little Klickitat River	30			
Mill Creek	30			
Mill Creek	32	Ammonia-N	1	12-Feb-93

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
		Chlorine	1	28-Jul-97
Snake River, Lower	33	Dioxin	3	25-Feb-91
Palouse River to Mouth		Total Dissolved Gas	1	01-Oct-2003
Palouse River, North Fork	34	Fecal Coliform	4	21-March-2005
- Cedar Creek - Silver Creek - Clear Creek				
Palouse River, South Fork	34	Ammonia-N	1	09-Sep-94
Snake River, Middle	35	Total Dissolved Gas	1	01-Oct-2003
Clearwater River to Palouse River				
Pataha Creek	35	Chlorine; Ammonia-N; BOD (5-day)	3	09-Sep-94
Yakima River, Lower	37	Turbidity	3	25-Nov-98
		DDT	27	
Granger Drain	37	Fecal Coliform	2	12-Dec-01
Yakima, Upper	39	DDT, Turbidity	19	13-Sep-02
Wilson/Cooke Creek	39	Fecal Coliform	16	06-July-05
- Badger Creek - Bull Ditch - Caribou Creek - Cherry Creek - CID Canal - Coleman Creek - Cook Creek - EWC Canal - Johnson Drain - KRD Canal - Mercer Creek - Naneum Creek - Parke Creek - Whiskey Creek - Wilson Creek - Wipple Wasteway				
Crystal Creek	39	Chlorine; Ammonia-N; BOD (5-day); Fecal Coliform	4	12-Feb-93

Water Body Name	WRIA	Parameter	# TMDLs	Approval Date
Teanaway River segments include:		Temperature	8	29-Jan-02
* Upper West Fork Teanaway River	39			
* Upper Middle Fork Teanaway River	39			
* Upper North Fork Teanaway River	39			
* Stafford Creek	39			
* Lower West Fork Teanaway River	39			
* Lower Middle Fork Teanaway River	39			
* Lower North Fork Teanaway River	39			
* Mainstem Teanaway River	39			
Chelan Lake	47	Total Phosphorus	1	26-Jan-93
Okanogan River, Lower	49	DDT; PCB	10	01-Feb-05
Similkameen River • Palmer Creek	49	Arsenic	2	17-Feb-2004
Colville National Forest	50; 60	Temperature and Bacteria	50	05-Aug-05
Columbia River	CR	Dioxin	8	25-Feb-91
Columbia River, Lower	CR	Total Dissolved Gas	4	20-Nov-02
Columbia River, Middle	CR	Total Dissolved Gas	4	28-July-2004

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APPENDIX H: CONSULTATION LETTERS FROM STATE AND FEDERAL AGENCIES



United States
Department of
Agriculture

Farm Service
Agency

WA State FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX: (509) 323-3074

January 12, 2005

Donna Darm, Assistant Regional Administrator
National Marine Fisheries Service
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

RE: Environmental Assessment of the Conservation Reserve Enhancement
Program – Our letters of September 15 and October 3, 2005

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

of pages **2**

To Suzy Hill	From Rod Hamilton
Dept./Agency	Phone # WA FSA
Fax #	Fax #

NSN 7540-01-317-7368

5099-101

GENERAL SERVICES ADMINISTRATION

Dear Ms. Darm:

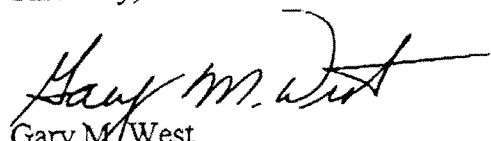
We want to thank Steve Landino and Dale Bambrick for taking the time to come to Spokane and meet with us on December 8, 2005 concerning the referenced issue. The purpose of this letter is to further clarify the intent of our September 15 and October 3, 2005 letters. In those letters, we requested consultation with the National Marine Fisheries Service (NMFS) on possible amendments to the Washington State Conservation Reserve Enhancement Program (CREP).

Our purpose in requesting consultation prior to fully developing our CREP amendment package was to ensure that we avoided proposing changes that would jeopardize ESA-listed fish species or adversely modify their designated critical habitat. We have learned in recent discussions with NMFS that consultation on these proposed changes will be more appropriate after our National Environmental Policy Act (NEPA) process has concluded and more detail has been added to our proposal. We understand and agree with this perspective. Accordingly, the Farm Services Agency would like to withdraw our request for consultation at this time.

However, we wish to maintain open communication with you as we proceed with our CREP program amendment planning during the NEPA process. In particular we would like early input from you regarding potential issues presented by adding two conservation practices, hedgerow plantings and grass filter strips, as eligible practices under a revised Washington CREP program. We understand NMFS desire to see more miles of stream protected under the CREP program to further salmon recovery efforts in Washington. We believe that adding these two practices to the CREP program will help to accomplish that objective.

We look forward to continued dialogue with your staff and that of the U. S. Fish and Wildlife Service as we work to improve the CREP program in Washington. Please do not hesitate to call Rod Hamilton, our Farm Programs Chief, at (509) 323-3015, if you have any questions or comments regarding this letter or the CREP program.

Sincerely,



Gary M. West
Acting State Executive Director

rdh

c: Bob Lohn, NMFS
Todd Ungerecht, NMFS
Steven W. Landino, NMFS
Ken Berg, USFWS
Martha Jensen, USFWS
Melissa Cummins, FSA
Suzanne Hill, The Shipley Group



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington State Habitat Office
510 Desmond Drive SE/Suite 103
LACEY, WASHINGTON 98503

February 2, 2006

Mr. Gary M. West
Acting Executive Director
Washington State Farm Service Agency Office
316 West Boone Avenue, Suite 568
Spokane, Washington 99201-2350

HA 01 FEB-06/06

Re: Environmental Assessment of the Conservation Reserve Enhancement Program
- January 12 letter

Dear Mr. West:

This correspondence acknowledges our receipt of your January 12 letter to withdraw your request for consultation under Section 7 of the Endangered Species Act on proposed amendments to the Washington State Conservation Reserve Enhancement Program (CREP). We are happy to accommodate you on this matter and look forward to consulting on the Washington CREP when revisions to the program are better defined.

In your January letter you also asked for our early impressions about the possible addition of hedgerow planting and grass filter strips as eligible practices under the Washington CREP. We agree with your suggestion that making these practices eligible in appropriate contexts may increase participation in the program, thereby improving environmental quality. We look forward to working with you as to the situations in which the use of these two practices would be appropriate.

Thank you again for taking the time to meet with us in December. If you have any questions regarding this matter, please feel free to contact me at (360)753-6054 or Mr. Dale Bambrick, Eastern Washington Branch Chief at (509) 925-8911 x221.

Sincerely,

Steven W. Landino
Washington State Director
for Habitat Conservation

cc: Ken Berg, FWS
Susan Martin, FWS
Rod Hamilton, FSA





United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

August 7, 2006

Donna Darm, Assist. Regional Director
NOAA Fisheries
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Attention: Protected Resources Division

RE: Washington State Conservation Reserve Enhancement Program (WA CREP)
Agreement

Dear Ms. Darm:

The Farm Service Agency (FSA) is in the process of amending the Washington Conservation Reserve Enhancement Program (WA CREP) Agreement that was approved in October 1998. The amendment would extend operation of the CREP Agreement until December 31, 2007. The amended CREP Agreement would still apply to the original counties of:

Asotin	Garfield	Lewis	Snohomish
Benton	Grays Harbor	Mason	Thurston
Chelan	Jefferson	Okanogan	Wahkiakum
Clallam	King	Pacific	Walla Walla
Clark	Kitsap	Pierce	Whatcom
Columbia	Kittitas	Skagit	Whitman
Cowlitz	Klickitat	Skamania	Yakima

As part of this amendment process, FSA is completing a programmatic environmental assessment (PEA) in order to comply with the provisions of the National Environmental Policy Act and other laws such as the Endangered Species Act (ESA). The PEA will address the potential effects of the CREP Amendment on listed threatened and endangered species and critical habitat. In addition to this PEA, FSA is required to complete a site-specific environmental evaluation for each contract completed under the CREP Agreement. These site-specific environmental evaluations will include a review of potential effects on listed species and critical habitat that may result in informal or formal consultation on an individual basis.

In completing the section of the PEA dealing with threatened and endangered species, FSA will rely on the biological opinion (BO) (NMFS Log # WSB-99-462 and USFWS Log # 1-3-F-0064) that was issued by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in 2000, as part of FSA's formal consultation request on the original CREP Agreement. In order to fully comply with Section 7 of the ESA, FSA is providing this letter to reinstate consultation at the programmatic level since the original CREP Agreement is being amended. Once completed, a copy of the draft PEA will also

be provided for comment.

The original CREP Agreement included provisions to install riparian buffers on non-irrigated cropland and pasture land that is located on streams that provide important spawning habitat for threatened and endangered salmonid species. To date, FSA has enrolled 9,775.5 acres and 538 stream miles in Conservation Reserve Program (CRP) contracts under this CREP Agreement. There are no provisions in the amendment to expand the acreage beyond the original 100,000 acre and 10,000 stream mile limit. The eligible conservation practice (CP) will not change from that provided for in the original CREP Agreement. Currently, the only CP allowed is riparian buffer strips.

An amendment that is being proposed would allow land in perennial crops (e.g orchards, vineyards) to be enrolled into CREP contracts, and to pay irrigated rental rates on these lands, thus enhancing benefits of CREP and minimizing agricultural impacts to aquatic wildlife. Riparian buffer strips would continue to be the only CP allowed under CREP. Spray application of pesticides on perennial crops can result in aerial deposition of these pesticides into nearby streams and can adversely affect aquatic habitat and wildlife, including salmonid species. If approved, this amendment would most likely provide the following benefits to aquatic wildlife:

- Reduce spray application of pesticides near streams and subsequently decrease pesticide loads in streams.
- Filter sediment, nutrients, and other pollutants from runoff and improve water quality.
- Shade streams to lower water temperatures.
- Provide cover for aquatic wildlife.

The conservation plan developed for each CREP contract will include provisions to minimize any potential adverse effects that would be caused by implementation or maintenance of the riparian buffer. In addition, FSA will make a determination during the completion of the site-specific environmental evaluation for each CREP contract as to whether the contract may affect a listed species or critical habitat and if consultation with FWS or NMFS is required for that particular contract.

Based on the following facts, FSA has determined that its amendment of the WA CREP Agreement is not likely to adversely affect federally listed species listed in the 2000 BO, as long as the recommendations contained in the BO are adhered to by FSA and program participants.

- The original size of the CREP area will not change.
- The original boundaries of the CREP area will not change.
- The conservation practice will not change.

The FSA has also determined that the proposed amendment, if approved, will not likely result in adverse effects to federally listed species. This determination is based upon the following:

- The original size of the CREP area will not change
- The original boundaries of the CREP area will not change.
- The conservation practice will not change.
- The proposed amendment will most likely have a beneficial effect on federally listed species, especially aquatic wildlife.
- Site-specific evaluations will ensure the protection of threatened and endangered species.

We look forward to receiving your comments regarding any further obligations that FSA may have under Section 7 of the ESA. Please provide your comments by October 15, 2005, to this office. A copy of the CREP Agreement is attached. If you have any additional questions concerning the amendment to the CREP Agreement, please contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-5015.

Sincerely,

Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods Cross, UT. 84010

Environmental Compliance Manager, FSA, Washington, D. C.
(By facsimile (202) 720-4619)



United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

August 7, 2006

U.S. Fish and Wildlife Service
Regional Director's Office
Eastside Federal Complex
911 NE 11TH AVE
Portland, OR 97232-4181

Attention: Endangered Species Division

RE: Washington State Conservation Reserve Enhancement Program (WA CREP)
Agreement

Dear Sir or Madame:

The Farm Service Agency (FSA) is in the process of amending the Washington Conservation Reserve Enhancement Program (WA CREP) Agreement that was approved in October 1998. The amendment would extend operation of the CREP Agreement until December 31, 2007. The amended CREP Agreement would still apply to the original counties of:

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As part of this amendment process, FSA is completing a programmatic environmental assessment (PEA) in order to comply with the provisions of the National Environmental Policy Act and other laws such as the Endangered Species Act (ESA). The PEA will address the potential effects of the CREP Amendment on listed threatened and endangered species and critical habitat. In addition to this PEA, FSA is required to complete a site-specific environmental evaluation for each contract completed under the CREP Agreement. These site-specific environmental evaluations will include a review of potential effects on listed species and critical habitat that may result in informal or formal consultation on an individual basis.

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providing this letter to reinitiate consultation at the programmatic level since the original CREP Agreement is being amended. Once completed, a copy of the draft PEA will also be provided for comment.

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- The original boundaries of the CREP area will not change.
- The conservation practice will not change.



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- The conservation practice will not change.
- The proposed amendment will most likely have a beneficial effect on federally listed species, especially aquatic wildlife.
- Site-specific evaluations will ensure the protection of threatened and endangered species.

We look forward to receiving your comments regarding any further obligations that FSA may have under Section 7 of the ESA. Please provide your comments by October 15, 2005, to this office. A copy of the CREP Agreement is attached. If you have any additional questions concerning the amendment to the CREP Agreement, please contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-5015.

Sincerely,

Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods
Cross, UT. 84010

Environmental Compliance Manager, FSA, Washington, D. C.
(By facsimile (202) 720-4619)



United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

August 7, 2006

U.S. Fish and Wildlife Service
Regional Director's Office
Eastside Federal Complex
911 NE 11TH AVE
Portland, OR 97232-4181

Attention: Endangered Species Division

**RE: Washington State Conservation Reserve Enhancement Program (WA CREP)
Agreement, Amendment To Letter Requesting Consultation Dated September 15,
2005**

Dear Sir or Madam:

In order to fully comply with Section 7 of the ESA, FSA is providing this letter as an amendment to a letter dated September 15, 2005. In that letter FSA reinitiated consultation for the WA CREP because of proposed amendments to the WA CREP Agreement. Proposed amendments include the following:

- Extending operation of the CREP Agreement until December 31, 2007
- Allowing perennial crops to be enrolled in CREP
- Paying irrigated rental rates on enrolled land
- Adding two conservation practices to those eligible CPs for use under WA CREP: grass filter strips and hedgerow plantings

The additional amendments that have been proposed since the letter dated September 15, 2005 include adding the conservation practices (CPs) grass filter strips and hedgerow plantings to the list of eligible CPs allowed under WA CREP. All other program elements as outlined in the September 15, 2005 letter would remain the same. The amended CREP Agreement would still apply to the original counties of:

Asotin	Garfield	Lewis	Snohomish
Benton	Grays Harbor	Mason	Thurston
Chelan	Jefferson	Okanogan	Wahkiakum
Clallam	King	Pacific	Walla Walla
Clark	Kitsap	Pierce	Whatcom
Columbia	Kittitas	Skagit	Whitman
Cowlitz	Klickitat	Skamania	Yakima

There are no provisions in the amendment to expand the acreage beyond the original 100,000 acre and 10,000 stream mile limit.

If approved, the additional CPs would most likely provide the following benefits to aquatic wildlife:

- Decrease pesticide loads in streams by reducing spray application of pesticides near streams
- Improve water quality by filtering sediment, nutrients, and other pollutants from agricultural runoff
- Reduce water temperatures by shading streams
- Provide cover for aquatic wildlife
- Protect and maintain downstream water quality by increasing infiltration of surface runoff, slowing the flow of surface water runoff, and reducing water and wind erosion

The conservation plan developed for each CREP contract will include provisions to minimize any potential adverse effects that would be caused by implementation or maintenance of the CPs. In addition, FSA will make a determination during the completion of the site-specific environmental evaluation for each CREP contract as to whether the contract may affect a listed species or critical habitat and if consultation with FWS or NMFS is required for that particular contract.

FSA has determined that its amendment of the WA CREP Agreement is not likely to adversely affect federally listed species listed in the biological opinion (BO) (NMFS Log # WSB-99-462 and USFWS Log # 1-3-F-0064) that was issued by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in 2000, as long as the recommendations contained in the BO are adhered to by FSA and program participants. This determination is based upon the following:

- The original size of the CREP area will not change
- The original boundaries of the CREP area will not change
- The proposed amendment will most likely have a beneficial effect on federally listed species, especially aquatic wildlife
- Site-specific evaluations will ensure the protection of threatened and endangered species

We look forward to receiving your comments regarding any further obligations that FSA may have under Section 7 of the ESA. Please provide your comments by xxxx, to this office. A copy of the CREP Agreement and a description of the additional CPs are attached. If you have any additional questions concerning the amendment to the CREP Agreement, please contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-3015.

Sincerely,

Melissa Cummins



State Environmental Coordinator

Attach: CREP Agreement and CP descriptions

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods
Cross, UT. 84010

Environmental Compliance Manager, FSA, Washington, D. C.
(By facsimile (202) 720-4619)





United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

August 7, 2006

Office of Environmental Assessment
Mail Stop OEA-095
1200 Sixth Avenue
Seattle, WA 98101

RE: Washington State Conservation Reserve Enhancement Program (WA CREP)
Agreement

Dear Ms. Lentz:

The Farm Service Agency (FSA) is in the process of amending the Washington Conservation Reserve Enhancement Program (WA CREP) Agreement that was approved in October 1998. The amendment would extend operation of the CREP Agreement until December 31, 2007. The enclosed agreement encompasses 100,000 acres in the counties of:

Asotin	Grays Harbor	Okanogan	Walla Walla
Benton	Jefferson	Pacific	Whatcom
Chelan	King	Pierce	Whitman
Clallam	Kitsap	Skagit	Yakima
Clark	Kittitas	Skamania	
Columbia	Klickitat	Snohomish	
Cowlitz	Lewis	Thurston	
Garfield	Mason	Wahkiakum	

As part of this amendment process, FSA is completing a programmatic environmental assessment (PEA) in order to comply with the provisions of the National Environmental Policy Act and other laws such as the Safe Drinking Water Act (SDWA). The PEA will address the potential effects of CREP on Sole Source Aquifers (SSAs). In addition to this PEA, FSA is required to complete a site-specific environmental evaluation for each contract completed under the CREP Agreement. These site-specific environmental evaluations will include a review of potential effects of CREP on SSAs.

In order to comply with SSA Protection Program, Section 1424(e) of the SDWA, FSA is providing this letter to initiate informal consultation of CREP at the programmatic level. Once completed, a copy of the draft PEA will also be provided for comment.

The original CREP Agreement included provisions to install the conservation practice (CP) riparian buffer on non-irrigated cropland and pasture land located on streams that provide important spawning habitat for threatened and endangered salmonid species. To date, FSA has enrolled 9,775.5 acres and 538 stream miles in Conservation Reserve Program (CRP) contracts under this CREP Agreement. There are no provisions in the amendment to expand the acreage beyond the original 100,000 acre and 10,000 stream

mile limit.

An amendment that is being proposed would allow land in perennial crops (e.g., orchards, vineyards) to be enrolled into CREP contracts, and to pay irrigated rental rates on these lands, thus enhancing benefits of CREP and minimizing agricultural impacts to water quality and aquatic wildlife. The Agreement would also be amended to include grass filter strips and hedgerow plantings as additional eligible CPs. If approved, this amendment would most likely provide the following benefits:

- Reduce spray application of pesticides near streams and subsequently decrease pesticide loads in streams.
- Filter sediment, nutrients, and other pollutants from runoff and improve water quality.

The conservation plan developed for each CREP contract will include provisions to minimize any potential adverse effects that would be caused by implementation or maintenance of the CPs. In addition, FSA will make a determination during the completion of the site-specific environmental evaluation for each CREP contract as to whether the contract may affect SSAs.

We feel that CREP would not have any adverse effects on SSAs for the following reasons:

- CREP would remove agricultural land from production, reducing the amount of agricultural chemicals being applied to the land, which may improve the quality of water recharging SSAs.
- Site-specific environmental evaluations would ensure the protection of SSAs

If possible as part of the consultation process, we ask you to review the agreement and let us know if you have any concerns about adverse effects on SSAs, or if any mitigating measures are necessary. Please provide your comments within 30 days. Your comments will allow us to address any effects to SSAs at the earliest possible time and will allow producers to gear their conservation plans towards SSA issues.

If you have any questions feel free to contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-3015.

Sincerely,

Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

October 6, 2005

Reply to: OEA-095

Melissa Cummins
State Environmental Coordinator
U. S. Dept. of Agriculture
316 W. Boone Ave., Suite 568
Spokane, WA 99201-2350

Dear Ms. Cummins:

Thank you for sending us your letter describing the Washington Conservation Reserve Enhancement Program (WA CREP) and attached Job Sheets and forms. This USDA program clearly protects, if not enhances, ground water quality in EPA-designated Sole Source Aquifer areas. We agree that the program likely reduces pesticide use, increases filtering of surface water infiltration, and provides an additional institutional environmental evaluation of subject lands. We do not believe that the CREP projects will have any adverse impact on ground water located in Sole Source Aquifer areas, and therefore we will not need to review specific projects in your program.

Feel free to give me a call anytime if you have questions regarding our Sole Source Aquifer Program and how it might relate to the CREP.

Sincerely,

Martha Lentz
Hydrogeologist



United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

September 15, 2005

Deputy State Historic Preservation Officer
Office of Archaeology and Historic Preservation
PO Box 4843
Olympia, WA 98504-8343

RE: Washington State Conservation Reserve Enhancement Program (WA CREP)
Agreement

Dear Mr. Griffith:

The Farm Service Agency (FSA) is completing an Programmatic Environmental Assessment with regard to the enclosed agreement submitted by State of Washington. WA CREP Agreement was approved in October 1998 and extends through December 2007. The intent of this letter is to initiate at the programmatic level informal consultation under Section 106 of the National Historic Preservation Act.

The enclosed agreement encompasses 100,000 acres in the counties of:

Asotin	Grays Harbor	Okanogan	Walla Walla
Benton	Jefferson	Pacific	Whatcom
Chelan	King	Pierce	Whitman
Clallam	Kitsap	Skagit	Yakima
Clark	Kittitas	Skamania	
Columbia	Klickitat	Snohomish	
Cowlitz	Lewis	Thurston	
Garfield	Mason	Wahkiakum	

The goal of WA CREP is to improve water quality in streams, reduce flow of polluted runoff to nearby waterbodies, and restore aquatic wildlife habitat. To achieve these goals, riparian buffers will be installed on streams that provide important spawning habitat for salmonid species, many of them threatened and endangered species. Riparian buffers will be installed on parcels of land that are used for agricultural activities.

Riparian buffers filter sediment, nutrients, and other pollutants from runoff and improve water quality. In addition, buffers shade streams, lowering water temperatures and providing cover for aquatic wildlife. Installment of riparian buffers may involve excavation of soil and could potentially disturb historic properties and cultural resources. However, an informal consultation process, which is outlined below, is already ongoing for the WA CREP and would ensure that any possible resources are protected. Based on this ongoing process we expect that the WA CREP will have no adverse effects on cultural resources or historic properties.

Producers (farmers/landowners/operators) apply to enroll parcels of property into

CREP. Once a parcel of land has been selected for enrollment in CREP, the local FSA County Executive Director then initiates consultation with a letter to SHPO describing the area of impact and requests comments. SHPO in response indicates whether or not a site survey is required. If a site survey is required, FSA conducts and reviews the surveys and sends copies to SHPO and any affected Tribes along with any findings based on the survey. The intent of this process is to ensure that any possible resources are protected. This process will be implemented for all future enrollments in WA CREP.

SHPO after reviewing the area of impact may determine that Tribal consultation is also necessary and will defer to the appropriate Tribe(s). Tribes that have been a part of this consultation process to date include the Nooksack, Lummi, Yakama, Spokane and Nez Perce Tribes. In Yakima County, FSA has contracted with the Yakama Tribe to have an archaeologist on site during any excavations. Involving the appropriate Tribe(s) early on in the consultation process ensures that Tribal cultural properties are protected. Tribal consultation will be initiated when appropriate for all future enrollments in WA CREP.

If possible as part of the consultation process, we ask you to review the agreement and let us know if you have any concerns about adverse effects on cultural resources or historic properties. Please provide your comments within 30 days. This will allow participants' conservation plans to be geared towards cultural resource issues at the earliest possible time, decreasing the processing time of applications, and reducing the number of unneeded State Historic Preservation Office referrals.

If you have any questions feel free to contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-5015.

Sincerely,

Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods Cross, UT. 84010



United States
Department of
Agriculture

Farm Service
Agency

Washington State
FSA Office
316 W. Boone Ave
Suite 568
Spokane, WA
99201-2350

Telephone:
(509) 323-3000

FAX:
(509) 323-3074

August 7, 2006

Deputy State Historic Preservation Officer
Office of Archaeology and Historic Preservation
PO Box 4843
Olympia, WA 98504-8343

RE: Amendment to letter dated September 15, 2005 initiating informal consultation concerning the Washington State Conservation Reserve Enhancement Program (WA CREP) Agreement

Dear Mr. Griffith:

In order to fully comply Section 106 of the National Historic Preservation Act, FSA is providing this letter as an amendment to a letter dated September 15, 2005. In that letter FSA initiated informal consultation for the WA CREP because of proposed amendments to the WA CREP Agreement. Proposed amendments include the following:

- Extending operation of the CREP Agreement until December 31, 2007
- Allowing perennial crops to be enrolled in CREP
- Paying irrigated rental rates on enrolled land
- Adding two conservation practices to those eligible CPs for use under WA CREP: grass filter strips and hedgerow plantings

The additional amendments that have been proposed since the letter dated September 15, 2005 include adding the conservation practices (CPs) grass filter strips and hedgerow plantings to the list of eligible CPs allowed under WA CREP. All other program elements as outlined in the September 15, 2005 letter would remain the same. The amended CREP Agreement would still apply to the original counties of:

Asotin	Garfield	Lewis	Snohomish
Benton	Grays Harbor	Mason	Thurston
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Clallam	King	Pacific	Walla Walla
Clark	Kitsap	Pierce	Whatcom
Columbia	Kittitas	Skagit	Whitman
Cowlitz	Klickitat	Skamania	Yakima

There are no provisions in the amendment to expand the acreage beyond the original 100,000 acre and 10,000 stream mile limit.

Installment of the additional CPs may involve excavation of soil and could potentially disturb historic properties and cultural resources. However, the informal consultation process, which was outlined in the September 15, 2005 letter, would not change with the additional CPs and would ensure that any possible resources are protected. Based on this

ongoing process we expect that the WA CREP will have no adverse effects on cultural resources or historic properties.

If possible as part of the consultation process, please review the additional amendments and let us know if you have any concerns about adverse effects on cultural resources or historic properties. Please provide your comments within 30 days. This will allow participants' conservation plans to be geared towards cultural resource issues at the earliest possible time, decreasing the processing time of applications, and reducing the number of unneeded State Historic Preservation Office referrals.

If you have any questions feel free to contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-3015.

Sincerely,

Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods Cross, UT. 84010



The goal of WA CREP is to improve water quality in streams, reduce flow of polluted runoff to nearby waterbodies, and restore aquatic wildlife habitat. To achieve these goals, riparian buffers will be installed on streams that provide important spawning habitat for salmonid species, many of them threatened and endangered species. Riparian buffers will be installed on parcels of land that are used for agricultural activities.

Riparian buffers filter sediment, nutrients, and other pollutants from runoff and improve water quality. In addition, buffers shade streams, lowering water temperatures and providing cover for aquatic wildlife. Installment of riparian buffers may involve excavation of soil and could potentially disturb historic properties and cultural resources. However, an informal consultation process, which is outlined below, is already ongoing for the WA CREP and would ensure that any possible resources are protected. Based on this ongoing process we expect that the WA CREP will have no adverse effects on cultural resources or historic properties.

Producers (farmers/landowners/operators) apply to enroll parcels of property into CREP. Once a parcel of land has been selected for enrollment in CREP, the local FSA County Executive Director then initiates consultation with a letter to SHPO describing the area of impact and requests comments. SHPO in response indicates whether or not a site survey is required. If a site survey is required, FSA conducts and reviews the surveys and sends copies to SHPO and any affected Tribes along with any findings based on the survey. The intent of this process is to ensure that any possible resources are protected. This process will be implemented for all future enrollments in WA CREP.

SHPO after reviewing the area of impact may determine that Tribal consultation is also necessary and will defer to the appropriate Tribe(s). Tribes that have been a part of this consultation process to date include the Nooksack, Lummi, Yakama, Spokane and Nez Perce Tribes. In Yakima County, FSA has contracted with the Yakama Tribe to have an archaeologist on site during any excavations. Involving the appropriate Tribe(s) early on in the consultation process ensures that Tribal cultural properties are protected. Tribal consultation will be initiated when appropriate for all future enrollments in WA CREP.

If possible as part of the consultation process, we ask you to review the agreement and let us know if you have any concerns about adverse effects on cultural resources or historic properties. Please provide your comments within 30 days. This will allow participants' conservation plans to be geared towards cultural resource issues at the earliest possible time, decreasing the processing time of applications, and reducing the number of unneeded State Historic Preservation Office referrals.

If you have any questions feel free to contact me at (509) 323-3021. For specifics about the CREP project itself, please contact Rod Hamilton, FSA Conservation Specialist, at (509) 323-5015.

Sincerely,



Melissa Cummins
State Environmental Coordinator

Attach: CREP Agreement

cc: Kelson Forsgren, The Shipley Group, Inc. 1584 South 500 West, Ste. 201, Woods Cross, UT.
84010

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APPENDIX I: COPIES OF PUBLIC COMMENTS WITH AGENCY RESPONSES

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