
PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

***Conservation Reserve Enhancement Program Agreement for
Oregon***



U.S. Department of Agriculture
Farm Service Agency

August 2009

EXECUTIVE SUMMARY

This programmatic environmental assessment (PEA) identifies the possible environmental consequences resulting from the proposed implementation of the Conservation Reserve Enhancement Program (CREP) agreement for the State of Oregon. The 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 outlined in the CREP agreement.

This PEA has been prepared by the United States Department of Agriculture (USDA) Farm Service Agency (FSA) in accordance with the requirements of the *National Environmental Policy Act* (NEPA) (42 *United States Code* 55 parts 4321 et seq., 2007), the Council on Environmental Quality implementing regulations (40 *Code of Federal Regulations* [CFR] 31 parts 1500 et seq., 2009), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 CFR 7 parts 799 et seq., 2005).

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to implement Oregon's CREP agreement. Under this agreement, 100,000 acres of eligible agricultural land would be removed from production and enhanced by approved conservation practices to establish and maintain improved water quality and long-term, high-quality fish and wildlife habitat. Conservation practices proposed in the CREP agreement include the planting of grass filter strips, the establishment of riparian and wildlife buffers, and wetland restoration and enhancement.

The Oregon CREP agreement is needed to meet the following CREP goals:

- Restore 100 percent of the area enrolled for the riparian buffer conservation practice to a properly functioning condition in terms of distribution and growth of woody plant species
- Reduce sediment and nutrient pollution from agricultural lands adjacent to 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
- Provide a contributing mechanism for farmers and ranchers to voluntarily meet the water quality requirements established under Federal law and under Oregon's agricultural water quality laws
- Provide adequate riparian buffers on 2,000 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics that meet the habitat requirements of salmon and trout
- Attain annual enrollment goals for specified geographic regions in Oregon until the 100,000-acre cap is fulfilled.

PROPOSED ACTION AND THE NO ACTION ALTERNATIVE

This PEA documents the analysis of the proposed action and the no action alternative. Under the no action alternative, no lands would be enrolled in CREP. The proposed action would seek to enroll up to 100,000 eligible acres along streams inhabited by fish species listed as threatened or endangered under the *Endangered Species Act*, streams where agricultural water quality management plans have been developed, and streams on reservations or tribal trust lands. In addition, the proposed action would seek to restore up to 5,000 eligible acres of wetlands on cropland and marginal pastureland that are either hydrologically connected to these streams or located in coastal estuaries. A minimum of 1,250 acres of the 5,000 acres of wetlands would be wetlands located in coastal estuaries.

The proposed action would provide participants with annual rental payments and maintenance payments for the 10–15 year contracts. Three types of one-time incentive payments are also available under the proposed CREP agreement. Depending upon the specific conservation practice, producers may be eligible to receive: (1) a signing incentive payment of \$10 per acre for each acre enrolled for each full year of the contract; (2) a practice incentive payment equal to 40 percent of the total eligible cost of the installation of the conservation practice; and (3) a cumulative impact incentive payment, based on enrollment of at least 50 percent of a streambank within a 5-mile stream segment in the CREP agreement, equal to four times the applicable base rental rate for each acre enrolled. For wetland restoration, a one-time incentive payment of 25 percent of the cost of hydrology restoration would be provided.

An additional incentive program called the Tualatin Watershed Option is available under the proposed action. This program, sponsored by Clean Water Services, increases the benefits and assistance available to producers within specific portions of the Tualatin River Watershed. The use of a riparian buffer is the only authorized conservation practice for this option; however, other practices would still be applicable under the proposed CREP within the Tualatin River Watershed.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

It is expected that there would be both positive and temporary minor negative impacts associated with implementation of the proposed action. A summary of the potential impacts is given in Table ES-1.

Table ES-1. Summary of potential impacts from implementation of the proposed action and the no action alternative.

Resource	Proposed Action	No Action
Biological Resources	<ul style="list-style-type: none"> • Enhancement or addition of native vegetation would result in a positive impact on vegetation resources • Woody vegetation would provide food, cover, nesting areas, and travel corridors for resident wildlife • Enhancement of aquatic species habitat, as well as improve overall water quality and temperature • Positive effect on threatened and endangered fish species and habitat • Temporary negative impacts due to human disturbance 	<ul style="list-style-type: none"> • Eligible land would remain in agricultural production • Potential long-term negative effects to terrestrial and aquatic wildlife present and their habitat • Continued polluting of water sources is likely to persist in limiting aquatic threatened and endangered species
Cultural Resources	<ul style="list-style-type: none"> • High potential for encountering recorded and unidentified archeological sites • Actions to be reviewed with the Oregon State Historic Preservation Office and tribal representatives, and followed by archival and field investigations as warranted • Class I literature search to be conducted once sites are determined 	<ul style="list-style-type: none"> • Continuation of farming not expected to impact resource • Change in farming practices that would disturb previously undisturbed areas may result in impacts to known or unknown archaeological, architectural, or traditional cultural resources
Water Resources	<ul style="list-style-type: none"> • Reduce sedimentation loading • Increased rates of aquifer recharge • Reduced agricultural runoff, pollutant loading, and nutrient leaching • Restoration of hydrology and plant communities associated with existing or degraded wetlands 	<ul style="list-style-type: none"> • Water resources are likely to continue to be subject to impairments such as low dissolved oxygen content, the presence of fecal coliform, high sedimentation levels, and fluctuating water temperatures
Earth Resources	<ul style="list-style-type: none"> • Stabilization of soils and topography as a result of decreased erosion and runoff • Reduced sedimentation in riparian areas • Temporary increase in erosion during implementation 	<ul style="list-style-type: none"> • Current rates of erosion and changes in topography due to erosion would be expected to continue

Resource	Proposed Action	No Action
Air Quality	<ul style="list-style-type: none"> • Potential long-term positive impacts to air quality • Temporary, negligible, negative impacts to air quality during implementation 	<ul style="list-style-type: none"> • No significant change to existing air quality conditions
Recreation Resources	<ul style="list-style-type: none"> • Increased availability of wildlife game species • Improved water quality and abundance of fish species • Increased wildlife viewing opportunities • Temporary displacement of wildlife may occur during implementation 	<ul style="list-style-type: none"> • Current recreational activities would continue • Conservation practices would not be used to improve lands and waters used by the public for hunting, fishing, wildlife watching, hiking, boating, swimming, and other water-related activities
Socio-economics	<ul style="list-style-type: none"> • Estimated loss of 719 farm worker positions • Implementation would create total net present value of approximately \$9 million over the contract period • Increased recreation opportunities would generate economic activity. 	<ul style="list-style-type: none"> • Socioeconomic conditions would continue to follow current trends • Minimal number of farmlands placed in conservation easements would not contribute significantly to slowing farmland conversion •

CONTENTS

EXECUTIVE SUMMARY ES-1

1.0 PURPOSE OF AND NEED FOR ACTION..... 1

 1.1 INTRODUCTION 1

 1.2 BACKGROUND 1

 1.2.1 Oregon Goals 2

 1.3 PURPOSE AND NEED FOR ACTION..... 4

 1.4 REGULATORY COMPLIANCE 5

 1.5 ORGANIZATION OF THE PEA..... 5

2.0 DESCRIPTION OF THE ALTERNATIVES..... 7

 2.1 ALTERNATIVE 1—NO ACTION 7

 2.2 ALTERNATIVE 2—PROPOSED ACTION 7

 2.2.1 Eligible Land..... 7

 2.2.2 Established Conservation Practices 7

 2.2.3 Financial Support to Land Owners 8

 2.2.4 Tualatin Watershed Option 9

3.0 AFFECTED ENVIRONMENT 11

 3.1 BIOLOGICAL RESOURCES 11

 3.1.1 Definition of Resource..... 11

 3.1.2 Region of Influence..... 11

 3.1.3 Affected Environment..... 11

 3.2 CULTURAL RESOURCES 27

 3.2.1 Definition of Resource..... 27

 3.2.2 Region of Influence..... 28

 3.2.3 Affected Environment..... 28

 3.3 WATER RESOURCES 30

 3.3.1 Definition of Resource..... 30

 3.3.2 Region of Influence..... 30

 3.3.3 Affected Environment..... 31

 3.4 EARTH RESOURCES 35

 3.4.1 Definition of Resource..... 35

3.4.2	Region of Influence.....	35
3.4.3	Affected Environment.....	35
3.5	AIR QUALITY.....	37
3.5.1	Definition of Resource.....	37
3.5.2	Region of Influence.....	38
3.5.3	Affected Environment.....	38
3.6	RECREATIONAL RESOURCES.....	39
3.6.1	Definition of Resource.....	39
3.6.2	Region of Influence.....	39
3.6.3	Affected Environment.....	39
3.7	SOCIOECONOMICS.....	40
3.7.1	Definition of Resource.....	40
3.7.2	Region of Influence.....	40
3.7.3	Affected Environment.....	40
4.0	ENVIRONMENTAL CONSEQUENCES.....	49
4.1	BIOLOGICAL RESOURCES.....	49
4.1.1	Alternative 1—No Action.....	49
4.1.2	Alternative 2—Proposed Action.....	49
4.2	CULTURAL RESOURCES.....	55
4.2.1	Alternative 1—No Action.....	55
4.2.2	Alternative 2—Proposed Action.....	55
4.3	WATER RESOURCES.....	56
4.3.1	Alternative 1—No Action.....	56
4.3.2	Alternative 2—Proposed Action.....	56
4.4	EARTH RESOURCES.....	57
4.4.1	Alternative 1—No Action.....	57
4.4.2	Alternative 2— Proposed Action.....	57
4.5	AIR QUALITY.....	57
4.5.1	Alternative 1—No Action.....	57
4.5.2	Alternative 2— Proposed Action.....	58
4.6	RECREATIONAL RESOURCES.....	58

4.6.1	Alternative 1—No Action.....	58
4.6.2	Alternative 2—Proposed Action.....	58
4.7	SOCIOECONOMICS.....	59
4.7.1	Alternative 1—No Action.....	59
4.7.2	Alternative 2—Proposed Action.....	59
5.0	CUMULATIVE IMPACTS AND IRRETRIEVABLE COMMITMENT OF RESOURCES.....	61
5.1	CUMULATIVE IMPACTS.....	61
5.1.1	Definition of Cumulative Impacts	61
5.1.2	Past, Present, and Reasonably Foreseeable Future Actions.....	61
5.1.3	Analysis of Cumulative Impacts.....	62
5.2	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	62
6.0	MITIGATION.....	63
6.1	BIOLOGICAL RESOURCES.....	63
6.2	CULTURAL RESOURCES	66
6.3	EARTH RESOURCES	67
7.0	LIST OF PREPARERS.....	69
8.0	PERSONS AND AGENCIES CONTACTED	71
9.0	REFERENCES	73

APPENDICIES

Appendix A:	Summary of Relevant Conservation Practices.....	A-1
Appendix B:	Critical Habitat	B-1
Appendix C:	Impaired Surface Waters	C-1
Appendix D:	Recreational Resources	D-1
Appendix E:	Net Present Value Analysis	E-1
Appendix F:	Program Biological Assessment for the Oregon Conservation Reserve Enhancement Program	F-2
Appendix G:	USFWS Biological Opinion.....	G-3
Appendix H:	NMFS Agreement Letter and NMFS/USFWS 1999 Biological Opinion.....	H-3

FIGURES

Figure 1.	The Coastal Basin, Columbia Basin, and Interior Drainages Basin of Oregon	4
Figure 2.	Level III Ecoregions in the ROI	12
Figure 3.	Basins and river basins in the ROI	14
Figure 4.	Major river systems in the ROI	32
Figure 5.	National forests, grassland, park, wildlife refuges, and monuments in the ROI	40

TABLES

Table ES-1.	Summary of potential impacts from implementation of the proposed action and the no action alternative.....	3
Table 1.	The Level III and Level IV Ecoregions of the ROI	13
Table 2.	Terrestrial game species in the ROI	16
Table 3.	Aquatic game species in the ROI	18
Table 4.	Threatened, endangered, and candidate wildlife species in the ROI	22
Table 5.	Threatened, endangered, and candidate plant species in the ROI	24
Table 6.	Soil orders in the Level III Ecoregions of the ROI	37
Table 7.	Air Quality Control Regions in the ROI	38
Table 8.	Hired farm and contract labor as a percentage of total production	42
Table 9.	Average farm production expenses and return per dollar of expenditure in 2002	43
Table 10.	Average value of land and buildings and machinery and equipment per farm in 2002	45
Table 11.	Acreage change for different agricultural land uses from 1997 to 2002	46
Table 12.	CREP PEA Consultation	71

ACRONYMS AND ABBREVIATIONS

AQI	Air Quality Index
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BP	before present
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality
CFR	<i>Code of Federal Regulations</i>
CFS	cubic feet per second
CP	conservation practice
CREP	Conservation Reserve Enhancement Program
CRITFC	Columbia River Inter-Tribal Fish Commission
CRP	Conservation Reserve Program
CWS	Clean Water Services
DDT	dichloro-diphenyl-trichloroethane
EO	Executive Order
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERS	Economic Research Service
ESA	<i>Endangered Species Act</i>
ESU	evolutionary significant unit
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
FR	<i>Federal Register</i>
FWS	Fish and Wildlife Service

GORP	Great Outdoor Recreation Pages
GRP	Grassland Reserve Program
GWMA	groundwater management area
NAAQS	National Ambient Air Quality Standards
NEPA	<i>National Environmental Policy Act</i>
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSFHWAR	National Survey of Fishing, Hunting and Wildlife Associated Recreation
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OHJV	Oregon Habitat Joint Venture
ONHIC	Oregon Natural Heritage Information Center
OPRD	Oregon Parks and Recreation Department
ORS	<i>Oregon Revised Statutes</i>
ORSHPO	Oregon State Historic Preservation Office
OWEB	Oregon Watershed Enhancement Board
PCB	polychlorinated biphenyl
PEA	programmatic environmental assessment
PFMC	Pacific Fisheries Management Council
PM ₁₀	particulate matter less than 10 microns in diameter
PSMFC	Pacific States Marine Fisheries Commission

ROI	region of influence
TCP	traditional cultural property
TWO	Tualatin Watershed Option
UFSG	unhealthy for sensitive groups
USACE	U.S. Army Corps of Engineers
USC	<i>United States Code</i>
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WHIP	Wildlife Habitat Incentives Program
WRP	Wetlands Reserve Program

This page intentionally left blank.

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

The United States Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Conservation Reserve Enhancement Program (CREP) agreement for the State of Oregon. This programmatic environmental assessment (PEA) has been prepared to analyze the potential environmental consequences associated with the proposed action and the no action alternative in accordance with the *National Environmental Policy Act* (NEPA) (42 *United States Code* [USC] 55 parts 4321 et seq., 2007), the Council on Environmental Quality (CEQ) implementing regulations (40 *Code of Federal Regulations* [CFR] 31 parts 1500 et seq., 2009), and *Environmental Quality and Related Environmental Concerns—Compliance with the National Environmental Policy Act* (7 CFR 7 parts 799 et seq., 2005). This analysis is programmatic in nature and does not address individual site-specific impacts, which will be evaluated for individual CREP contracts prior to approval.

1.2 BACKGROUND

FSA was established during the reorganization of USDA in 1994. The mission of FSA is to:

“...ensure the well-being of American agriculture and the American public through efficient and equitable administration of agricultural commodity, farm loan, conservation, environmental, emergency assistance, and domestic and international food assistance programs.” (FSA n.d.)

The Conservation Reserve Program (CRP) was established under Title XII of the *Food Security Act of 1985* (16 USC 58 part 3831, 2008). The purpose of CRP is to cost-effectively assist owners and operators 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 10–15 years in exchange for annual rental payments and cost-share assistance for installing certain conservation practices (CPs).

The initial goal of CRP was to reduce soil erosion on highly erodible cropland. Subsequent amendments to CRP regulations have made certain cropland and pastureland eligible for CRP based on benefits to water quality and wildlife habitat. The *Food, Conservation, and Energy Act of 2008*, commonly known as the 2008 Farm Bill, authorizes CRP through 2017 and caps the overall enrollment authority to 39.2 million acres through 2009 and 32 million acres for fiscal years 2010, 2011, and 2012 (16 USC 58 part 3831, 2008). The *Conservation Reserve Program Final Programmatic Environmental Impact Statement* contains a detailed analysis of the impacts of implementing the CRP nationwide, including the CREP component (FSA 2003a).

The Secretary of Agriculture initiated CREP in 1997. CREP is authorized pursuant to the *Federal Agriculture Improvement and Reform Act of 1996* and is a subset of CRP (7 USC 100 parts 7201 et seq., 2008). This program is based on the continuous CRP model but differs in four important ways (FSA 2009):

- CREP is targeted to specific geographic areas and is designed to focus CPs on addressing specific environmental concerns.

- CREP is a partnership between USDA, State and/or tribal governments, other Federal and State agencies, environmental groups, wildlife groups, and other stakeholders who have an interest in addressing particular environmental issues.
- CREP is results-oriented, and requires States to establish measurable objectives and conduct annual monitoring to measure progress toward implementation of those objectives.
- CREP is flexible, within existing legal constraints, and may be adapted to meet local conditions on the ground.

This voluntary program uses financial incentives to encourage farmers and ranchers to enroll in contracts of 10–15 years in duration to remove lands from agricultural production. The two primary objectives of CREP are the following:

- Coordinate Federal and non-Federal resources to address specific conservation objectives of a State and the nation in a cost-effective manner
- Improve water quality, erosion control, and wildlife habitat related to agricultural use in specific geographic areas.

CRP and CREP are administered by FSA in cooperation with the Natural Resource Conservation Service (NRCS), the Cooperative State Research and Education Extension Service, State forestry agencies, and local soil and water conservation districts. FSA is the lead agency in the development of this PEA.

1.2.1 Oregon Goals

CREP agreements are designed to meet specific regional conservation goals and objectives related to agriculture. The proposed agreement with Oregon is focused on assisting in the recovery of fish species that have been listed as threatened or endangered under the *Endangered Species Act* (ESA) and improving water quality.

A number of fish species native to Oregon have been either listed or proposed for listing as threatened or endangered species under the ESA. Agricultural activities in riparian corridors, along with agriculture-related impacts to water quality, have contributed to habitat loss for these fish species in Oregon. The CREP agreement seeks to help alleviate some of these problems. Under the proposed CREP agreement, farmers and ranchers who voluntarily participate will enter into contracts with the Federal government for 10–15 years, agreeing to remove portions of their land from agricultural production and plant them to grass, shrubs, and trees.

The Oregon CREP agreement would intend on enrolling up to 100,000 acres located along any of the following (USDA 2004a):

- Streams inhabited by fish listed under Federal law as threatened or endangered species
- Streams where agricultural water quality management plans have been developed pursuant to *Oregon Revised Statutes* (ORS) 568.930 to 568.933 (2007)
- Streams on reservations or tribal trust lands.

The Oregon CREP would seek to restore up to 5,000 acres of wetlands on cropland and marginal pastureland that are either hydrologically connected to these streams or located in coastal estuaries. A minimum of 1,250 acres of the 5,000 acres of wetlands would be wetlands located in coastal estuaries.

The specific goals and objectives for the Oregon CREP agreement include the following:

- Restore 100 percent of the area enrolled for the riparian buffer CP to a properly functioning condition in terms of distribution and growth of woody plant species
- Reduce sediment and nutrient pollution from agricultural lands adjacent to 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
- Provide a contributing mechanism for farmers and ranchers to voluntarily meet the water quality requirements established under Federal law and under Oregon's agricultural water quality laws
- Provide adequate riparian buffers on 2,000 stream miles to permit natural restoration of stream hydraulic and geomorphic characteristics which meet the habitat requirements of salmon and trout.

In addition, the annual enrollment goal for each of the following geographic regions in Oregon would be attained until the 100,000-acre cap is fulfilled (Figure 1):

Coastal Basin

1,250 acres of riparian forest buffer
1,000 acres of restored wetland
2,250 total acres (180 total stream miles) of riparian buffer

Columbia Basin

8,000 acres of riparian forest buffer and filter strips
1,000 acres of restored wetland
9,000 total acres (700 stream miles) of riparian buffer

Interior Drainages Basin

3,500 acres of riparian forest buffer and filter strips
1,000 acres of restored wetland
4,500 total acres (375 stream miles) of riparian buffer

The intended outcome of the Oregon CREP agreement is to enhance the ability of producers to enroll certain acreage under CRP where deemed desirable by the USDA and the Commodity Credit Corporation (CCC). CCC is a Federal entity within USDA that was created to stabilize, support, and protect agricultural income and prices.

1.3 PURPOSE AND NEED FOR ACTION

The purpose of this action is to implement Oregon's CREP agreement to reduce and mitigate agriculture-related impacts to streams throughout Oregon that provide current or historical habitat for fish species listed as threatened or endangered under the ESA. Under this agreement, eligible farm and ranch land would be planted in grasses, shrubs, and/or trees.

The Oregon CREP agreement is needed to:

- Restore native riparian vegetation and wetlands removed or eliminated by historical farming and ranching activities to reduce rates of sedimentation and moderate water temperatures
- Provide a contributing mechanism for farmers and ranchers to voluntarily meet the water quality requirements established under Federal law and under Oregon's agricultural water quality laws
- Enhance the ability of producers to enroll certain acreage under CRP
- Provide for partnerships between Federal, State, and local governments and with private conservation organizations to create mutually beneficial conservation management practices for agriculture and Oregon's threatened and endangered species
- Fairly compensate producers for their contribution to sustaining wildlife resources on private lands.

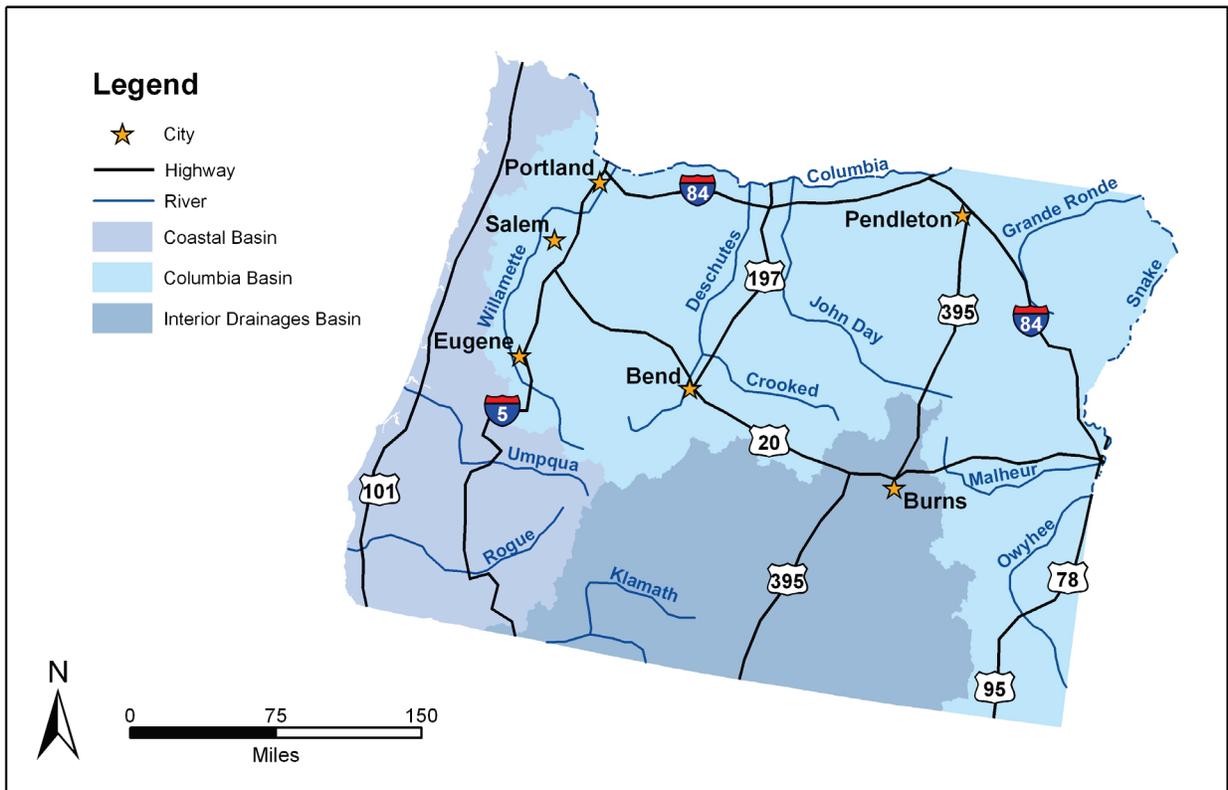


Figure 1. The Coastal Basin, Columbia Basin, and Interior Drainages Basin of Oregon

1.4 REGULATORY COMPLIANCE

This PEA has been completed as part of the NEPA process and is in compliance with its implementing regulations (40 CFR 31 parts 1500 et seq., 2009) and the FSA implementing regulation *Environmental Quality and Related Environmental Concerns—Compliance with the National Environmental Policy Act* (7 CFR 7 parts 799 et seq., 2005). The intent of NEPA is to protect, restore, and enhance the human environment through well-informed Federal decisions. The following non-exclusive list of higher-tier executive orders (EOs), acts, and relevant decision and guidance documents apply to actions undertaken by Federal agencies and form the basis of the analysis presented in this PEA:

- *Clean Air Act* (42 USC 85 parts 7401 et seq., 2007)
- *Clean Water Act* (33 USC 26 parts 1251 et seq., 2008)
- *Endangered Species Act of 1973* (16 USC 35 parts 1531 et seq., 2008)
- EO 11514, Protection and Enhancement of Environmental Quality (35 *Federal Register* [FR] 4247, 1977)
- *National Historic Preservation Act* (16 USC 1A part 470, 2008)
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 32, 1995)

However, environmental justice in low income and minority populations has been eliminated from detailed analysis in this PEA. Interim Rule, 7 CFR Part 1410 Conservation Reserve Program, has been reviewed by the USDA and the FSA and certified according to Departmental Regulation 4300-4. With the recent acceptance and clearance of this regulation through USDA, individual analysis for each potential implication of a CRP action in regard to Environmental Justice is no longer needed. This finding is based on the following: (1) eligibility criteria for CRP are sound and reasonable for the distribution of Federal funds. Because the criteria for participation are being established by regulatory means, there would be no subjective component inherent in it to obscure the fair and equitable distribution of funds; and, (2) use of the State committees or State offices to review local decisions made at the county office level aids in the checks and balances and helps to prevent discriminatory behavior or favoritism. In addition, county FSA committees are required to ensure that all groups of producers are represented on the county committee, including females and minorities. The county committee will recommend a county committee advisor (previously termed “minority advisor”) as necessary to ensure that the interests of under-represented producers are fairly represented. This includes the appointment of a tribal representative as a county committee advisor to represent Native American interests in the county or area. Environmental justice is thus eliminated from analysis.

1.5 ORGANIZATION OF THE PEA

This PEA discloses the potential impacts of the proposed action and the no action alternative on affected environmental and economic resources. Chapter 1.0 provides background information relevant to the proposed action and discusses the purpose and need for the proposed action. Chapter 2.0 describes the proposed action and the no action alternative. Chapter 3.0 describes the baseline conditions (i.e., the conditions against which potential impacts of the proposed action and alternative are measured) for each of the resource areas. Chapter 4.0 explains the potential environmental impacts to these resources. Chapter 5.0 provides an analysis of cumulative impacts and irreversible and irretrievable resource commitments. Chapter 6.0 describes mitigations to reduce potential impacts of the proposed action.

Chapter 7.0 is a list of the preparers of this document, Chapter 8.0 presents a list of those persons and agencies contacted during the preparation of this document, and Chapter 9.0 contains references used in the PEA.

2.0 DESCRIPTION OF THE ALTERNATIVES

This chapter describes the alternatives, which includes the proposed action and the no action alternative. These two alternatives are compared in terms of their environmental impacts and ability to achieve the objectives listed in Section 1.2.

2.1 ALTERNATIVE 1—NO ACTION

Alternative 1, the no action alternative, would involve not implementing the Oregon CREP agreement. No land would be enrolled in CREP, and the goals for the Oregon CREP would not be met. This alternative would result in a continuation of the current agricultural practices that have lead to the decline in fish species listed as threatened or endangered under the ESA and a continued decrease in water quality.

2.2 ALTERNATIVE 2—PROPOSED ACTION

Alternative 2, the proposed action, would implement the Oregon CREP agreement. This alternative would enroll up to 100,000 acres along streams inhabited by fish species listed as threatened or endangered under the ESA, streams where agricultural water quality management plans have been developed pursuant to ORS 568.930 to 568.933 (2007), and streams on reservations or tribal trust lands. Specific CPs would be installed on eligible land and according to rules in *Agricultural Resource Conservation Program for State and County Offices (Handbook 2–CRP)* (FSA 2003b).

This alternative would seek to restore up to 5,000 acres of wetlands on cropland and marginal pastureland which are either hydrologically connected to these streams or located in coastal estuaries. A minimum of 1,250 acres of the 5,000 acres of wetlands would be wetlands located in coastal estuaries.

2.2.1 Eligible Land

The proposed Oregon CREP agreement would enroll 100,000 acres in CRP. Once the CREP agreement is approved, landowners would enroll eligible lands in the program on a voluntary basis. As such, the exact location of parcels that might be enrolled is not known.

To be eligible, land would be required to be adjacent to a stream segment that is either: (1) determined to support any of the fish species listed in Section 3.1.3.4 of this PEA and the *Addendum to the Oregon CREP Agreement* (USDA 2000), (2) within an area where an agricultural water quality management area plan has been developed and approved pursuant to ORS 568.930 to 568.933 (2007), or (3) on reservations or tribal trust lands.

Under this alternative, land within these areas would have to be either cropland that was planted or considered planted to a crop in 2 of the last 5 years, or marginal pasture land. If the land is currently enrolled in CRP, that contract must expire before being eligible for CREP.

2.2.2 Established Conservation Practices

The CPs proposed for implementation under the Oregon CREP agreement for Alternative 2 include the following:

- CP21, Filter Strips

- CP22, Riparian Buffer
- CP23, Wetland Restoration
- CP29, Marginal Pastureland Wildlife Habitat Buffer
- CP30, Marginal Pastureland Wetland Buffer.

These CPs, which require a contract period of between 10 and 15 years, would be installed according to *Handbook 2–CRP* rules unless otherwise specified in Oregon’s CREP agreement (USDA 2004a). For lands to be devoted to CP22, CP29, and CP30, the maximum average width may exceed 180 feet provided that the minimum design specification needed for water quality purposes would be met as detailed in *Handbook 2–CRP*. A description of each CP is provided in Appendix A.

Preparation of lands for installation of CPs may include removal of existing vegetation or rocks through the use of tilling, burning, or approved agricultural chemicals. Temporary covers may be installed. Earth moving equipment may be used to construct surface dikes, dams, levies, and subsurface piping and structures to regulate water flow. Fire breaks, fencing, and roads may also be installed.

2.2.3 Financial Support to Land Owners

The proposed action would provide participants with annual rental payments for each acre enrolled. The rental rate for non-irrigated land would be determined as calculated in *Handbook 2–CRP*. Rental rates for irrigated land would be established by the Deputy Administrator for Farm Programs on a watershed basis using existing data. If the producer agrees to enter into an agreement with the State and it is acceptable to CCC, then CCC would pay the irrigated rental rate to lease surface water allocated to those lands to the State for instream flow purposes. Otherwise, non-irrigated rental rates would apply.

Under Alternative 2, CCC would cost share with producers for 50 percent of the eligible reimbursable costs of all approved CPs. The State of Oregon would provide an additional 25 percent of the cost of establishing conservation practices, all the costs of the annual monitoring program, and a portion of the technical assistance costs. For Wetland Restoration (CP23), CCC would pay an incentive payment equal to 25 percent of the cost of hydrology restoration in accordance with specifications in *Handbook 2–CRP*.

CCC would provide an annual incentive payment as a percentage of the base CRP contract annual rental rate otherwise applicable to the land that would be enrolled in the CREP in the following amounts:

- Fifty percent for land enrolled either as CP22, CP23, CP29, or CP30 (Riparian Buffer, Wetland Restoration, Marginal Pastureland Wildlife Habitat Buffer, or Marginal Pastureland Wetland Buffer, respectively)
- Twenty-five percent for land enrolled as CP21 (Filter Strips)

Alternative 2 would provide producers with a cumulative impact incentive payment based on enrollment along a particular stream segment in any case where a total of at least 50 percent of the streambank within a 5-mile stream segment is enrolled in CRP under this CREP agreement. Individuals eligible for this payment would participate in CREP along that stream segment. The payment would be a one-time incentive payment and would equal four times the applicable base rental rate for each acre enrolled. In addition, an annual maintenance incentive payment for each enrolled acre would be provided in the same manner as other CRP contracts. A one-time CRP signing incentive payment and practice incentive payment would be provided for enrollment in CP21, CP22, CP29, and CP30 (Filter Strips, Riparian

Buffer, Marginal Pastureland Wildlife Habitat Buffer, and Marginal Pastureland Wetland Buffer) as outlined in *Handbook 2–CRP*. A one-time incentive payment equal to 25 percent of the cost of hydrology restoration as specified by FSA would be paid for CP23 (Wetland Restoration).

This alternative would provide for direct cost-share payments from the State of Oregon for 75 percent of the costs of certain water developments, watering facilities, pipelines, and livestock crossings. To be eligible for this cost share, these practices must be specified in the conservation plan for the subject land enrolled in CREP, specified in the State cost-share contract, and not eligible for cost share by FSA.

In the case where the producer agrees to lease surface water, the State of Oregon would pay the application fees for lands enrolled in CREP at the irrigated rental rate. For permanent instream water right transfers, the State would pay transaction costs, including any certified water rights examiner fees, public notice fees, application fees, and other costs as determined on an individual basis.

The State of Oregon would purchase permanent instream water right transfers for lands enrolled in CREP at the irrigated rental rate. Purchases would be made on a per-acre basis and purchase price would be no more than the net present value of the irrigated rental rate for the subject acreage for a period of 10–15 years following the signing of the CREP contract, assuming a 6 percent discount rate.

The total program cost is estimated at \$250 million. Of this, CCC will provide 80 percent and the State of Oregon or other non-Federal sources will provide 20 percent of the total cost. CCC will pay applicable land rental costs, 50 percent of the cost of establishing conservation practices, an annual maintenance incentive, and a portion of the costs of providing technical assistance. The State of Oregon will pay 25 percent of the cost of establishing conservation practices, all the costs of the annual monitoring program, and a portion of the technical assistance costs.

2.2.4 Tualatin Watershed Option

An additional incentive program called the Tualatin Watershed Option (TWO) is available under Alternative 2. TWO is sponsored by Clean Water Services (CWS), an Oregon county service district and political subdivision of State government organized under ORS Chapter 451 (ORS 451 parts 010 et seq. 2007) with headquarters in Hillsboro, Oregon. Under the Oregon CREP, TWO increases the benefits and assistance available to producers within specific portions of the Tualatin River Watershed. This includes perennial streams identified on U.S. Geological Survey (USGS) quadrangle maps and upstream from the Durham wastewater treatment facility. The only eligible CP for this option would be CP22 (Riparian Buffer); however, other CPs would still be applicable under the proposed CREP within the Tualatin River Watershed.

Tualatin Watershed Option would provide funds to cover the implementation and maintenance of CPs that exceed amounts reimbursed by CCC and the State of Oregon, provided that producers have elected to have CWS or its contractor assume responsibility for the implementation and maintenance of CPs.

Incentive payments would be provided to producers in the amount of \$127.50 per acre per year for irrigated cropland, and between \$52.25 and \$131 per acre per year for non-irrigated cropland, depending on soil type. For irrigated marginal pastureland, incentive payments would be \$127.50 per acre per year. Incentive payments for non-irrigated marginal pastureland would be \$66 per acre per year. These payments would be in addition to the soil rental payments made by CCC under CREP.

Direct cumulative impact incentive payments would be provided to producers in any case where a total of at least 50 percent of the stream bank within a stream segment that is at least 2 miles long but less than 5

miles long is enrolled in TWO. Payment would be equal to the cumulative impact incentive payment that would be paid under CREP (if the requirements for payment under that program were met).

A lump sum bonus payment would be provided when water rights leased to the State of Oregon for instream use under TWO have a priority date preceding the priority dates of water rights that are usually suspended each summer. The bonus payment would be \$20 per acre per year of enrollment, and would increase by a factor of 1.5 when the land enrolled in TWO and to which the water rights are appurtenant exceeds 5 acres. Priority dates that qualify for payment would vary by stream and would be established by CWS.

A lump sum bonus payment would also be provided to producers when water rights that would otherwise be leased to the State of Oregon are transferred permanently to the State for instream use. The bonus payment would equal the amount that would be paid for a 15-year lease, including the 5-acre bonus if applicable, multiplied by a factor of 1.5. The bonus payment would be in addition to any payments to producers made by the State for permanent transfers. CWS would pay all transaction costs for water-right leases and permanent transfers not paid by the State.

Tualatin Watershed Option would provide for the purchase of permanent, 30-year, or 20-year conservation easements on enrolled land. The amount paid for permanent conservation easements would be 30 percent of the net present value of the total TWO annual program payments, provided the land is enrolled in TWO for 15 years. Annual program payments would consist of the sum of the annual soil rental, practice incentive, and maintenance payments. The discount rate used to calculate net present value would be 4 percent. Easement purchases would be made on a lump sum basis, and payment for easements would be in addition to all other TWO payments, including annual payments. The amount paid for 30-year easements would be 75 percent of the amount paid for permanent easements, and the amount paid for 20-year easements would be 50 percent of the amount paid for permanent easements.

3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing conditions for the resources potentially affected by the proposed action. In compliance with guidelines contained in NEPA and CEQ regulations, the description of the affected environment focuses on those aspects potentially subject to impacts.

3.1 BIOLOGICAL RESOURCES

3.1.1 Definition of Resource

Biological resources are plant and animal species and the habitats in which they occur. This analysis divides these resources into vegetation; terrestrial wildlife; aquatic wildlife; and threatened, endangered, and sensitive species and their defined critical habitat.

3.1.2 Region of Influence

The region of influence (ROI) for biological resources includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in CREP and listed in Section 1.2.1.

3.1.3 Affected Environment

3.1.3.1 Vegetation

Ecoregions, by definition, are areas of relatively uniform ecological systems that have similar vegetation, climate, and geology. Oregon is divided into nine Level III Ecoregions (Figure 2) (Thorson et al. 2003). From west to east, there are the Coast Range, the Willamette Valley, the Klamath Mountains, the Cascades, and the Eastern Cascades Slopes and Foothills. Along the eastern border from north to south, there are the Columbia Plateau, the Blue Mountains, the Snake River Plain, and the Northern Basin and Range. These Level III Ecoregions are further subdivided into 65 Level IV Ecoregions or, for the purpose of discussion in this analysis, *subregions* (Table 1) (Bryce et al. 2003, McGrath et al. 2002, Pater et al. 1998). The predominant subregions and potential natural vegetation of the Level III Ecoregions within the ROI are described in the following subsections.

Coast Range

The Coast Range Ecoregion is located within the North Coast, South Coast, Willamette, Umpqua, and Rogue river basins (i.e., subdivisions of basins) (Figure 2) (Oregon Watershed Enhancement Board [OWEB] 2007). All of these river basins lie within the Coastal Basin except the Willamette, which lies in the Columbia Basin (Figure 3). Although the Coast Range is divided into seven subregions, it is dominated by the Mid-Coastal Sedimentary subregion, which covers approximately 3,739 square miles. This subregion is composed of predominantly Douglas fir plantations with hemlock mixed throughout (Thorson et al. 2003). Understory vegetation consists of salal, sword fern, vine maple, Oregon grape, and rhododendron (Thorson et al. 2003). Bigleaf maple, grand fir, western red cedar, and red alder dominate the canopy in riparian areas and on wet slopes, with salmonberry and oxalis in the understory (Thorson et al. 2003).

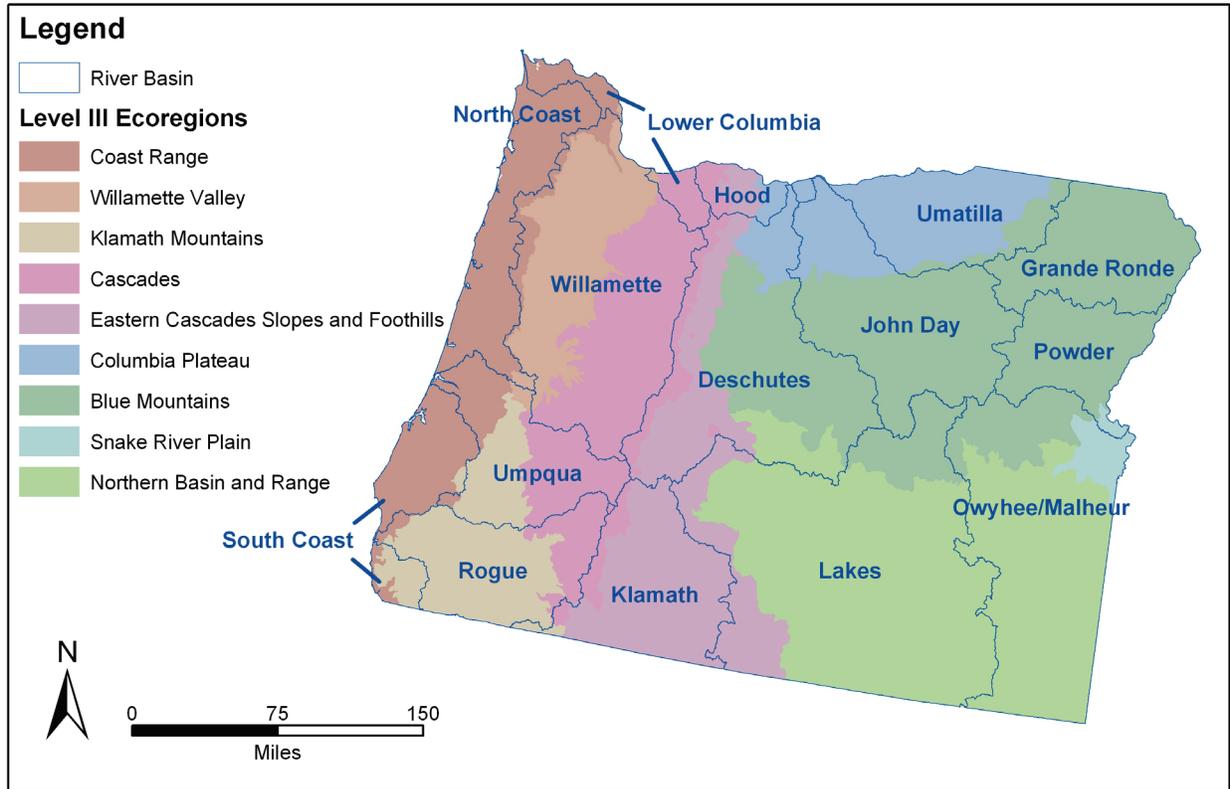


Figure 2. Level III Ecoregions in the ROI

Willamette Valley

The Willamette Valley Ecoregion lies within the Willamette, Lower Columbia, North Coast, and Umpqua river basins, which are located within the Coastal and Columbia basins (Figures 2 and 3) (OWEB 2007). There are four subregions within the Willamette Valley, the predominant one being the Valley Foothills, which covers 2,415 square miles. The Valley Foothills are a series of rolling foothills with vegetation consisting of oak savanna and prairies containing fescue, blue wildrye, brodiaea, and oatgrass cover (Thorson et al. 2003). Some Douglas fir forests are present, with understory containing oceanspray, hazel, poison oak, baldhip, alien Himalayan, and sword fern (Thorson et al. 2003). The Prairie Terraces subregion composes the majority of the remaining area within the Willamette Valley and consists of flat to slightly rolling fluvial terraces vegetated by Oregon white oak with a camas, sedge, fescue, and tufted hairgrass cover. Douglas fir groves can be found occasionally, and ash, oak, maple, and fir are dominant along riparian zones with poison oak, hazel, and Indian plum in the understory (Thorson et al. 2003).

Klamath Mountains

The Klamath Mountain Ecoregion is within the Umpqua, Rogue, Klamath, and South Coast river basins, all of which are located within the Coastal Basin (Figures 2 and 3) (OWEB 2007). This ecoregion contains seven subregions, the dominant being the Inland Siskiyou, which covers 2,610 square miles. The Inland Siskiyou subregion consists of highly dissected mountains that are vegetated by Douglas fir, ponderosa pine, Oregon white oak, California black oak, madrone, serviceberry, snowberry, Oregon grape, California fescue, and poison oak (Thorson et al. 2003). The Umpqua Interior Foothills, the second largest subregion, contains Oregon white oak, Douglas fir, ponderosa pine, and madrone, but also grand fir, tan oak, and chinquapin. The understory consists of snowberry, salal, Oregon grape, poison oak, oceanspray, and swordfern (Thorson et al. 2003).

Table 1. The Level III and Level IV Ecoregions of the ROI

Level III Ecoregions	Level IV Ecoregions (square miles in parentheses)
Blue Mountains	John Day/Clarno Uplands (5,022), John Day/Clarno Highlands (2,475), Maritime-Influenced Zone (1,391), Melange (1,228), Wallowas/Seven Devils Mountains (526), Canyons and Dissected Highlands (1,093), Canyons and Dissected Uplands (1,091), Continental Zone Highlands (1,555), Continental Zone Foothills (3,715), Blue Mountain Basins (1,084), Mesic Forest Zone (2,226), Subalpine-Alpine Zone (540), Deschutes River Valley (1,576), Cold Basin (400)
Cascades	Western Cascades Lowland and Valleys (3,905), Western Cascades Montane Highlands (2,729), Cascade Crest Montane Forest (1,909), Cascade Subalpine/Alpine (331), High Southern Cascade Montane Forest (915), Southern Cascades (1,414)
Coast Range	Coastal Lowlands (633), Coastal Uplands (1,177), Volcanics (2,043), Willapa Hills (751), Mid-Coastal Sedimentary (3,739), Southern Oregon Coastal Mountains (692), Redwood Zone (31)
Columbia Plateau	Umatilla Plateau (3,712), Pleistocene Lake Basins (1,407), Yakima Folds (109), Deep Loess Foothills (146), Deschutes/John Day Canyons (674), Umatilla Dissected Uplands (743)
Eastern Cascades Slopes and Foothills	Grand Fir Mixed Forest (162), Oak/Conifer Foothills (461), Ponderosa Pine/Bitterbrush Woodlands (1,077), Pumice Plateau (4,236), Pumice Plateau Basin (640), Klamath/Goose Lake Basins (1,039), Fremont Pine/Fir Forest (1,672), Southern Cascades Slope (515), Klamath Juniper Woodland (784)
Klamath Mountains	Rogue/Illinois Valleys (285), Oak Savanna Foothills (818), Umpqua Interior Foothills (921), Serpentine Siskiyou (440), Inland Siskiyou (2,610), Coastal Siskiyou (853), Klamath River Ridges (121)
Northern Basin and Range	Dissected High Lava Plateau (3,984), Pluvial Lake Basins (2,092), High Desert Wetlands (1,651), Owyhee Uplands and Canyons (2,991), High Lava Plains (10,262), Semiarid Uplands (1,041), Partly Forested Mountains (103), Salt Shrub Valleys (725), Barren Playas (179)
Snake River Plain	Treasure Valley (499), Unwooded Alkaline Foothills (489)
Willamette Valley	Portland/Vancouver Basin (269), Willamette River and Tributaries Gallery Forest (674), Prairie Terraces (1,971), Valley Foothills (3,415)
<i>Source: Thorson et al. 2003</i>	

Cascades

The Cascades Ecoregion is within the Lower Columbia, Hood, Willamette, and Deschutes river basins of the Columbia Basin; the Umpqua and Rogue river basins of the Coastal Basins; and the Klamath River Basin of the Interior Drainages (Figures 2 and 3) (OWEB 2007). Of the six subregions in the Cascades Ecoregion, the dominant is the Western Cascades Lowland and Valleys. This subregion is vegetated by Douglas fir, western hemlock, western redcedar, bigleaf maple, red alder, vine maple, salal, rhododendron, Oregon grape, huckleberry, thimbleberry, swordfern, oxalis, hazel, and blackberry, and covers approximately 3,905 square miles (Thorson et al. 2003). The second major subregion is the Western Cascades Montane Highlands, which consists of Pacific silver fir, western hemlock, mountain hemlock, Douglas fir, noble fir, bigleaf maple, red alder, and pacific yew. The understory is vine maple, rhododendron, Oregon grape, huckleberry, and thimbleberry (Thorson et al. 2003). The Western Cascades Montane Highlands covers approximately 2,729 square miles.

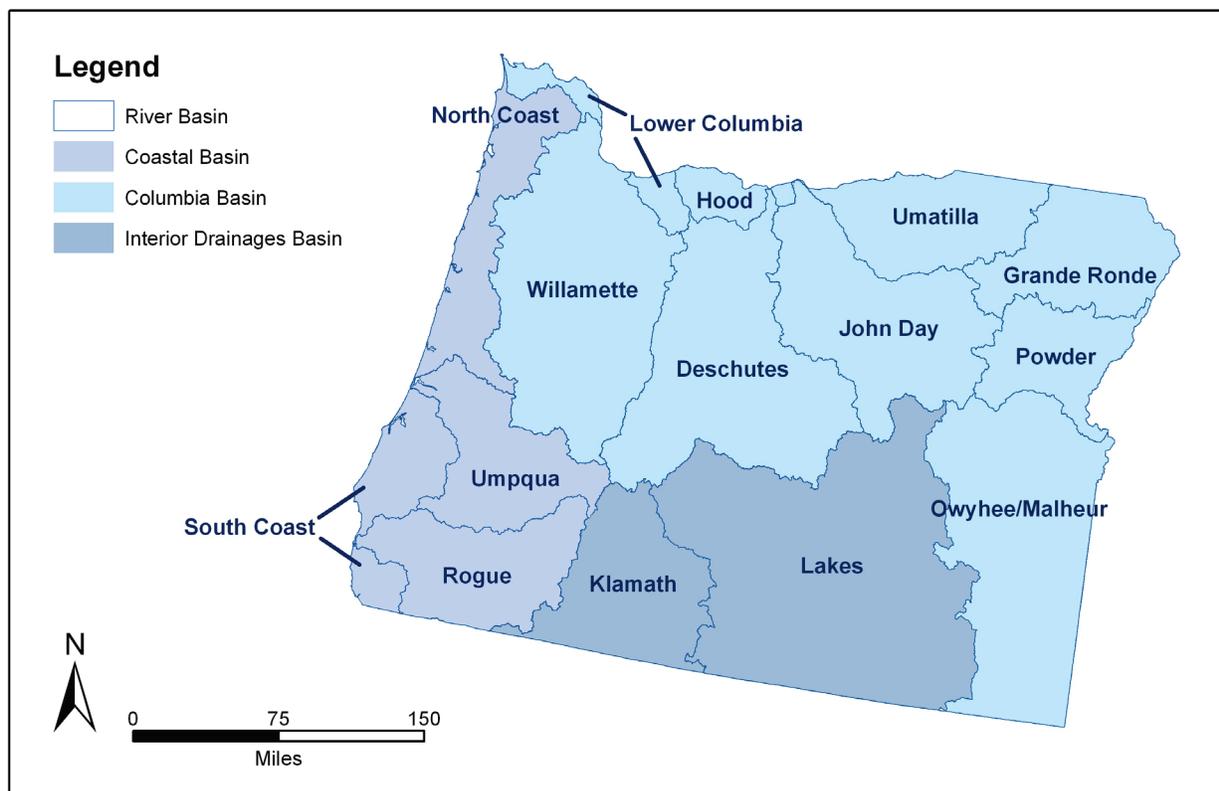


Figure 3. Basins and river basins in the ROI

Eastern Cascades Slopes and Foothills

The Eastern Cascades Slopes and Foothills Ecoregion lies within the Hood, Deschutes, Klamath, and Lakes river basins (Figure 2). These river basins are located within the Columbia Basin and Interior Drainage Basin (Figure 3) (OWEB 2007). The Eastern Cascades Slopes and Foothills Ecoregion are divided into nine subregions. The dominant subregion, the Pumice Plateau, covers 4,236 square miles and is vegetated by lodgepole pine in flat areas or depressions, ponderosa pine on slopes, and white pine at higher elevations. Riparian areas support stream dogwood, mountain alder, willows, and quaking aspen. Understory vegetation is relatively low-growing shrubs, such as antelope bitterbrush, and Idaho fescue (Thorson et al. 2003). After the Pumice Plateau, the Freemont Pine/Fir Forests is the next most dominant subregion. The Freemont Pine/Fir Forests covers 1,672 square miles and contains mostly ponderosa pine and western juniper in lower elevations, and white fir, whitebark pine, and lodgepole pine in higher elevations. Understory vegetation is mainly snowberry, heartleaf arnica, antelope bitterbrush, longstolon sedge, and Wheeler bluegrass (Thorson et al. 2003).

Columbia Plateau

The Columbia Plateau Ecoregion is within the Hood, Deschutes, Umatilla, and John Day river basins, all of which are located within the Columbia Basin (Figures 2 and 3) (OWEB 2007). The Umatilla Plateau is the most dominant of the six subregions within the Columbia Plateau Ecoregion. This subregion consists of 3,712 square miles that are nearly flat to gently rolling. It is vegetated by grasslands including bluebunch wheatgrass, Sandberg bluegrass, and Idaho fescue. Sagebrush can be found sparingly throughout. Cheatgrass, a non-native and highly invasive species, can be found in broad areas (Thorson et al. 2003). The second most dominant subregion is the Pleistocene Lake Basin, which covers 1,407 square miles. The Pleistocene Lake Basin is characterized by bluebunch wheatgrass, needle-and-thread, Indian

ricegrass, Sandberg grass, and basin big sagebrush. Cheatgrass can be found in broad patches in this subregion as well (Thorson et al. 2003).

Blue Mountains

The Blue Mountains Ecoregion is located in the Umatilla, Grand Ronde, Deschutes, John Day, Powder, Lakes, and Owyhee/Malheur river basins (Figure 2). These river basins are within the Columbia Basin and Interior Drainage Basin (Figure 3) (OWEB 2007). The Blue Mountains Ecoregion is very diverse and can be divided into 14 subregions. The John Day/Clarno Uplands subregion is mostly grasslands and covers 5,022 square miles. Vegetation in this subregion includes bluebunch wheatgrass, basin wildrye, Idaho fescue, Wyoming big sagebrush, and Thurber needlegrass. Riparian areas consist of mockorange, chokecherry, clematis, white alder, willows, cottonwood, and water birch. Western juniper and ponderosa pine can be found in transitional areas (Thorson et al. 2003). The Continental Zone Foothills subregion covers 3,715 square miles and is vegetated by bluebunch wheatgrass, mountain big sagebrush, Wyoming big sagebrush, Idaho fescue, Sandberg bluegrass, and Nevada greasebush (Thorson et al. 2003).

Snake River Plain

The Snake River Plain Ecoregion is within the Powder and Owyhee/Malheur river basins in the Columbia Basin (Figures 2 and 3) (OWEB 2007). The Snake River Plain Ecoregion is quite smaller than the other ecoregions in Oregon, and contains only two subregions. The Treasure Valley and Unwooded Alkaline Foothills subregions contain approximately the same acreage. The Treasure Valley subregion covers 499 square miles and consists of Wyoming big sagebrush, basin big sagebrush, bluegrass, bluebunch wheatgrass, cheatgrass, basin wildrye, Thurber needlegrass, and rabbitbrush. Shadscale, greasewood, and inland saltgrass can also be found in saline areas (Thorson et al. 2003). The Unwooded Alkaline Foothills subregion covers 489 square miles and contains Wyoming big sagebrush, bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, Indian ricegrass, and cheatgrass. Black greasewood, shadscale, fourwing saltbush, and inland saltgrass can be found in saline-alkaline areas (Thorson et al. 2003).

Northern Basin and Range

The Northern Basin and Range Ecoregion lies within the Deschutes, Lakes, and Owyhee/Malheur river basins (Figure 2). These river basins are located within the Columbia Basin and the Interior Drainage Basin (Figure 3) (OWEB 2007). The Northern Basin and Range Ecoregion can be divided into nine subregions. The most predominant is the High Lava Plains subregion, which covers 10,262 square miles. This subregion consists of Wyoming big sagebrush, mountain big sagebrush, bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, bottlebrush squirreltail, and Idaho fescue. Silver sagebrush, creeping wildrye, and mat muhley can be found in depression areas, and western juniper is scattered throughout shallow and rocky soils (Thorson et al. 2003). The second most predominant subregion is the Dissected High Lava Plateau. It covers 3,984 square miles and consists of Wyoming big sagebrush, low sagebrush, Douglas rabbitbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Sandberg bluegrass, Thurber needlegrass, Indian ricegrass, and cheatgrass, with scattered western juniper in rocky areas (Thorson et al. 2003).

3.1.3.2 Terrestrial Wildlife

The Oregon Department of Fish and Wildlife (ODFW) oversees the wildlife in the State of Oregon, which includes approximately 451 native species of birds, 146 native mammals, 68 native freshwater fishes, 29 native amphibians, and 33 native reptiles (ODFW 1996).

ODFW big game hunting regulations include the take of mule deer, black-tailed deer, white-tailed deer, Rocky Mountain elk, cougar, bighorn sheep, black bear, pronghorn antelope, and Rocky Mountain goat (Table 2). The western gray squirrel is also included within the big game regulations. Of all big game hunting, mule and black-tailed deer species are the most popular among hunters (ODFW 2009b). Bear,

cougar, pronghorn, sheep, and goat populations are estimated by the ODFW (2008a) as stable or increasing in numbers.

Table 2. Terrestrial game species in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Black bear	<i>Ursus americanus</i>	Striped skunk	<i>Mephitis mephitis</i>
Black-tailed deer	<i>Odocoileus hemionus hemionus</i>	Weasles	<i>Mustela sp.</i>
Bighorn sheep	<i>Ovis canadensis</i>	Blue grouse	<i>Dendragapus obscurus</i>
Cougar	<i>Puma concolor cougar</i>	Ruffed grouse	<i>Bonasa umbellus</i>
Elk	<i>Cervus elaphus</i>	Sage grouse	<i>Centrocercus urophasianus</i>
Pronghorn	<i>Antilocapra americana</i>	Ring-neck pheasant	<i>Phasianus colchicus</i>
Mountain goat	<i>Oreamnos americanus</i>	Chukars	<i>Alectoris chukar</i>
Mule deer	<i>Odocoileus hemionus</i>	Hungarian partridge	<i>Perdix perdix</i>
White-tailed deer	<i>Odocoileus virginianus</i>	California quail	<i>Callipepla californica</i>
Beaver	<i>Castor canadensis</i>	Mountain quail	<i>Oreortyx pictus</i>
Bobcat	<i>Felis rufus</i>	Wild turkey	<i>Meleagris gallopavo</i>
Gray fox	<i>Urocyon cinereoargenteus</i>	Mourning dove	<i>Zenaida macroura</i>
Red fox	<i>Vulpes vulpes</i>	Coot	<i>Fulica americana</i>
Marten	<i>Martes americana</i>	Snipe	<i>Gallinago gallinago</i>
Muskrat	<i>Ondatra zibethicus</i>	Crow	<i>Corvus brachyrhynchos</i>
Mink	<i>Mustela vison</i>	Band-tailed pigeon	<i>Columba fasciata</i>
Raccoon	<i>Procyon lotor</i>	Mallard	<i>Anas platyrhynchos</i>
River otter	<i>Lontra canadensis</i>	Pintail	<i>Anas acuta</i>
Badger	<i>Taxidea taxus</i>	Canvasback	<i>Aythya valisineria</i>
Coyote	<i>Canis latrans</i>	Redhead	<i>Aythya americana</i>
Nutria	<i>Myocastor coypus</i>	Scaup	<i>Aythya marila / Aythya affinis</i>
Opossum	<i>Didelphis virginiana</i>	Canada goose	<i>Branta canadensis</i>
Porcupine	<i>Erethizon dorsatum</i>	Merganser	<i>Anatidae</i> (family)
Spotted skunk	<i>Spirogale putorius</i>		

Source: ODFW 2009b

Black-tailed deer herd composition in Oregon averages 16–27 bucks per 100 does and 41–52 fawns per 100 does (ODFW 2008a). Factors affecting herd size and composition include high mortality rates due to deer hair-loss syndrome, which has been plaguing the state for 4 years; habitat changes; poor fawn

recruitment; and disease. Populations in Douglas County, where mild winter conditions allow for higher survival, are doing better than populations throughout the rest of the State (ODFW 2004a). A 2001 survey recorded the highest number of mule deer in Wallowa game units (roughly Baker, Union, and Wallowa counties) (ODFW 2008a). In 2004, population size levels in these units were expected to be below average to average due to low fawn survival (ODFW 2004a). Management objectives in these units are 15 bucks per 100 does, but are currently estimated at 6–14 bucks per 100 does. Dry conditions in these high desert areas cause high, winter mortality rates due to lack of suitable vegetation. The 2001 estimate for the Oregon mule deer population was 283,000 individuals (ODFW 2003).

The 2004 elk population was estimated to be higher than average in all portions of the State except the northeastern areas where calf recruitment has been problem, causing the population to decline slightly (ODFW 2004a). Low calf recruitment rates could be the result of poor foraging habitat combined with severe weather conditions. The herd composition in 2001 averaged 13 bulls per 100 cows and 46 fawns per 100 cows for Roosevelt elk. Rocky Mountain elk herd composition averaged 12 bulls per 100 cows and 29 calves per 100 cows (ODFW 2008a). Low bull numbers could cause delays in cow conception leading calves to be born late. This late birthing period could cause growth stunting, resulting in a decline in calf survival.

Furbearer harvest in Oregon includes seasons for beaver, bobcat, gray fox, red fox, marten, muskrat, mink, raccoon, river otter, badger, coyote, nutria, opossum, porcupine, spotted skunk, striped skunk, and weasels (ODFW 2009b).

The ODFW sets regulations for migratory bird hunting, which encompasses the take of mourning doves, band-tailed pigeons, ducks and mergansers, pintail and canvasbacks, coots, black brants, Canada goose, and snipe (ODFW 2009b). Upland game includes blue, ruffed, and sage grouse; pheasants; fall and spring turkey; chukar; Hungarian partridge; California and mountain quail; and crows (ODFW 2009b).

Non-game species (i.e., species that are not hunted, fished, or trapped) make up 88 percent of all Oregon fish and wildlife species. The non-game category often includes species such as bats, turtles, woodpeckers, hawks, frogs, and songbirds. There are roughly 600 non-game species in Oregon. Excluding those listed on the U.S. Fish and Wildlife Service (FWS) threatened and endangered species list, 121 Oregon non-game species are considered sensitive species and there is concern for their long-term well being (ODFW 2008b).

3.1.3.3 Aquatic Wildlife

Fishing, both commercial and sport, is widespread in Oregon. Game fish include species such as salmon, shad, steelhead, sturgeon, trout, bass, bluegill, catfish, crappie, sunfish, perch, walleye, and mullet (Table 3). Freshwater non-game and shellfish include bullfrogs, crayfish, freshwater clams, pacific lamprey, smelt, suckers, northern pikeminnows, carp, chub, and sculpin. Marine non-game fish include herring, anchovy, sardines, smelt, lingcod, rockfish, cabezon, greenling, flounder, and perch (ODFW 2009c).

Mercury, polychlorinated biphenyls (PCBs), dioxins, and pesticides affect water quality in Oregon, causing some aquatic species to not be fit for consumption. The 2004 fishing regulations for Oregon indicate 14 bodies of water within the State that contain high levels of these pollutants and advise anglers as to how much, if any, fish from these waters they can safely consume (ODFW 2009c).

Invasive fish species are causing population decline to some native fish species. Included on the list of Oregon's 100 most invasive species are Asian carp, Atlantic salmon, black carp, round goby, ruffe, Shimofuri goby, and snakeheads (Oregon Department of Agriculture [ODA] 2009).

Table 3. Aquatic game species in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Brook trout	<i>Salvelinus fontinalis</i>	White crappie	<i>Pomoxis annularis</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>	Green sunfish	<i>Lepomis cyanellus</i>
Lake trout	<i>Salvelinus namaycush</i>	Pumpkinseed sunfish	<i>Lepomis gibbosus</i>
Brown trout	<i>Salmo trutta</i>	Redear sunfish	<i>Lepomis microlophus</i>
Cutthroat trout	<i>Salmo clarki</i>	Bullhead catfish	<i>Ictalur Ictalurus nebulous us</i> <i>Ictalurus nebulous nebulous</i>
Atlantic salmon	<i>Salmo salar</i>	Channel catfish	<i>Ictalurus punctatus</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	White catfish	<i>Ameiurus catus</i>
Kokanee salmon	<i>Oncorhynchus nerka</i>	Walleye	<i>Stizostedion vitreum</i>
Coho salmon	<i>Oncorhynchus kisutch</i>	Yellow perch	<i>Perca flavescens</i>
Chum salmon	<i>Oncorhynchus keta</i>	Sacramento perch	<i>Archoplites interruptus</i>
Steelhead	<i>Oncorhynchus mykiss</i>	Whitefish	<i>Coregonus clupeaformis</i>
Largemouth bass	<i>Micropterus salmoides</i>	Sturgeon	<i>Acipenser sp</i>
Smallmouth bass	<i>Micropterus dolomieu</i>	Shad	<i>Alosa sapidissima</i>
Striped bass	<i>Morone saxatilis</i>	Mullet	<i>Mugilidae</i> (family)
Bluegill	<i>Lepomis macrochirus</i>	Grayling	<i>Thymallus arcticus</i>
Black crappie	<i>Pomoxis nigromaculatus</i>		

Source: ODFW 2009c

Oregon supplements its game fish population with hatchery-raised fish. Within the northeast region of the State, there are four hatcheries that raise steelhead and spring/summer/fall Chinook salmon. The high desert region of Oregon contains five hatcheries that raise rainbow, brook, cutthroat, and brown trout, as well as kokanee and Atlantic salmon. There are five hatcheries in the southwest region that raise salmon, spring/summer/winter steelhead, Coho salmon, rainbow trout, and Chinook salmon. The northwest region contains the most hatcheries, with 19 that raise steelhead, Coho salmon, Chinook salmon, rainbow trout, Tule fall Chinook salmon, and Rogue River fall Chinook salmon (ODFW 2009a).

Aquatic resources are divided among 15 major river basins within the State of Oregon: North Coast, South Coast, Lower Columbia, Rogue, Umpqua, Hood, Willamette, Deschutes, Klamath, John Day, Umatilla, Grande Ronde, Powder, Lakes, and Owyhee/Malheur (OWEB 2007). These river basins are grouped into the three larger geographic basins called the Coastal Basin, Columbia Basin, and Interior Drainages Basin.

Coastal Basin

The North Coast River Basin contains eight tributaries that flow directly into the Pacific Ocean. Approximately half of the river basin is privately owned; however, portions are also owned by the Bureau of Land Management (BLM), U.S. Forest Service (USFS), tribes, and State and local governments. The majority of the area is forested, with some urban and agricultural usage. Major habitat issues in the North Coast River Basin include invasive species, destructive habitat modifications (dams/culverts), high water

temperatures, and elevated levels of fine substrate that make areas unsuitable for fish spawning. Streams within the river basin currently support Coho salmon, a federally-listed threatened species, as well as cutthroat trout, Chinook salmon, chum salmon, and steelhead (OWEB 2007).

The South Coast River Basin is located in the southwestern-most portion of the State. Approximately 79.8 percent of this river basin is forest land, 60.8 percent of which is privately owned. USFS manages 21.8 percent of the river basin and other public land managers include BLM and State and local governments. Primary usage of the land is forestry, grazing, and agriculture. Streams within the river basin currently support Coho salmon and fall Chinook salmon. Habitat concerns include high water temperatures, bacteria in streams, low dissolved oxygen, and invasive exotic riparian species (OWEB 2007).

The Umpqua River Basin is primarily forested and harvested for the timber industry. Agricultural usage comprises approximately 14 percent of the river basin. Over 45 percent of river basin ownership is private, with adjacent lands managed by USFS and BLM. A small portion of the river basin is managed by State and local governments and the National Park Service (NPS). There are 32 primary rivers and streams within the river basin. Streams currently support Coho salmon, spring Chinook, and summer steelhead. Major water issues include high bacteria cultures, unbalanced pH (hydrogen ion concentration) levels, high water temperatures, and adverse habitat and flow modifications (OWEB 2007).

The Rogue River Basin, located in the extreme southwest portion of the State, is primarily privately-owned forest lands, with almost equal portions managed by BLM and USFS. Smaller portions are managed by NPS and State and local governments. The main land uses are mining and forestry. Chinook salmon and steelhead fishing are extremely popular in the Rogue River Basin. Coho salmon occur in this river basin as well. Issues of concern include high water temperatures, adverse habitat and flow modifications, bacteria presence, unbalanced pH levels, and high levels of fine sedimentation. Urban development has had a severe impact on juvenile salmonid populations within the Rogue River Basin (OWEB 2007).

Columbia Basin

The Lower Columbia River Basin is located at the northwest portion of Oregon, inland from the Pacific Coast. The Columbia River is the most hydroelectrically developed river in the world, causing natural fish migration to be impossible. The majority of the Columbia River floodplain is diked to accommodate human developments. Species diversity in these diked areas is very low as opposed to undiked areas. Listed species that occur within the river basin include Columbia River winter steelhead, summer steelhead, spring Chinook, fall Chinook, and chum salmon. The vast majority of the landscape is privately owned forest lands, with some agricultural and urban uses. Concerns about the river basin include high water temperatures, low dissolved oxygen content, bacteria, and fish passage barriers (particularly at hatchery locations) (OWEB 2007).

The Hood River Basin is located in north-central Oregon, just east of the Lower Columbia River Basin. Approximately 25 percent of the land is used for agriculture and 55 percent is devoted to forestry practices. Agriculture is mainly in the form of orchard crops and wheat. High levels of fine sedimentation from streambank erosion are of major concern in the river basin. Flow and habitat modifications are having an adverse impact on salmonid species. In addition, water temperatures are higher than average throughout most of the streams, resulting in low dissolved oxygen content. Streams within the river basin currently support winter steelhead, summer steelhead, spring Chinook, fall Chinook, and bull trout, all of which are federally-listed species. Dams and culverts deflect natural fish migration throughout this river basin (OWEB 2007).

The Willamette River Basin is located east of the North Coast River Basin and continues through north and central Oregon. Most land within this river basin is privately-owned forest land, with agricultural usage comprising 27 percent of the remaining land. The Willamette River Basin is the most populated by urban development and contains over 10,000 cities. Streams currently support bull trout, spring Chinook, winter steelhead, rainbow trout, and cutthroat trout. Concerns in this river basin include urban development, agricultural runoff, habitat and stream flow modification, high bacteria levels and toxins, high water temperatures, loss of wetlands, and invasive fish species (OWEB 2007).

The waterways in the Deschutes River Basin, located in the high desert region of central Oregon, lack suitable salmonid habitat. Streams have high rates of bank erosion and often contain fine sediment making them unfit for spawning, and there are few large pools for juvenile rearing. Furthermore, there are frequent dams and culverts that divert fish migration, as well as overall poor water quality. Natural stream succession within the Deschutes River Basin has been interrupted by urban development and agricultural processes, leading to the decline in suitable fish habitat (Washington State Conservation Commission 2009)

The John Day River Basin is located in north-central Oregon. It is bordered by the Umatilla River Basin to the north, the Deschutes to the south and west, and the Powder to the east. The John Day River Basin is almost 60 percent privately-owned, with the remaining land managed by USFS, BLM, NPS, tribes, and State and local governments. The river basin currently supports summer steelhead and bull trout, both federally-listed species. Concerns include high water temperatures, stream alterations due to mining, accumulated fine sedimentation, low dissolved oxygen content, and bacteria presence (OWEB 2007). Grazing allotments adjacent to the John Day River have created concern over severe bank erosion and increased water temperatures.

The Umatilla River Basin, located in northern Oregon, is bordered by the Grande Ronde River Basin to the east, the Columbia River to the north and west, and the John Day River Basin to the south. The Umatilla River Basin is approximately 86 percent privately owned. Management of the remaining land is divided among tribes, USFS, ODFW, BLM, and other Federal agencies. Much of the land, almost 42 percent, is dedicated to agricultural uses in the form of ranching, wheat crops, and orchards. Major concerns in this river basin include high water temperatures, adverse habitat and flow modifications, nuisance aquatic weeds and vegetation, high levels of fine sedimentation, toxins within waterways, bacteria presence, and unbalanced pH levels. Summer steelhead and bull trout occupy streams within the river basin (OWEB 2007).

The Grande Ronde River Basin is located in the extreme northeast portion of Oregon. It is bordered by Washington and Oregon to the north and east, the Powder River Basin to the south, and the Umatilla River Basin to the west. The river basin supports the local economy through agriculture, ranching, and timber harvesting. The river basin is approximately 46 percent privately owned, with the remaining land managed by tribes, USFS, BLM, and other Federal agencies. Forest lands comprise the majority of the river basin at 60.2 percent, and agricultural land occupies 10 percent of the river basin. Major water quality issues within the river basin include bacteria presence in waterways, high water temperatures, very high levels of fine sedimentation in streambeds, low nutrients content, nuisance aquatic vegetation, and low dissolved oxygen content. Fish passage from the Grande Ronde River Basin is limited by eight major dams on the Columbia River, making it impossible for most anadromous fish to make it to the Pacific Ocean (OWEB 2007).

The Powder River Basin is located at the northeast portion of Oregon and is bordered by the Snake River to the east, the Grande Ronde River Basin to the north, the John Day River Basin to the west, and the Owyhee/Malheur River Basin to the south. Approximately half of the land within the river basin is privately owned. The remaining land is managed by BLM (17.9 percent), USFS (31.4 percent), and, to a

smaller extent, other Federal agencies and State government. Anadromous fish do not occur in the Powder River Basin, which limits funds for restoration projects. However, federally-listed bull trout do occur in the river basin. Issues of concern include high bacteria content, high levels of fine sedimentation in streambeds, low dissolved oxygen content, nuisance aquatic weeds and vegetation, adverse habitat and flow modifications, and extremely high water temperatures. The Powder River Basin was previously used by the mining industry, and the ill effects of historic mining practices still influence water quality within this river basin today (OWEB 2007).

The Owyhee/Malheur River Basin is located at the extreme southeastern portion of Oregon. It is bordered by Idaho on the east, the Lakes River Basin on the west, the Powder River Basin to the north, and the Nevada border to the south. The river basin is largely shrub/grasslands (86.9 percent), with some forest and agricultural lands mixed within. BLM manages the majority of the land, with private lands comprising the majority of the remaining land. Major industry in the river basin includes onion farming and cattle ranching. Water quality concerns include high bacteria rates, high levels of toxins, nuisance aquatic vegetation, and high water temperatures. The only currently-listed species within the river basin is the bull trout (OWEB 2007).

Interior Drainages Basin

The Lakes River Basin, located in the south-central portion of the State, is bordered by the California/Nevada border to the south, the Klamath River Basin to the west, the Owyhee/Malheur River Basin to the east, and the Deschutes River Basin to the north. The majority of the Lakes River Basin is managed by BLM and private landowners. Smaller portions of the land are managed by USFS, FWS, tribes, and State and local governments. Approximately 74 percent of the landscape is shrub/grasslands, with some forest and agricultural lands mixed within. This river basin contains many federally-listed fish species including the Warner sucker, Lahontan cutthroat, Borax Lake chub, Hutton tui chub, and Fosskett speckled dace. Water quality is good within the river basin, with concerns mainly about high water temperatures and wetland restoration in such arid conditions (OWEB 2007).

The Klamath River Basin is located in south-central Oregon in the southern high desert region. It is bordered by the Rogue River Basin to the west and the Lakes River Basin to the east. The Klamath River Basin is almost equally divided by private land owners and USFS. Small portions are also managed by BLM, FWS, NPS, and State government. The majority of the land is forested, with grasslands and agricultural lands comprising the remaining areas. Water allocation causes controversy within the river basin, resulting in most landowners not wanting to participate in restoration. This lack of owner participation is one key issue involving the river basin. Other issues include loss of wetlands, high water temperatures, bacteria presence in water, low dissolved oxygen content, and nuisance aquatic weeds and algae growth. Streams within this river basin currently support bull trout, lost river suckers, and shortnose suckers, all of which are listed as threatened or endangered (OWEB 2007).

3.1.3.4 Threatened, Endangered, and Sensitive Species and Their Defined Critical Habitat

The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share responsibility for implementing the Endangered Species Act (ESA). Generally, USFWS manages land and freshwater species, while NMFS manages marine and "anadromous" (species that live their adult lives in the ocean but move into freshwater streams to reproduce or spawn [e.g., salmon] species). The ESA requires USFWS and NMFS to designate critical habitat and to develop and implement recovery plans for threatened and endangered species (NOAA 2009). In the State of Oregon there are 20 federally-listed threatened or endangered fish and wildlife species and subspecies under the jurisdiction of the Fish and Wildlife Service and 10 federally-listed threatened or endangered fish and wildlife species and subspecies under the jurisdiction of the NMFS. This includes five endangered and nine threatened fish, two endangered and three threatened

birds, three endangered and two threatened mammals, one endangered and two threatened reptiles, and one endangered and two threatened invertebrates (FWS 2009) (Table 4).

The State recognizes eight candidate wildlife species for listing: two birds, two amphibians, two mammals, and two insects (FWS 2009). Oregon also contains 118 species listed as a concern to the FWS, and 46 species that the ODFW consider to be close to critical condition if immediate actions are not taken (Oregon Natural Heritage Information Center [ONHIC] 2007).

Table 4. Threatened, endangered, and candidate wildlife species in the ROI

Species	State Status ¹	Federal Status ¹	Species	State Status ¹	Federal Status ¹
Albatross, short-tailed (<i>Phoebastria albatrus</i>)	E	E	Butterfly, Fender's blue (<i>Icaricia icariodes fenderi</i>)	NL	E
Butterfly, Oregon silverspot (<i>Speyeria zerene hippolyta</i>)	NL	T	Chub, Borax Lake (<i>Gila boraxobius</i>)	E	E
Chub, Hutton tui (<i>Gila bicolor</i>)	T	T	Chub, Oregon (<i>Oregonichthys crameri</i>)	SC	E
Cuckoo, yellowed-billed (<i>Coccyzus americanus</i>), western distinct population segment (DPS)	SC	C	Dace, Foskett speckled (<i>Rhinichthys osculus</i>)	T	T
Deer, Columbia white-tailed (<i>Odocoileus virginianus leucurus</i>), Columbia River DPS	E	E	Fairy shrimp, vernal pool (<i>Branchinecta lynchi</i>)	T	T
Frog, Columbia spotted (<i>Rana luteiventris</i>), Great Basin DPS	SU	C	Frog, Oregon spotted (<i>Rana pretiosa</i>)	SC	C
Horned lark, streaked (<i>Eremophila alpestris strigata</i>)	SC	C	Murrelet, marbled (<i>Brachyramphus marmoratus maroratus</i>)	T	T
Owl, northern spotted (<i>Strix occidentalis caurina</i>)	T	T	Pelican, brown (<i>Pelecanus occidentalis</i>)	E	E
Plover, western snowy (<i>Charadrius alexandrinus nivosus</i>)	T	T (coastal population only)	Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>), fall, Snake River	T	T

Table 4. (continued)

Species	State Status ¹	Federal Status ¹	Species	State Status ¹	Federal Status ¹
Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>), Lower Columbia River	SC	T	Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>), spring/ summer, Snake River	T	T
Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>), Upper Willamette River	NL	T	Salmon, chum (<i>Oncorhynchus keta</i>), Columbia River	SC	T
Salmon, Coho (<i>Oncorhynchus kisutch</i>), Lower Columbia River	E	T	Salmon, Coho, (<i>Oncorhynchus kisutch</i>), Oregon Coast	SC	T
Salmon, sockeye (<i>Oncorhynchus nerka</i>), Snake River	NL	E	Sea-lion, Steller (<i>Eumetopias jubatus</i>), eastern population segment	SV	T
Sea turtle, green (<i>Chelonia mydas</i>)	NL	T	Sea turtle, leatherback (<i>Dermochelys coriacea</i>)	NL	E
Sea turtle, loggerhead (<i>Caretta caretta</i>)	NL	T	Skipper, Mardon (<i>Polites mardon</i>)	NL	C
Squirrel, Washington ground (<i>Spermophilus washingtoni</i>)	C	C	Steelhead (<i>Oncorhynchus mykiss</i>), Lower Columbia River	SC	T
Steelhead (<i>Oncorhynchus mykiss</i>), Middle Columbia River	SV	T	Steelhead (<i>Oncorhynchus mykiss</i>), Snake River Basin	SV	T
Steelhead (<i>Oncorhynchus mykiss</i>), Upper Willamette River	SC	T	Sucker, Lost River (<i>Deltistes luxatus</i>)	E	E
Sucker, shortnose (<i>Chasmistes brevirostris</i>)	E	E	Sucker, Warner (<i>Catostomus warnerensis</i>)	T	T
Trout, bull (<i>Salvelinus confluentus</i>)	SC	T	Trout, Lahontan cutthroat (<i>Oncorhynchus clarki henshawi</i>)	T	T
Whale, humpback (<i>Megaptera novaeangliae</i>)	NL	E	Whale, killer (<i>Orcinus orca</i>) Southern Resident DPS	NL	E
Wolf, gray (<i>Canis lupus</i>)	NL	E			

¹Status Codes: C = Candidate; DM = Delisted Taxon, Recovered, Being Monitored First Five Years; E = Endangered; SC = Critical; SU = Undeterminable Status; SV = Vulnerable; T = Threatened; NL = not listed.

Source: ONHIC 2007, FWS 2009, NOAA 2009

There are currently 17 plant species federally listed as threatened or endangered in Oregon (Table 5). Seven of these species are listed as threatened and ten as endangered. There are two species, siskiyou mariposa lily and northern wormwood, which are candidates for Federal listing. Malheur wire-lettuce, Willamette daisy, and Kincaid's lupine have designated critical habitat.

Table 5. Threatened, endangered, and candidate plant species in the ROI

Species	State Status ¹	Federal Status ¹	Species	State Status ¹	Federal Status ¹
Macdonald's rock-cress (<i>Arabis macdonaldiana</i>)	E	E	Cook's lomatium (<i>Lomatium cookii</i>)	E	E
Marsh sandwort (<i>Arenaria paludicola</i>)	NL	E	Kincaid's lupine (<i>Lupinus sulphureus</i>)	T	T
Applegate's milk-vetch (<i>Astragalus applegatei</i>)	E	E	MacFarlane's four-o'clock (<i>Mirabilis macfarlanei</i>)	T	T
Golden paintbrush (<i>Castilleja levisecta</i>)	T	T	Rough popcornflower (<i>Plagiobothrys hirtus</i>)	E	E
Willamette daisy (<i>Erigeron decumbens</i>)	E	E	Nelson's checker-mallow (<i>Sidalcea nelsoniana</i>)	T	T
Gentner's fritillary (<i>Fritillaria gentneri</i>)	E	E	Spalding's catchfly (<i>Silene spaldingii</i>)	T	T
Water howellia (<i>Howellia aquatilis</i>)	T	T	Malheur wire-lettuce (<i>Stephanomeria malheurensis</i>)	E	E
Western lily (<i>Lilium occidentale</i>)	E	E	Howell's spectacular thelypody (<i>Thelypodium howellii spectabilis</i>)	T	T
Large-flowered wooly meadowfoam (<i>Limnanthes floccosa grandiflora</i>)	E	E	Slender moonwort (<i>Botrychium lineare</i>)	NL	C
Bradshaw's desert-parsley (<i>Lomatium bradshawii</i>)	E	E	Northern wormwood (<i>Artemisia campestris ssp. borealis var. wormskioldii</i>)	C	C

¹Status Codes: C = Candidate, E = Endangered, T = Threatened, NL = not listed.
Source: ONHIC 2007, FWS 2009.

Critical Habitat

Only 14 of the 50 species listed under the ESA have designated critical habitat within Oregon. This includes one threatened mammal, three threatened birds, two threatened and two endangered fish, 2 threatened and one endangered invertebrates, and one threatened and two endangered plants. Critical Habitat has been proposed for three endangered fish. Appendix B provides a complete listing of species with critical habitat and the associated counties and hydrological units of occurrence.

Malheur wire-lettuce, an endangered plant, has designated critical habitat in Harney County, located 27 miles from the town of Burns. The critical habitat occurs on a 160-acre scientific study area managed by

BLM. Though the last existing population of Malheur wire-lettuce does not cover the entire 160 acres, this area was designated as habitat to buffer the population from negative impacts, such as the invasion of nuisance exotic species (47 FR 218, 1982).

Critical habitat has been designated for the threatened Kincaid's lupine in Benton, Lane, Polk, and Yamhill Counties of Oregon, as shown in Appendix C. The PCEs of critical habitat for the *Lupinus sulphureus* ssp. *kincaidii* are the habitat components that provide: Early seral upland prairie, or oak savanna habitat with a mosaic of low growing grasses and forbs, and spaces to establish seedlings or new vegetative growth; an absence of dense canopy vegetation; and undisturbed subsoils. The presence of insect outcrossing pollinators, such as *Bombus mixtus* and *B. californicus*, with unrestricted movement between existing lupine patches (65 FR 3875).

Critical habitat has been designated for the endangered Willamette daisy in Benton, Lane, Linn, Marion, and Polk Counties of Oregon, as shown on the maps in Appendix C. The PCEs of critical habitat for *Erigeron decumbens* var. *decumbens* are the habitat components that provide early seral upland prairie, wet prairie, or oak savanna habitat with a mosaic of low-growing grasses and forbs, and spaces to establish seedlings or new vegetative growth; an absence of dense canopy vegetation; and undisturbed subsoils (63 FR 3863).

The threatened Oregon silverspot butterfly has designated critical habitat in Lane County. Lane County was chosen because it is the only place where a healthy population of silverspots exists (45 FR 129, 1980).

There are 28 designated critical habitat areas containing a total of 18,000 acres for western snowy plover. Of these areas, seven are located within five counties in Oregon. This critical habitat is used by the threatened plovers primarily for nesting and over-wintering (70 FR 188, 2005).

There are 76 critical habitat units in 20 counties throughout Oregon for the threatened northern spotted owl. This habitat comprises approximately 3.2 million acres that is managed by USFS (2,211,000 acres) and BLM (1,046,000 acres). Northern spotted owls use this critical habitat for nesting, roosting, foraging, and dispersal of young (57 FR 10, 1992).

The marbled murrelet, a threatened bird species, has designated critical habitat in 12 counties in Oregon totaling 1,515,300 acres. Of this land, 1,338,200 acres are federally managed, 175,100 acres are State managed, 1,100 acres are county managed, and 900 acres are privately owned. Critical habitat for this species was determined by the need for large diameter conifers for nesting platforms, overstory canopy for nesting cover, and distance from a marine environment (61 FR 102, 1996).

Vernal pool fairy shrimp, a threatened crustacean, has four units containing a total of 7,574 acres of critical habitat in Jackson County. The North Agate Desert Unit includes 2,130 acres, the White City East Unit includes 2,251 acres, the White City West Unit includes 2,301 acres, and the Table Rocks Unit includes 892 acres (68 FR 151, 2003).

There are 640 acres of critical habitat for the threatened Borax Lake chub located in Harney County. Most of the critical habitat is located on federally-managed land; however, some critical habitat does occur on private land (47 FR 193, 1982).

The Warner sucker is a threatened endemic species in Oregon whose decline is attributed to the introduction of exotic fish species. Critical habitat for the Warner sucker, designated in Lake County in 1985, is focused around Twelvemile Creek (approximately 4 stream miles), Twentymile Creek (approximately 18 stream miles), Spillway Canal north of Hart Lake (approximately 2 stream miles),

Snyder Creek (approximately 3 stream miles), and Honey Creek (approximately 16 stream miles). Criteria for critical habitat included the species presence and low gradient streams (50 FR 188, 1985).

On September 21, 2004, the Klamath River and Columbia River threatened populations of bull trout were designated with 1,748 miles of stream and 61,235 acres of lakes and marshes as critical habitat. Of this allotment, 706 miles of stream and 33,939 acres of marshes and lakes are located in Oregon. The critical habitat for bull trout occur in 23 counties in Oregon. These critical areas were chosen because they are areas that bull trout historically occupied and they provide movement corridors and areas for spawning, rearing, foraging and over-wintering (69 FR 193, 2004).

Approximately 13,679 square miles of critical habitat was designated for the Snake River fall Chinook salmon, a threatened fish species, in Idaho, Oregon and Washington. In Oregon, critical habitat occurs within 11 counties. These counties are either within the critical habitat in their entirety, or bordering critical habitat areas. Snake River fall Chinook salmon critical habitat includes river reaches of the Salmon, Snake, and Columbia rivers, as well as their tributaries that are presently or were historically accessible to this species (excluding areas above Dworshak Dam, Hells Canyon Dam, and any impassible falls) (58 FR 247, 1993).

There are 22,390 square miles of designated critical habitat for the threatened Snake River spring/summer Chinook salmon. In Oregon, critical habitat occurs within 12 counties that are wholly or partially within this designation. Critical habitat includes river reaches of the Snake, Salmon, and Columbia Rivers; this includes all tributaries that are presently or historically accessible to the species. Exclusions from the critical habitat are the Clearwater River, areas above Hells Canyon Dam, and above any impassible falls (58 FR 247, 1993).

Sockeye salmon, a threatened fish species, has designated habitat in or bordering 11 counties in Oregon. Hydrologic unit designated for critical habitat are based on present or historical access of the unit to sockeye salmon. Hydrological units include the Lower Salmon, Middle Salmon-Panther, Upper Salmon, Middle Salmon-Chamberlain, Lower Snake, Lower Snake-Tucannon, and Lower Snake-Asotin (58 FR 247, 1993).

On September 29, 2003, the National Oceanic and Atmospheric Administration amended the final rule for critical habitat designation for 19 evolutionary significant units (ESUs) of salmon and steelhead in Oregon, Washington, California, and Idaho. The amendment was made under a court order from a Federal district court. NOAA will be re-issuing critical habitat to these ESUs after an additional economic impact analysis is completed (68 FR 188, 2003). Because the future critical habitat may closely match the previously assigned habitat, for purposes of this analysis, previous critical habitat areas will be included for the following listed species:

- Lower Columbia River Chinook salmon had designated critical habitat in or bordering eight counties in Oregon. Hydrological units that contained critical habitat in Oregon included the Lower Columbia, Lower Columbia-Clatskanie, Lower Columbia-Sandy, Middle Columbia-Hood, Clackamas, and Lower Willamette (65 FR 32, 2000).
- Upper Willamette River Chinook salmon had designated critical habitat in or bordering 14 counties in Oregon. Hydrological units that contained critical habitat in Oregon included the Lower Columbia, Lower Columbia-Clatskanie, Lower Willamette, Middle Willamette, Middle Fork Willamette, Coast Fork Willamette, Upper Willamette, McKenzie, North Santiam, South Santiam, Molalla-Pudding, Tualatin, Yamhill, and Clackamas (65 FR 32, 2000).

- The Oregon Coast/California Coast Coho salmon had designated critical habitat in or bordering 13 counties in Oregon. Hydrological units that contained critical habitat in Oregon included the Alsea, Coos, Coquille, Necanicum, Nehalem, Sixes, Siletz-Yanquina, Siuslaw, Siltcoos, Umpqua, North Umpqua, South Umpqua, and Wilson-Trask-Nestucca (65 FR 32, 2000).
- Snake River Basin steelhead had designated critical habitat in or bordering 12 counties in Oregon. Hydrological units that contained critical habitat in Oregon included Hells Canyon, Imnaha, Lower Snake-Asotin, Upper Grande Ronde, Wallowa, Lower Grande Ronde, Middle Columbia-Lake Wallula, Middle Columbia-Hood, Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, and Lower Willamette (65 FR 32, 2000).
- The Lower Columbia River steelhead ESU had designated critical habitat in or bordering seven counties in Oregon. Hydrological units that contained critical habitat in Oregon included Lower Columbia-Clatskanie, Lower Columbia, Upper Willamette, Middle Willamette, Lower Willamette, North Santiam, South Santiam, Yamhill, Molalla-Pudding, and Tualatin (65 FR 32, 2000).
- Middle Columbia River steelhead had designated critical habitat in or bordering 16 counties in Oregon. Hydrological units that contained critical habitat in Oregon included Walla Walla, Middle Columbia-Lake Wallula, Middle Columbia-Hood, Umatilla, Willow, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Lower Columbia-Sandy, Lower Columbia-Clatskanie, Lower Columbia, Lower Willamette, and Trout (65 FR 32, 2000).
- Upper Willamette River steelhead had designated critical habitat in or bordering 12 counties in Oregon. Hydrological units that contained critical habitat in Oregon included the Lower Columbia, Lower Columbia-Clatskanie, Lower Columbia-Sandy, Middle Columbia-Hood, Clackamas, and the Lower Willamette (65 FR 32, 2000).
- Columbia River chum salmon had designated critical habitat in four counties in Oregon. Hydrological units that contained critical habitat in Oregon included the Lower Columbia, Lower Columbia-Sandy, Lower Columbia-Clatskanie, and the Lower Willamette (65 FR 32, 2000).

3.2 CULTURAL RESOURCES

3.2.1 Definition of Resource

Cultural or heritage resources are defined as those sites, structures, landscapes, districts, objects, records, and lifeway skills that are of importance to a culture or community for historic, scientific, traditional, or religious reasons. Cultural resources are tied to places, persons, events, or practices of social custom and traditional skills and are recognized for their heritage, social, educational, and scientific value through the passage of State and Federal laws for their protection.

Archeological resources are locations and objects from past human activities. Architectural resources are standing structures that are usually over 50 years of age and of significant historic or aesthetic value. Traditional cultural properties (TCPs) hold importance to Native Americans or other ethnic groups for the continuing practice of traditional culture. Any of these properties may meet the criteria for inclusion in the National Register of Historic Places (NRHP) and this determination of eligibility (36 CFR 8 parts 800.3–800.13, 2009) is a requirement of the Federal and State environmental assessment process before the initiation of ground disturbance or alteration of a landscape or structure.

State and Federal regulations require Federal agencies to document, protect, and manage the physical and visual integrity of heritage resources. This project will require compliance with Federal and State historic preservation statutes and regulations including, but not limited to:

- *American Indian Religious Freedom Act of 1978* (42 USC 21 part 1996, 2007)
- *Antiquities Act of 1906* (16 USC 1 parts 431–433, 2008)
- *Archaeological Resources Protection Act of 1979* (16 USC 1B parts 470aa–470mm, 2008)
- *Historic Sites, Buildings, and Antiquities Act* (16 USC 1A parts 461–462, 464-467, 1935)
- *National Historic Preservation Act of 1966* (16 USC 1A part 470, 2008)
- *Native American Graves Protection and Repatriation Act* (25 USC 32 parts 3001 et seq., 2008)
- *Museums; Historical Societies; Preservation of Historical and Archaeological Properties and Objects; Oregon Historic Families Database* (ORS 358 parts 015–961, 2007).

The Oregon State Historic Preservation Office (ORSHPO) and Oregon Heritage Commission have developed a statewide historic preservation plan and handbook for preservation planning (ORSHPO 2001) that offer goals for the State and general guidance for compliance with heritage resource protection.

3.2.2 Region of Influence

The ROI for cultural resources includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1.

3.2.3 Affected Environment

The character of the physiographic provinces—Coast Range, Klamath Mountains, Deschutes-Umatilla Plateau, Willamette Valley, Blue Mountains, Cascade Range, Harney Desert, Basin and Range, Payette Section—major river valleys, and changing climatic regimes through time created the rich environmental mosaic of Oregon that influenced human adaptation and the development of a wide variety of cultures.

To date, approximately 1,900 properties in the 36 counties of Oregon, including 116 historic districts (encompassing 8,550 contributing prehistoric and historic resources), are on the NRHP (ORSHPO 2001, Oregon Parks and Recreation Department [OPRD] 2009a). Approximately 40,000 properties in Oregon have been identified as having historical significance. There are an estimated 40,000–45,000 archaeological sites in Oregon, even though only 7 percent of the State’s land surface has been surveyed, and more than 2,000 known historic cemeteries and hundreds of miles of historic trails according to OPRD (2007).

The following brief outline of Oregon’s cultural history is summarized from Aikens (1993), d’Azevedo (1986), Lavender (1958), Meinig (1968), Walker (1998), ORSHPO (2001), and the BLM (2009).

3.2.3.1 Prehistoric Periods (12,000 years before present [BP]–A.D. 1,500)

The Native American prehistoric record is marked by a wide variety of archaeological remains that document response to cultural and climatic change and regional resources. Site types include shell

middens, villages, pit houses, temporary campsites, lithic sites and quarries, burials, fishing structures and implements, rock ovens and cairns, rock art, hunting blinds, and drive lanes.

PaleoIndian Period (12,000–9,000 years BP)

Peoples of this period were highly mobile hunters that used the atlatl and spear to hunt large game, including species now extinct such as the mammoth, mastodon, and bison predecessors.

Early Archaic Period (9,000 BP–6,000 BP)

Semi-nomadic hunting and gathering continued during this time. A wide variety of tools were used including the atlatl, fish hooks, fish spears, net sinkers, manos and metates, and camas ovens. Perishable artifacts, such as woven baskets, mats, and sandals, survive from this period.

Middle Archaic Period (6,000 BP–2,000 BP)

This period was marked by a warmer and drier climate and stabilization of sea levels at modern level. There is evidence of fire used to manipulate plant growth and animal populations. The archaeological record reflects increased diversity in tool types and the development of distinctive regional cultures and expansion of trade networks. More stone quarries come into use during this period, and pit houses and coastal shell middens reflect long-term residency in many areas.

Late Archaic Period (2,000 BP–A.D. 1,500)

Fishing technology and plant processing techniques continued to diversify and the bow and arrow replaced the atlatl and dart. Elements of distinctive Northwest, Plateau, Great Basin, and California styles in tools, art, and shelter began to coalesce. Many villages increased in size and were occupied year-round, and the Columbia River trade network flourished. Contemporary climatic conditions were reflected in the landscape, plants, and animals.

3.2.3.2 Protohistoric and Historic Periods (A.D. 1550–Present)

For purposes of historic research and preservation planning, Oregon's history is organized into specific chronological themes (ORSHPO 2001). These themes, as well as a few highlights of the Euroamerican settlement of Oregon, are briefly discussed in the following subsections.

Exploration (1543–1811)

European and Asian traders visited coastal and Columbia River Indian people and supplied the burgeoning fur trade. Trade goods appeared in coastal village sites, and shipwrecks were common. Horses arrived in Oregon about 1730, and several tribes, notably the Nez Perce, became master horse breeders and equestrians. Lewis and Clark wintered (1805–1806) at Fort Clatsop at the mouth of the Columbia River.

Fur Trade and Mission to the Indians (1812–1846)

Forts and missionary settlements were established. Fort Vancouver was founded in 1820 by Hudson's Bay Company. The Siskiyou Trail, originally a Native American trail and later a portion of the Oregon-California trail, linked Willamette Valley and the Sacramento Valley/San Francisco area beginning in the 1820s. By the 1830s, many trails were in use by fur trappers and dealers, cattle drives, military, and freighting. The Oregon Trail (1841–1869) entered present day southeastern Oregon at the Snake River crossing on the Idaho border, with major destinations of the Willamette Valley for settlers and southwestern Oregon and northern California for gold seekers. Portions of the trail later became stage, railroad, and vehicle roads.

Settlement, Statehood, and Steampower (1847–1865)

By the 1850s, Native American populations had declined through disease and conflicts, and reservations were established. Oregon was accepted into the Union in 1859.

With the Oregon Trail immigrants, and later peoples from Europe, Asia, and Mexico, homesteading, pioneer settlements, farming, ranching, dairying, and logging established quickly. Transportation and communication flourished via ferries and steamboats, ocean-going ships, and improved roads.

Railroads and Industrial Growth (1866–1883)

The completion of the Southern Pacific Railroad in 1887 assured the success of the major Oregon industries of agriculture, logging, fishing, and mining.

Progressive Era (1884–1913)

Urban and commercial development continued with increased immigration to Oregon and the expansion of modernized cities, sophisticated architecture and utilities, and educational services.

The Motor Age (1914–1940)

Widespread use of railroads, followed by trucks, autos, improved roads, farm machinery, manufacturing equipment, and power dams assured the modernization of Oregon and many of its industries.

War and the Post-War Era (1941–1967) and the Contemporary Era (1968–Present)

Economic, social, and political developments; the rise of tourism and recreation as economic forces; and the continuation of traditional industries in Oregon responded to international conditions and reflected the events and trends of much of the U.S. during these critical times.

3.3 WATER RESOURCES

3.3.1 Definition of Resource

The *Clean Water Act* (33 USC 26 parts 1251 et seq., 2008) was created to protect the nation's lakes, rivers, aquifers, wetlands, and coastal areas. For the purposes of this analysis, water resources include surface water, groundwater, wetlands, and floodplains. Surface waters are rivers, streams, and lakes. This analysis also addresses impaired surface waters, defined by the Environmental Protection Agency (EPA) as those with levels of pollutants that exceed State water quality standards.

Groundwater refers to subsurface hydrologic resources such as aquifers that are used for domestic, agricultural, and industrial purposes. For this analysis, groundwater includes sole source aquifers. Wetlands are defined by the U.S. Army Corps of Engineers (USACE) as areas that are characterized by a prevalence of vegetation adapted to saturated soil conditions. Wetlands can be associated with surface water or groundwater and are identified based on specific soil, hydrology, and vegetation criteria defined by USACE. For the purposes of this analysis, floodplains are defined as 100-year floodplains, designated by the Federal Emergency Management Agency (FEMA) as those low-lying areas that are subject to inundation by a 100-year flood (i.e., a flood that has a 1 percent chance of being equaled or exceeded in any given year).

3.3.2 Region of Influence

The ROI for water resources includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1.

3.3.3 Affected Environment

3.3.3.1 Surface Water

The Oregon Department of Environmental Quality (ODEQ) is required by the *Clean Water Act* (33 USC 26 parts 1251 et seq., 2008) to compile a list of Oregon water bodies and water body segments that do not meet water quality standards. This list of water body impairments is updated every 2 years by ODEQ to identify and prioritize areas of poor water quality. Standards for water quality are based on beneficial uses, such as drinking water, cold water fisheries, agricultural usage, industrial water supply, and recreational usage (ODEQ 2003a).

The 2002 *Oregon Final 303(d) List of Impaired Waters* identified 1,726 water bodies and water body segments that do not meet water quality standards (Appendix C) (ODEQ 2002). The majority of impairments were listed because they did not meet the standards for criteria such as dissolved oxygen content, presence of fecal coliform, sedimentation levels, pH levels, and temperature. Other impairments include the presence of heavy metals, dichloro-diphenyl-trichloroethane (DDT), *E. coli* bacteria, and aquatic weeds or algae blooms (ODEQ 2002).

The major river systems in Oregon include the Columbia, Willamette, Grande Ronde, Deschutes, John Day, Umpqua, Rogue, Klamath, Snake, Malheur, and Owyhee (Figure 4). The Columbia River runs for 1,200 miles, forming the border between Washington and Oregon, before flowing into the Pacific Ocean at the town of Astoria, Oregon. The most hydroelectrically-developed river system in the world, the Columbia drains a 219,000 square mile basin called the Columbia Basin Province that includes land in Oregon, Washington, Montana, Idaho, Nevada, Wyoming, and Utah. This province is drained by the Columbia and extends from the crest of the Cascade Mountains in Oregon and Washington to the Rocky Mountains of Montana and Wyoming (USACE 2002). The Columbia River in Oregon drains the Willamette, Deschutes, John Day, Lower Columbia, Hood, Umatilla, Grande Ronde, Powder, and Owyhee/Malheur river basins. The Willamette, John Day, Deschutes and Snake Rivers are the major tributaries of the Columbia River in Oregon. Water quality impairments within the Columbia River include the presence of arsenic, DDT metabolite, PCBs, polynuclear aromatic hydrocarbons, and poor water temperature (ODEQ 2002).

The Willamette River flows for 240 miles northward between the Coastal Range and the Cascades Range to form and drain the Willamette Valley. This river runs a zigzag course through Benton, Linn, Polk, Marion, Yamhill, and Clackamas counties before its confluence with the Columbia near the city of Portland, Oregon (Wikipedia 2009). Water impairments within the Willamette include the presence of DDT, DDT metabolite, dieldrin, PCBs, arsenic, pentachlorophenol, manganese, iron, mercury, fecal coliform, and polynuclear aromatic hydrocarbons, as well as poor water temperature and dissolved oxygen content (ODEQ 2002).

The Grande Ronde River is roughly 180 miles long and is located in northeastern Oregon. The Grande Ronde drains the area on the east side of the Blue Mountains on the Columbia Plateau before joining the Snake River from the east, approximately 5 miles north of the Oregon/Washington border, and approximately 15 miles from the mouth of the Salmon River (Wikipedia 2009). Water impairments within the Grande Ronde include the presence of fecal coliform, poor water temperature, and sedimentation levels (ODEQ 2002).

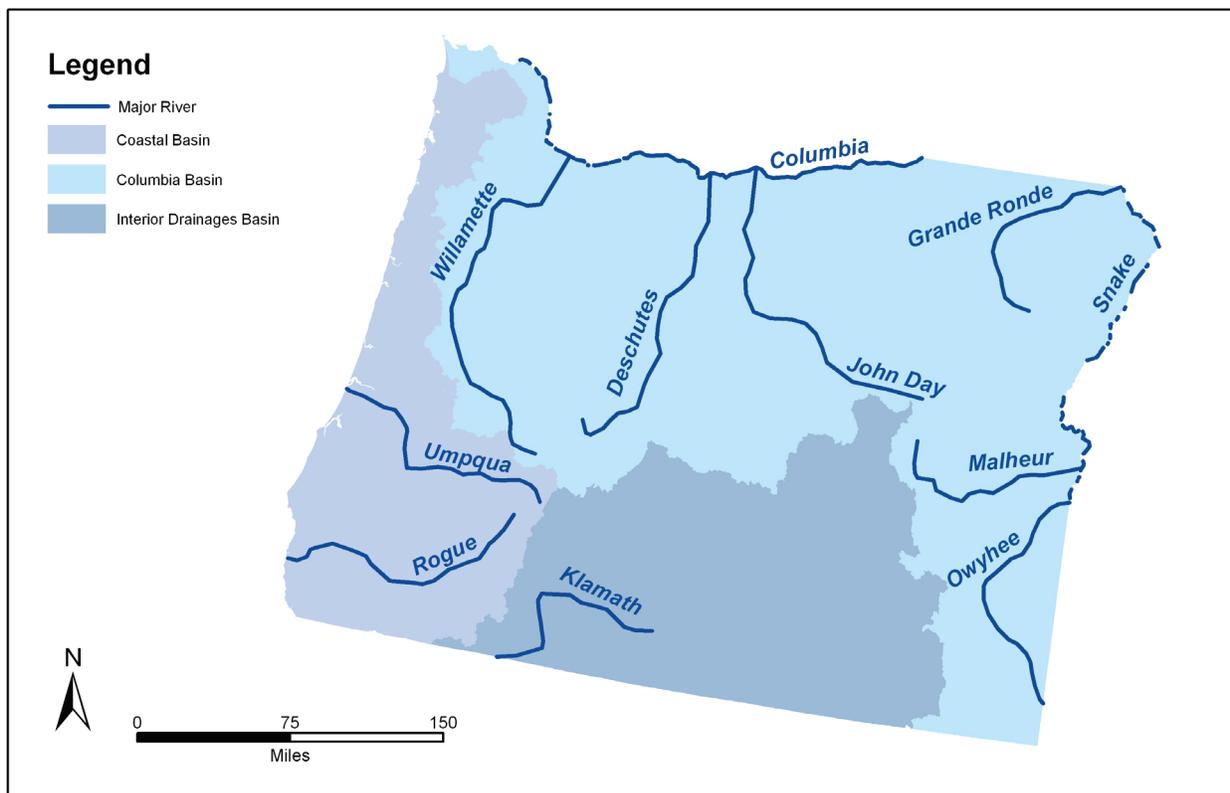


Figure 4. Major river systems in the ROI

The Deschutes River is approximately 240 miles long and drains the eastern side of the Cascades Range while meandering through central Oregon. This river flows through Deschutes, Jefferson, Sherman, and Wasco counties before joining with the Columbia River approximately 12 miles east of the Dalles in Oregon (Wikipedia 2009). Water quality impairments within the Deschutes include the presence of chlorophyll a, poor water temperature, turbidity, dissolved oxygen content, sedimentation, and pH levels (ODEQ 2002).

The John Day River drains most of the Blue Mountains region and flows for 281 miles in northeastern Oregon. The John Day River flows east of the Cascade Range until its confluence with the Columbia River upstream from the Columbia River Gorge. The John Day begins in Grant County and flows through Gilliam, Jefferson, Wheeler, and Sherman counties until its confluence with the Columbia from the northwest, approximately 10 miles north of Biggs, Oregon (Wikipedia 2009). Impairments within the John Day include the presence of fecal coliform, poor water temperature, dissolved oxygen content, and pH levels (ODEQ 2002).

The Umpqua River, roughly 111 miles in length, lies on the Pacific Coast of Oregon and flows only through Douglas County. The Umpqua drains an expansive series of valleys in the mountains west of the Cascade Mountains, as well as the area south of the Willamette Valley. At Reedsport, Oregon, the Umpqua enters Winchester Bay, which flows into the Pacific Ocean (Wikipedia 2009). Water impairments within the Umpqua include the presence of fecal coliform and poor water temperature (ODEQ 2002).

The Rogue River begins in southwest Oregon, near Crater Lake in the Cascade Mountains, and flows approximately 240 miles until it reaches the Pacific Ocean at Gold Beach, Oregon. The Rogue drains

approximately 75 percent of the Rogue River-Siskiyou National Forest (Wikipedia 2004). Water impairments within the Rogue include the presence of fecal coliform, poor water temperature, and pH levels (ODEQ 2002).

The Klamath River begins in southern Oregon at Upper Klamath Lake, near the area of Klamath Falls. The Klamath flows for approximately 240 miles and enters the Pacific Ocean at Klamath, California. The Klamath River drains arid farming valleys in the Cascade Range (Wikipedia 2009). Water impairments include the presence of chlorophyll a and ammonia, poor dissolved oxygen content, pH levels, and temperature (ODEQ 2002).

The Snake River is the main tributary of the Columbia River, flowing 1,038 miles through Wyoming, Idaho, Washington, and Oregon. In Oregon, the Snake River passes through the counties of Wallowa, Baker, and Malheur, helping the Columbia to drain the Columbia River Basin. The Snake runs the length of the Idaho/Oregon border before joining with the Columbia River near Pasco, Washington (Wikipedia 2009). The Owyhee, Malheur, and Grande Ronde rivers are the major tributaries of the Snake River in Oregon. Water quality impairments within the Snake River include the presence of mercury and poor water temperature (ODEQ 2002).

The Malheur River flows for 165 miles and drains the high desert plateau region of the Blue Mountains. This river zigzags north and south through Oregon until it meets the Snake River from the west approximately 2 miles north of Ontario, Oregon (Wikipedia 2009). Water impairments within the Malheur include the presence of fecal coliform, DDT, dieldrin, chlorophyll a, and poor water temperature (ODEQ 2002).

The Owyhee River enters Oregon at the extreme southeast region in Malheur County. The Owyhee flows in a zigzag fashion until it enters the Snake River from the east at the Idaho/Oregon border (Wikipedia 2009). Major water impairments within the Owyhee include the presence of fecal coliform, chlorophyll a, DDT, dieldrin, and mercury, as well as poor water temperature and dissolved oxygen content (ODEQ 2002).

3.3.3.2 Groundwater

Basalt from lava flows, sand and gravel deposits, and bedrock contain the groundwater reservoirs in Oregon. As of 2009, approximately 70 percent of Oregon residents and over 90 percent of rural Oregon residents rely solely or in part on groundwater for drinking water. There is one sole source aquifer in Oregon, the North Florence-Dunal Aquifer, which lies on the Pacific Coast and supplies 68 percent of the drinking water to residents within North Florence area, which extends from Mercer Lake south to the Siuslaw River and includes the Collard, Clear, Ackerley, and Munsel Lakes. (EPA 2009).

ODEQ is responsible for implementing protection programs to protect groundwater from pollution, clean up polluted groundwater, and monitor and assess groundwater quality. In accordance with the statutory policies set out in ORS Chapter 468B parts 155 and 160 and the authority given in part 180 (2007), ODEQ can declare a groundwater management area (GWMA), if non-point source pollutants are found in the water supply (ODEQ 2009). Oregon currently has three GWMA's (ODEQ 2009). The Northern Malheur County GWMA was established in 1989 when nitrate contamination was identified within the water supply. The Umatilla Basin GWMA was established in 1990 when nitrate-nitrogen concentrations were found to exceed Federal drinking water standards. The Southern Willamette Valley GWMA was established in 2004 due to high levels of nitrate contamination.

According to the 2003 Oregon Groundwater Conditions Fact Sheet, point source pollutant threats to groundwater in Oregon include 19,978 leaking underground storage tanks; 12 National Priority List sites where hazardous substances have been released; 33 dry-cleaning sites where solvents are released; and

40,000 underground injection systems. There are also 230 facility land sites treating effluent or biosolids; 1,168 permitted wastewater disposal sites; 500 confined animal feeding operations; and 480 solid waste landfills (ODEQ 2003b).

3.3.3.3 Wetlands

The 1987 USACE Wetland Delineation Manual (USACE 1987) provides guidelines to identify and delineate wetlands. For regulatory purposes under the *Clean Water Act*, wetlands are defined as:

“Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.” (33 CFR 2 part 328.3, 2009)

Approximately 2 percent of Oregon is covered by wetlands, encompassing 1.2–1.5 million acres. The five main types of wetlands in Oregon are palustrine, lacustrine, estuarine, riverine, and marine (USGS 2000).

Palustrine, lacustrine, and estuarine wetlands are the dominant wetland types in Oregon. Palustrine wetlands cover approximately 1,390,900 acres of land in Oregon, comprising 59.6 percent of all wetlands within the State (NRCS 2003). These non-tidal or tidal freshwater wetlands are dominated by shrubs, trees, and other emergent wetland plants. Palustrine wetlands are classified as less than 20 acres in size with a water depth of 6.6 feet when the water is at its lowest point (NRCS 2003).

Lacustrine wetlands cover approximately 557,600 acres of land in Oregon, or approximately 23.9 percent of the total wetlands in the State (NRCS 2003). Lacustrine wetlands are non-tidal and tidal freshwater wetlands and deepwater habitats that are also 20 acres in size, but are over 6.6 feet in depth, with non-persistent emergent or submersed and floating plants.

Estuarine wetlands occupy about 25,400 acres, which is approximately 1.1 percent of the total wetlands in Oregon (NRCS 2003). These are tidal wetlands or deep water tidal habitats that are adjacent to tidal wetlands. Water salinity in estuarine wetlands is usually greater than 0.5 parts per thousand (ppt) (USGS 2000).

Riverine and marine wetlands are less dominant in Oregon. Riverine wetlands are defined as non-tidal and tidal freshwater wetlands that are located within a channel with vegetation much like that of the lacustrine wetlands. Marine wetlands are tidal wetlands that are exposed to currents and waves, usually from the ocean, giving them a salinity of more than 30 ppt. Marine wetlands are often associated with high-energy coast lines (USGS 2000).

3.3.3.4 Floodplains

Floodplains are natural areas located adjacent to rivers and main stream channels. These floodplain areas act as a natural storage area for excess water overflow during periods of high precipitation. EO 11988, *Floodplain Management* (42 FR 26951, 1979), requires that Federal agencies:

“...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...”

FEMA delineates 100-year floodplains for the National Flood Insurance Program. The State of Oregon has 255 communities prone to a 100-year flood (Oregon Department of Land Conservation Development 1999). Because FEMA maps are delineated to use for insurance purposes, mapping of 100-year floodplains is mainly limited to urban or highly developed areas.

The lack of 100-year floodplain mapping in the more remote regions of Oregon makes it difficult to complete a statewide analysis using FEMA-defined floodplains (FWS, EPA, and USACE 2002). However, site-specific evaluations would be conducted prior to enrolling a site into CREP to determine if the site is within, or would be impacted by, a 100-year floodplain.

3.4 EARTH RESOURCES

3.4.1 Definition of Resource

For the purposes of this analysis, earth resources include topography, soils, and paleontological resources.

3.4.2 Region of Influence

The ROI for earth resources includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1.

3.4.3 Affected Environment

3.4.3.1 Topography

There are four major physiographic provinces in Oregon. The Pacific Border Province is located in the western portion of the State. The Sierra-Cascade Province is east of and parallels the Pacific Border Province. The Columbia Plateau Province lies in the northeastern and north-central part of the State. The Great Basin Province is located in the south-central portion of the State.

Pacific Border Province

The Pacific Border Province comprises three distinct regions, the Oregon Coast Range, the Klamath Mountains, and the Willamette Valley. The Oregon Coast Range runs parallel to the coast and consists of igneous and sedimentary rocks. The average height of these mountains in the north is 1,800 feet and 3,600 feet in the south, and the highest point is Mary's Peak at 4,097 feet (Encarta 2009). The Klamath Mountains are steeper than the Oregon Coast Range to the north and consist of rugged metamorphic and igneous peaks and several alluvial basins. The highest peaks are over 7,000 feet (Encarta 2009). The Willamette Valley, located just east of the Oregon Coast Range, is the only large alluvial lowland in Oregon. This slightly hilly to level valley contains the meandering Willamette River.

Sierra-Cascade Province

The Sierra-Cascade Province is dominated by the Cascade Range. The Cascades are actually made up of two volcanic regions. The western Cascades are older, broader, and more deeply eroded (Oregon Department of Geology and Mineral Industries 2009). The high Cascades to the east contain Mount Hood, which is the highest peak in Oregon at 11,239 feet (Encarta 2009).

Columbia Plateau Province

The Columbia Plateau Province contains both glaciated and non-glaciated landforms and can be subdivided into the Blue Mountains, the Deschutes-Umatilla Plateau, the Harney Desert, and the Payette Section. The Blue Mountains can be described as a large plateau with some steep and rugged areas (Encarta 2009). Glaciation formed the peaks and lakes of this region. The Deschutes-Umatilla Plateau is a lava plateau that has been dissected by the Deschutes, John Day, and Umatilla rivers. The Harney Desert, also known as the High Lava Plains, consists of relatively young lava flows and is covered in places by ash and pumice (Encarta 2009). The Payette Section, also called the Owyhee Upland, consists of older lava flows that have been dissected by rivers and streams.

Great Basin Province

The Great Basin Province contains the Basin and Range located in south-central Oregon. The ranges trend north-south and alternate with broad basins.

3.4.3.2 Soil

In general, western Oregon experiences moderate temperatures and high precipitation. This leads to the development of thick soils that are leached of soluble minerals. Fertilizer must be added to these soils in order for them to be productive agriculturally. The Willamette Valley experiences less precipitation and thus soils tend to be less leached. Eastern Oregon is fairly dry, and so these soils are high in soluble minerals and do not require fertilizer to be productive. For the following detailed analysis of soil orders present in the ROI, soils are described by the Level III Ecoregions described in Section 3.1.3.1 (Thorson et al. 2003, University of Idaho 2009) (Table 6).

- Alfisols are relatively fertile and tend to be very productive for both agriculture and silviculture. Alfisols are found in all of the Level III Ecoregions in Oregon except for the Columbia Plateau and the Snake River Plain.
- Andisols are soils that have formed in volcanic ash or other volcanic ejecta. They possess a high water-holding capacity and the ability to fix large quantities of phosphorus, and thus make unavailable to plants, large quantities of phosphorus. Andisols occur in the Coast Range, Cascades, Eastern Cascades Slopes and Foothills, and the Blue Mountains.
- Aridisols are found in more arid regions and contain calcium carbonate. They are generally not used for agriculture unless irrigation water is available. Aridisols are found in the Columbia Plateau, Blue Mountains, Snake River Plain, and the Northern Basin and Range.
- Entisols are very diverse and develop in unconsolidated parent material. They usually lack genetic horizons except an A horizon. Entisols are found in all of the Level III Ecoregions in Oregon except for the Klamath Mountains and the Eastern Cascades Slopes and Foothills.
- Histosols are composed mainly of organic materials and are ecologically important because of the large quantities of carbon they contain. In Oregon, they occur only in the Eastern Cascades Slopes and Foothills and the Northern Basin and Range.
- Inceptisols exhibit minimal horizon development, but they are more developed than entisols. Inceptisols are widely distributed and occur under a wide range of ecological settings. They are found in all of the Level III Ecoregions in Oregon except for the Columbia Plateau.
- Mollisols are characterized by a thick, dark surface horizon. They are rich in organic materials and thus very productive agriculturally. They occur in all of the Level III Ecoregions in Oregon except the Coast Range.
- Spodosols often occur under coniferous forests in cool and moist climates. They are naturally infertile and thus require additions of lime to be productive agriculturally. Spodosols are found in the Coast Range and the Cascades.
- Ultisols are generally found in older, stable landscapes. Although they have relatively low fertility, these soils occur in favorable climate regimes where they can support productive forests. Ultisols can be productive agriculturally with the use of fertilizer and lime.

- Vertisols are clay-rich soils that shrink and swell with changes in moisture content, and thus tend to lack distinct, well-developed horizons. Vertisols exhibit minimal horizon development and can occur in a wide range of ecological settings. They are found in the Willamette Valley, Blue Mountains, Klamath Mountains and the Northern Basin and Range.

3.4.3.3 Paleontological Resources

Paleontological resources are tied closely to a geologic setting—sedimentary strata, landforms, and areas of erosion into older rocks. The geological setting can be used to predict the occurrence of fossils, their type, abundance, and quality of preservation. The geology of Oregon is complex and, with some exceptions, is composed mainly of igneous rocks (i.e., granite, andesite, rhyolite, basalt) from very ancient to relatively recent geologic events, and includes in its origin fragments of islands, sea floor, and older continental rocks that have accreted to form the bedrock of the State (Alt and Hyndman 1978, 1995). Marine, river, and lake bed deposits contain plant, invertebrate, and vertebrate fossils from the Tertiary Period (60–20 million years ago). For example, the John Day Basin in north-central Oregon is internationally known for fossils preserved in sediments deposited 54 to 6 million years ago. Oregon cave sediments often preserve fossils from the Pleistocene to Holocene epochs (2 million years ago–10,000 BP).

Paleontological resources are considered part of the national natural, scientific, and educational heritage and are protected and addressed under the broad directive of NEPA and in the *Federal Land Policy and Management Act of 1976* (43 USC 35 parts 1701 et seq., 2007). Fossils are fully protected on land administered by NPS (36 CFR 1 part 2.1, 2009) and USFS (36 CFR 2 part 261.9, 2009). Additional historic, cultural and natural resource preservation statutes may also apply to fossil resources on State and Federal land.

Table 6. Soil orders in the Level III Ecoregions of the ROI

Level III Ecoregion	Soil Order
Coast Range	Alfisols, andisols, entisols, inceptisols, spodosols, ultisols
Willamette Valley	Alfisols, entisols, inceptisols, mollisols, ultisols, vertisols
Cascades	Alfisols, andisols, entisols, inceptisols, mollisols, spodosols, ultisols
Eastern Cascades Slopes and Foothills	Alfisols, andisols, aridisols, histosols, inceptisols, mollisols
Columbia Plateau	Aridisols, entisols, mollisols
Blue Mountains	Alfisols, andisols, aridisols, entisols, inceptisols, mollisols, vertisols
Snake River Plain	Aridisols, entisols, inceptisols, mollisols
Klamath Mountains	Alfisols, inceptisols, mollisols, ultisols, vertisols
Northern Basin and Range	Alfisols, aridisols, entisols, histosols, inceptisols, mollisols, vertisols

Source: Thorson et al. 2003

3.5 AIR QUALITY

3.5.1 Definition of Resource

Although the *Clean Air Act* (42 USC 85 parts 7401 et seq., 2007) is a Federal law, States are generally responsible for implementing the Act. Each State is required by the EPA to develop a State

Implementation Plan that contains strategies to achieve and maintain the National Ambient Air Quality Standards (NAAQS). NAAQS establish limits for six criteria pollutants including ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and respirable particulates (PM₁₀, or particulate matter less than 10 microns in diameter, and PM_{2.5}, particulate matter less than 2.5 microns in diameter). Areas that violate air quality standards are designated as non-attainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants.

3.5.2 Region of Influence

The ROI for the air quality analysis is area within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin. Air Quality Control Regions that encompass this area include the Portland Intrastate, Central Oregon Intrastate, Eastern Oregon Intrastate, Southwest Oregon Intrastate, and the Northwest Oregon Intrastate (40 CFR 17 part 81.338, 2009) (Table 7).

3.5.3 Affected Environment

ODEQ is responsible for ensuring that air quality within the State meets and maintains NAAQS. The ODEQ operates 31 air quality monitoring sites in cities throughout Oregon. Pollutants that cause the greatest concern in the State include ground level ozone (smog), fine particulate matter (e.g., wood smoke, dust), and air toxins (ODEQ 2008).

Table 7. Air Quality Control Regions in the ROI

Air Quality Control Regions in Oregon	Counties within each Region
Portland Intrastate	Benton, Clackamas, Columbia, Lane, Linn, Marion, Multnomah, Polk, Washington, Yamhill
Central Oregon Intrastate	Crook, Deschutes, Hood, Jefferson, Klamath, Lake, Sherman, Wasco
Eastern Oregon Intrastate	Baker, Gilliam, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa, Wheeler
Southwest Oregon Intrastate	Coos, Curry, Douglas, Jackson, Josephine
Northwest Oregon Intrastate	Clatsop, Lincoln, Tillamook
<i>Source: 40 CFR 17 part 81.338, 2009</i>	

The EPA developed the Air Quality Index (AQI) as an approximate indicator of overall air quality that can be easily interpreted by the public. The AQI converts concentrations of all criteria air pollutants into one normalized number (0–500) that defines the air quality for the area. The AQI establishes air quality categories of good (0–50), moderate (51–100), unhealthy for sensitive groups (UFSG) (101–150), unhealthy (151–200), very unhealthy (201–300), and hazardous (301–500).

In 2008, Oregon air quality was negatively influenced by forest fire activity and smoke in southern and eastern areas of the State during the summer, and fall and all of western Oregon at the end of June and beginning of July. Most areas in the state meet the NAAQS except Klamath Falls and Oakridge which currently violate the daily PM_{2.5} standard. Lakeview and Burns are also exceeding the PM_{2.5} standard and may be in violation when three years of federal reference data are collected at the end of 2009. (ODEQ 2008). As reported by ODEQ (2008) for 2008, the 31 air quality monitoring stations averaged 290 days of good air quality and 37 days of moderate air quality. Twenty-one cities reported UFSG days with Klamath Falls (20 days), Lakeview (11 days), Burns (8 days), Medford (8 days), and Oakridge (8 days)

having the highest number of UFSG days. Six monitoring stations within Oregon reported days of unhealthy air quality, including Klamath Falls (4 days), Lakeview (3 days), Prineville (1 day), Burns (1 day), Cave Junction (1 day), and Applegate Valley (1 day). No monitoring stations within Oregon reported days of very unhealthy, or hazardous AQIs in 2008.

Overall Oregon has relatively clean air; however, as of November 2008, there were three cities considered non-attainment areas and two counties that would be classified as non-attainment areas in 2009 due to revised standards (EPA 2008). Klamath Falls and Oakridge counties were postulated to become non-attainment areas for PM_{2.5} in 2009 and the cities of Eugene/Springfield and Oakridge were designated as non-attainment areas for PM₁₀ and the city of Salem-Keizer was designated as a non-attainment area for carbon monoxide.

3.6 RECREATIONAL RESOURCES

3.6.1 Definition of Resource

Recreational resources are natural or anthropogenic settings that are designated or available for recreational use by the public. In this analysis, recreational resources include lands and waters used by the public for hunting, fishing, wildlife watching, hiking, boating, swimming, and other water-related activities.

3.6.2 Region of Influence

The ROI for recreational resources includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1.

3.6.3 Affected Environment

Because the land that could be enrolled in CREP is privately held, access to this land for recreational activities is presently controlled by landowners. However, there is public land available for recreation in the proposed CREP area. For example, there are three national monuments in Oregon including the John Day Fossil Beds, Oregon Caves, and Newberry National Monument (Great Outdoor Recreation Pages [GORP] 2009). Crater Lake is the only national park in the State, but there are 188 State parks (GORP 2004, Oregon Department of Forestry [ODF] 2007, OPRD 2009b). In addition, there are 24 national wildlife refuges, 1 national grassland, 13 national forests, 5 State forests, 5 recreation areas, and 39 wilderness areas in the proposed CREP area (Figure 5) (Appendix D) (GORP 2009, ODF 2007, OPRD 2009b).

There are 46 wild, scenic, or recreational rivers within the proposed CREP area (Appendix D). Wild rivers are those that are undeveloped, unpolluted, and have limited trail access. Scenic rivers are accessible by trail and some roads. Recreational rivers are those that are easily accessed by road and have been developed along the shoreline (National Wild and Scenic Rivers 2009).

Public land provides recreational activities such as hunting, hiking, camping, fishing, biking, and backpacking. Hunting and fishing require State-issued licenses for both public and private land; however, American Indians with tribal treaty rights cannot be required to buy State fishing licenses (Columbia River Inter-Tribal Fish Commission [CRITFC] 2009b). A discussion of the economics associated with hunting, fishing, and other recreational activities is provided in Sections 3.7 and 4.7.

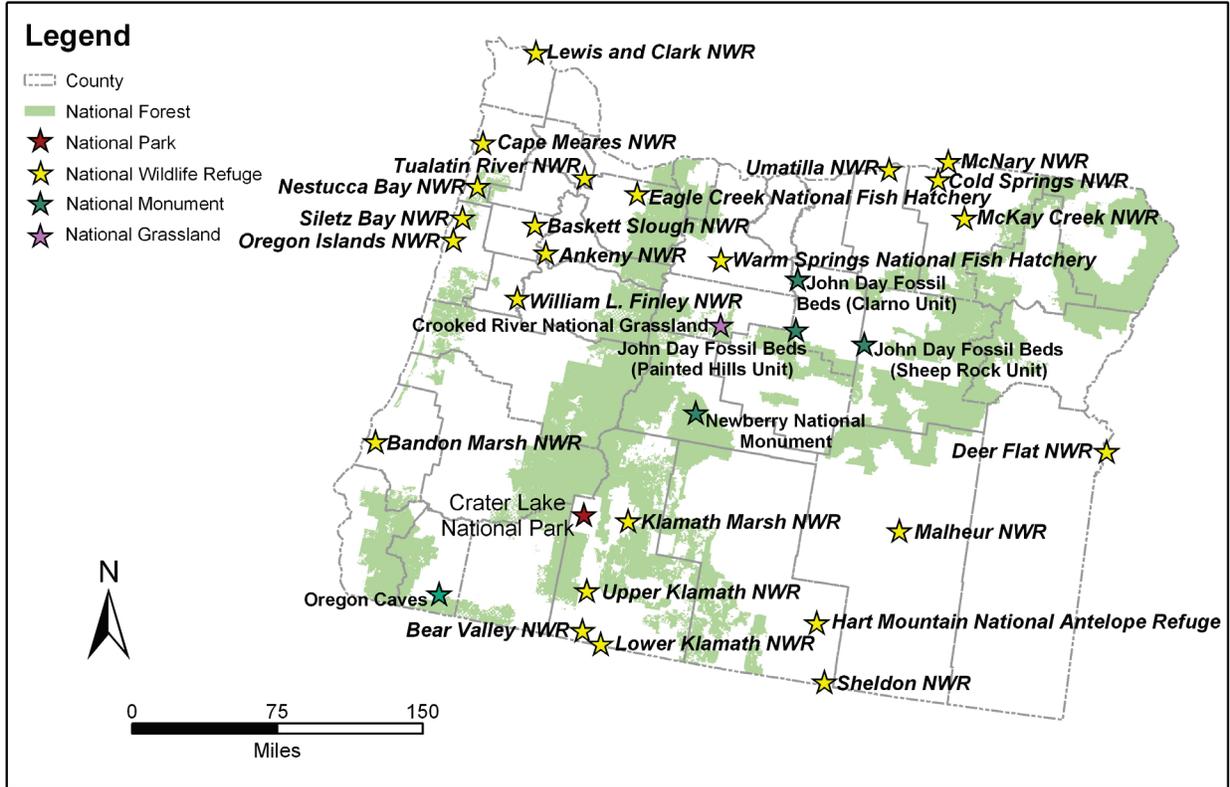


Figure 5. National forests, grassland, park, wildlife refuges, and monuments in the ROI

3.7 SOCIOECONOMICS

3.7.1 Definition of Resource

Socioeconomic analyses generally include investigations of population, income, employment and housing conditions of a specific area. Socioeconomic issues that are significant and considered in detail in this analysis are farm and non-farm employment and income, farm production expenses and returns, agricultural land use, and recreation spending in the ROI.

3.7.2 Region of Influence

The ROI for analysis of socioeconomics and environmental justice is the land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1.

3.7.3 Affected Environment

3.7.3.1 Demographic Profile

The total population within the ROI was 3,421,399 people in 2000, which was almost a 17% increase from the population of 1990 (USCB 1993a, 2003a). In 2000, approximately 79% of the total population was located in urban areas or urban clusters, and 21% of the population was located within rural areas (USCB 2003a). This was an increase of approximately 9% from the 1990 urban population (USCB 1993b). In 2002, there were 65,555 farm operators managing 40,033 farms in the ROI (USDA 2004b).

3.7.3.2 Non-Farm Employment and Income

Between 1990 and 2003, the non-farm labor force within the ROI ranged from 1,491,733 in 1993 to 1,858,879 in 2003 (Bureau of Labor Statistics [BLS] 2003). Non-farm employment also ranged during this period from a low of 80,649 positions in 1995 to a high of 152,151 positions in 2003 (BLS 2003). The unemployment rate within the ROI varied from a high of 8.2% in 2003 to a low of 4.8% in 1995 (BLS 2003). Median household income with the ROI in 1999 ranged from \$28,750 in Wheeler County to \$52,122 in Washington County (USCB 2003b).

3.7.3.3 Farm Employment and Income

The average wages for agricultural employment in Oregon are among the highest in the U.S. (Currey 2001). As reported by the 2002 Census of Agriculture (USDA 2004b), there were 122,845 hired farm workers on 10,978 of the 40,033 farms within the ROI in 2002, accounting for a payroll of \$620,422,000. Table 8 lists the hired farm and contract labor costs per county within the ROI and labor costs as a percentage of total production costs. In 1997, the total hired farm and contract labor costs were \$544,062,000, which was 23.6% of total production costs. In 2002, the total hired farm and contract labor costs were \$683,186,000, which was 24.5% of total production costs.

The Bureau of Economic Analysis (BEA) (2004) reported a realized net farm income of \$67,737,000 in 2002. This was a decrease of 86% as compared to the 1992 net farm income. BEA (2004) also reported that total government payments to farms within the ROI were \$80,290,000 in 2002, a decrease of 18% from 1992. Farm wages and perquisites in 2002 were \$606,764,000, which was an increase of 45% over those of 1992. These costs were a significant contributor to the 87% reduction in net farm proprietors' income within the ROI from 1992 (BEA 2004).

3.7.3.4 Farm Production Expenses and Returns

In 2002, farm production expenses were \$2,786,838,000 within the ROI. This is a slight increase over the 1997 figure of \$2,589,342,000 (adjusted to 2002 dollars) (USDA 2004b). Using the 2002 acreage in active farm production (17,080,422 acres), the average cost per acre within the ROI in 2002 was \$163.16 (USDA 2004b). The cost per acre of agricultural inputs (e.g., seed, fertilizers), less hired farm labor and contract farm labor, was \$123.16 (USDA 2004b). Average net cash return per farm within the ROI was \$15,156 in 2002 (USDA 2004b). The average net cash receipts per acre within the ROI in 2002 were \$35.49 (USDA 2004b). Table 9 lists the average farm production expenses and return per dollar of expenditure in 2002 within each county in the ROI. Table 10 lists the average value of land and buildings and the average value of machinery and equipment per farm in 2002 within each county in the ROI.

3.7.3.5 Current Agricultural Land Use Conditions

In 2002, 14,272,846 acres of land within the ROI were actively used for agricultural purposes including cropland, hay land, and pastureland. This was a 5.4% decrease from 1997 (USDA 2004b). Table 11 lists the acreage for different agricultural land uses in 1992 and 1997 and the percent change during that period. In 1997, 546,937 acres within the ROI were enrolled in either CRP or the Wetlands Reserve Program (WRP). In 2002, 483,237 acres were enrolled. As of October 2005, 528,146 acres within the ROI will be enrolled in CRP (FSA 2004b). The average value of farm land in 2003 was estimated at \$1,200 per acre (ODA 2004).

3.7.3.6 Tribal Salmon Fishing

The Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of the Warm Springs Reservation of Oregon have reserved rights to anadromous fish in accordance with treaties signed in 1855. As noted by CRITFC (2005), salmon play an integral role in tribal religion, culture, and economics. Wholesale salmon buyers had previously offered tribal fishers between \$0.50 and \$0.80 per pound, which usually failed to even cover fishing costs (CRITFC 1999). Direct or "over-the-bank" sales to the public, occurring seasonally along the Columbia River from the Bonneville Dam near Portland east

to McNary Dam near Umatilla, allow tribal fishers to support their families and continue their traditional livelihood. The loss and degradation of habitat has resulted in declining wild salmon populations, and tribal fisheries managers must reduce harvests in response to declining populations.

Table 8. Hired farm and contract labor as a percentage of total production

Area	2002				1997			
	Hired Farm Labor (\$1000)	Contract Labor (\$1000)	Total Production Expenses (\$1000)	Labor as a Percent of Total Production Expenses	Hired Farm Labor (\$1000) ^a	Contract Labor (\$1000) ^a	Total Production Expenses (\$1000) ^a	Labor as a Percent of Total Production Expenses
Oregon	620,422	62,764	2,786,838	24.5	557,008	54,192	2,589,342	23.6
Baker	4,316	356	43,672	10.7	3,111	698	41,913	9.1
Benton	14,244	2,684	55,430	30.5	10,381	2,757	58,392	22.5
Clackamas	98,199	6,602	267,319	39.2	76,016	5,391	231,762	35.1
Clatsop	1,332	94	6,730	21.2	718	116	6,547	12.7
Columbia	4,245	1,122	27,435	19.6	4,209	379	18,386	25.0
Coos	2,750	270	22,556	13.4	4,186	563	26,463	17.9
Crook	3,805	610	30,335	14.6	3,153	502	30,113	12.1
Curry	4,161	268	14,660	30.2	2,008	421	10,150	23.9
Deschutes	2,213	577	27,406	10.2	2,448	644	26,821	11.5
Douglas	7,566	1,639	47,168	19.5	2,348	663	34,759	8.7
Gilliam	2,229	385	21,598	12.1	2,797	218	21,293	14.2
Grant	2,257	948	18,454	17.4	1,975	330	19,848	11.6
Harney	3,749	421	32,204	12.9	4,386	781	37,187	13.9
Hood River	22,955	1,706	54,160	45.5	23,586	1,041	56,312	43.7
Jackson	16,645	2,586	60,476	31.8	16,349	351	51,710	32.3
Jefferson	7,614	255	38,083	20.7	6,262	254	38,370	17.0
Josephine	2,710	178	13,553	21.3	4,960	236	18,987	27.4
Klamath	11,978	1,410	96,553	13.9	10,905	1,118	90,267	13.3
Lake	6,727	1,004	50,938	15.2	3,916	1,635	34,190	16.2
Lane	17,966	1,322	87,582	22.0	14,376	1,557	86,893	18.3
Lincoln	1,392	328	7,773	22.1	782	64	4,989	17.0
Linn	18,816	1,636	122,930	16.6	21,747	1,414	149,696	15.5
Malheur	24,233	3,294	199,113	13.8	23,571	4,800	187,621	15.1

Table 8 (continued)

Area	2002				1997			
	Hired Farm Labor (\$1000)	Contract Labor (\$1000)	Total Production Expenses (\$1000)	Labor as a Percent of Total Production Expenses	Hired Farm Labor (\$1000) ^a	Contract Labor (\$1000) ^a	Total Production Expenses (\$1000) ^a	Labor as a Percent of Total Production Expenses
Marion	112,892	7,360	368,118	32.7	109,156	6,910	361,188	32.1
Morrow	19,276	2,200	217,048	9.9	14,813	2,434	129,507	13.3
Multnomah	18,853	1,268	47,614	42.3	14,331	406	35,917	41.0
Polk	16,168	2,125	70,096	26.1	14,573	2,065	75,853	21.9
Sherman	1,378	130	15,029	10.0	1,428	429	19,840	9.4
Tillamook	9,182	463	67,619	14.3	5,889	184	55,063	11.0
Umatilla	27,969	1,896	177,021	16.9	29,189	3,987	203,891	16.3
Union	5,555	1,716	55,785	13.0	6,071	1,476	47,802	15.8
Wallowa	2,503	415	24,332	12.0	2,060	347	24,564	9.8
Wasco	11,606	353	44,487	26.9	15,928	734	49,767	33.5
Washington	60,630	9,369	189,683	36.9	50,473	6,492	149,793	38.0
Wheeler	1,097	67	7,243	16.1	736	37	7,293	10.6
Yamhill	51,211	5,705	156,634	36.3	48,174	2,758	146,195	34.8

^aValue in 2002 dollars
Source: USDA 2004b

Table 9. Average farm production expenses and return per dollar of expenditure in 2002

Area	Average Size of Farm (acres)	Average Total Farm Production Expense (\$)	Average Cost per Acre (\$)	Average Net Cash Return per Farm (\$)	Average Net Cash Return per Acre (\$)	Average Return per \$ Expenditure (\$)
Oregon	427	69,575	163	15,156	35	0.22
Baker	1,237	62,211	50	8,958	7	0.14
Benton	143	60,912	426	35,172	246	0.58
Clackamas	46	57,254	1,245	15,732	342	0.27
Clatsop	90	27,137	302	3,994	44	0.15
Columbia	71	31,354	442	3,254	46	0.10
Coos	193	30,115	156	2,734	14	0.09
Crook	1,369	44,092	32	11,411	8	0.26

Table 9.(continued)

Area	Average Size of Farm (acres)	Average Total Farm Production Expense (\$)	Average Cost per Acre (\$)	Average Net Cash Return per Farm (\$)	Average Net Cash Return per Acre (\$)	Average Return per \$ Expenditure (\$)
Curry	340	70,141	206	4,244	12	0.06
Deschutes	85	16,834	198	-4,351	-51	-0.26
Douglas	185	22,186	120	648	4	0.03
Gilliam	4,122	139,345	34	8,634	2	0.06
Grant	2,265	46,718	21	7,211	3	0.15
Harney	3,006	61,108	20	10,915	4	0.18
Hood River	52	95,859	1,843	14,133	272	0.15
Jackson	129	30,981	240	-1,938	-15	-0.06
Jefferson	1,639	88,979	54	6,479	4	0.07
Josephine	44	18,566	422	-1,499	-34	-0.08
Klamath	572	78,755	138	14,146	25	0.18
Lake	1,619	110,256	68	19,608	12	0.18
Lane	91	34,039	374	3,073	34	0.09
Lincoln	88	20,728	236	2,205	25	0.11
Linn	164	52,467	320	14,527	89	0.28
Malheur	924	156,535	169	29,130	32	0.19
Marion	106	114,750	1,083	24,563	232	0.21
Morrow	2,999	581,899	194	95,292	32	0.16
Multnomah	48	67,252	1,401	31,389	654	0.47
Polk	128	52,743	412	22,039	172	0.42
Sherman	2,418	71,229	29	28,679	12	0.40
Tillamook	119	203,672	1,712	75,301	633	0.37
Umatilla	808	107,351	133	28,820	36	0.27
Union	482	56,121	116	4,509	9	0.08
Wallowa	1,030	47,993	47	2,331	2	0.05
Wasco	2,020	82,535	41	6,926	3	0.08
Washington	69	99,728	1,445	26,047	377	0.26
Wheeler	4,501	43,371	10	1,087	0	0.03
Yamhill	84	67,254	801	26,121	311	0.39

Source: USDA 2004b

Table 10. Average value of land and buildings and machinery and equipment per farm in 2002.

Area	Average Size of Farm (acres)	Average Value of Land and Buildings per Farm (\$)	Average Value of Machinery and Equipment per Farm (\$)
Oregon	427	508,882	63,462
Baker	1,237	662,738	63,215
Benton	143	507,363	62,936
Clackamas	46	418,469	44,015
Clatsop	90	285,734	35,520
Columbia	71	337,543	34,404
Coos	193	376,831	37,710
Crook	1,369	699,605	59,914
Curry	340	790,974	51,513
Deschutes	85	423,461	23,540
Douglas	185	346,175	36,772
Gilliam	4,122	1,288,176	167,689
Grant	2,265	776,913	64,512
Harney	3,006	815,042	69,141
Hood River	52	521,070	49,621
Jackson	129	428,469	43,963
Jefferson	1,639	830,129	123,348
Josephine	44	211,540	28,095
Klamath	572	527,619	97,123
Lake	1,619	773,588	136,503
Lane	91	363,136	38,602
Lincoln	88	318,161	23,618
Linn	164	516,273	65,318
Malheur	924	550,305	106,943
Marion	106	510,810	87,306
Morrow	2,999	1,127,290	144,885
Multnomah	48	505,733	46,930
Polk	128	548,559	56,604
Sherman	2,418	889,122	138,674
Tillamook	119	557,675	81,089
Umatilla	808	605,831	82,553
Union	482	510,520	193,196
Wallowa	1,030	596,339	50,768

Table 10. (continued)

Area	Average Size of Farm (acres)	Average Value of Land and Buildings per Farm (\$)	Average Value of Machinery and Equipment per Farm (\$)
Wasco	2,020	782,204	79,336
Washington	69	537,825	47,656
Wheeler	4,501	1,217,864	54,371
Yamhill	84	541,936	58,874

Source: USDA 2004b

Table 11. Acreage change for different agricultural land uses from 1997 to 2002

Land Use	Acres in 1997	Acres in 2002	Percent Change
Cropland ¹	1,307,505	1,300,286	-0.6
Hay land ²	4,171,974	4,117,101	-1.3
Pastureland ³	9,601,536	8,855,459	-7.8
Woodland ⁴	604,712	622,134	2.9
House lots, ponds, roads, wasteland, etc.	686,342	641,175	-6.6
CRP and WRP ⁵	546,937	483,237	-11.6
Active Agriculture ⁶	15,081,015	14,272,846	-5.4
Total Land in Farms	17,658,213	17,080,422	-3.3

¹ Cropland excludes all harvested hay land and cropland used for pasture or grazing.
² Hay land includes all harvested and cropland used for pasture or grazing.
³ Pastureland includes all pasture and rangeland, other than cropland and woodland pastured.
⁴ Woodland excludes all wooded pasture lands.
⁵ Operations with land enrolled in the CRP or WRP are counted as farms if they received \$1,000 or more in government payments.
⁶ Active agricultural lands include the sum of cropland, hay land, and pastureland.

Source: USDA 2004b

3.7.3.7 Recreational Values

3.7.3.7.1 Hunting

According to the National Survey of Fishing, Hunting and Wildlife Associated Recreation (NSFHWAR), 248,000 non-resident and resident hunters, ages 16 and up, participated in hunting-related activities within Oregon in 2001. This number decreased by 45,000 from the 1996 survey. Hunting-related expenditures contributed approximately \$365 million of revenue to the State of Oregon. Of these hunting-related expenditures, \$109 million went to trip-related expenses, \$233 million to equipment, and \$24 million to expenses such as membership dues, licenses, and permits. Of the hunters surveyed, 226,000 hunted big game, 60,000 hunted small game, and 42,000 hunted migratory birds (some individuals hunted in more than one category) (FWS and USCB 2001).

Hunting license sales in 2003 generated significant revenue for the State of Oregon. Black-tailed deer licenses alone brought in \$3,404,788. Rocky Mountain and Roosevelt elk licenses created revenue of \$4,618,281; black bear licenses created \$290,300; and cougar licenses generated \$111,590. Revenues from the sale of pronghorn antelope and Big Horn Sheep hunting licenses garnered \$67,475 and \$9,660, respectively, for Oregon (ODFW 2004b).

Wildlife stamps have also generated revenue for Oregon. The ODFW sold 56,962 upland game stamps statewide to create revenue of \$447,385 in 2003 (ODFW 2004b). In that same year, waterfowl stamps created revenue of \$185,310 (2004e).

3.7.3.7.2 Fishing

The NSFHWAR estimated that 687,000 resident and non-resident anglers, ages 16 and up, participated in fishing related activities in 2001. Of that total, 513,000 were residents of Oregon, while the remaining 174,000 resided in other states. Fishing-related expenditures in 2001 resulted in approximately \$602 million in revenue to the State of Oregon from non-resident and resident anglers. Fishing-related expenditures included \$259 million for trip-related expenses, \$245 million for equipment, and \$97 million for other expenses such as licenses, permits, and membership dues. Licenses and tags in 2003 created revenue of roughly \$18 million for the State (ODFW 2004c). The number of anglers actively fishing in Oregon increased from 658,000 individuals in 1996 to 687,000 in 2001. The NSFHWAR indicated that trout were the game fish species of preference for anglers, while steelhead and salmon were close seconds (FWS and USCB 2001). Other game species include salmon, shad, steelhead, sturgeon, trout, bass, bluegill, catfish, crappie, sunfish, perch, walleye and mullet (ODFW 2004c).

3.7.3.7.3 Wildlife Viewing

Approximately 1.7 million individuals participated in wildlife viewing activities in Oregon (FWS and USCB 2001). Wildlife viewing includes non-consumptive activities, such as photographing, observing, or feeding wildlife. Wildlife viewing activities created revenue of \$769 million for Oregon in 2001. Expenditures included \$305 million for trip-related expenses, \$340 million for equipment, and \$124 million for other related expenses, such as donations, memberships, and contributions. The number of individuals that left their home areas to participate in wildlife viewing increased from 715,000 in 1996 to 910,000 in 2001. The number of participants that viewed wildlife from around their own homes increased from 972,000 in 1996 to 1.2 million in 2001. The 2001 survey indicated that individuals who participated in wildlife viewing away from their homes most often went to publicly-owned, wooded areas (FWS and USCB 2001).

This page intentionally left blank.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences or impacts to resources described in Chapter 3 that may result from implementing the proposed action or the no action alternative. As this analysis is programmatic and not site-specific, resource impacts may not always be quantifiable. In compliance with guidelines contained in NEPA and CEQ regulations, each individual CREP agreement will require a site-specific environmental evaluation to be completed by FSA.

4.1 BIOLOGICAL RESOURCES

4.1.1 Alternative 1—No Action

Under the no action alternative, land eligible for CREP enrollment would remain in agricultural production and the proposed CPs would not be implemented. Water resources, marginal vegetation, and wildlife habitat in these areas are likely to continue to be polluted from runoff of agricultural chemicals, sediment, and animal waste. Without implementation of the proposed CPs, poor water quality would continue to limit the viability of threatened and endangered aquatic species. Impaired waterways within the State are likely to remain as such, exposing terrestrial and aquatic species to harmful pathogens, heavy metals, poor water temperature, low levels of dissolved oxygen, and fecal coliform.

4.1.2 Alternative 2—Proposed Action

Implementation of the proposed action would result in positive short and long-term impacts as well as short-term negative impacts to biological resources throughout Oregon. Removing previously harvested agricultural acres from production and implementing the proposed CPs would be beneficial to native vegetation, terrestrial and avian wildlife, aquatic wildlife, and threatened and endangered species, all of which have been displaced from these areas due to current and historical agricultural practices. The short-term positive environmental impacts of the proposed action include reduced sedimentation from tillage and livestock activity, reduced introduction of agricultural chemicals into streams from adjacent croplands, and increased bank stability. Ultimately, all of the covered restoration activities should provide long-term benefits by improving existing conditions for many of these species. The duration of these benefits will depend on the specific activity and any other actions that may occur in the future to extend the current benefits at a project site.

4.1.2.1 Vegetation

All of the proposed CPs would add or enhance native vegetation and result in a positive impact on vegetation resources within the ROI. The addition of filter strips would create narrow bands 50–150 feet in width of grass or other permanent native vegetation on areas adjacent to streams, lakes, ponds, wetlands, water-filled ditches, sinkholes, and groundwater recharge areas (NRCS 2000a). Implementation of riparian buffers would create areas 50–180 feet in width of trees and shrubs on acreage located by perennial or intermittent streams, lakes, ponds, wetlands, seeps, and areas of groundwater recharge (NRCS 2000b). Wetland restoration would involve planting or restoring native woody vegetation or grasslands associated with wetland areas to restore the function of the wetland (NRCS 2000c). Implementation of marginal pasture wildlife habitat buffers would result in the enhancement or restoration of existing vegetation in marginal pasturelands with primary grass, shrub, and forb communities to improve water quality of perennial or intermittent streams (FSA 2003b). Marginal Pastureland Wetland Buffers (CP30) would enhance or restore native plant communities associated with wetland resources (FSA 2003b).

To restore or enhance native vegetation within the ROI, some herbicides may be used. Herbicides used during CP implementation would be pre-approved by the governing Federal agency of the specific site and applied strictly according to the label directions to minimize the threat to biological resources within the area. The best management practices (BMP) for minimizing effects to native vegetation during herbicide application can be found in section 2.4 and section 2.5.6 of Appendix F. Additional activity-based BMPs (vegetation planting, fence installation, riparian, instream, and streambank work, mechanical activities, and livestock watering facilities and spring developments) are also found in section 2.4 of Appendix F.

4.1.2.2 Terrestrial Wildlife

Implementation of the proposed CPs would enhance and restore wildlife habitat resulting in a beneficial impact to wildlife species within the ROI. The establishment of filter strips would create narrow bands of grasses or other permanent vegetation that would provide valuable wildlife habitat. Filter strip areas are often used by ground-nesting bird species for nesting cover and winter thermal cover. Filter strips also offer grazing forage for wildlife as well as nectar and pollination areas for insects (NRCS 2000a). Acreage enrolled in CREP would be planted with native vegetation; however, landowners may also request introduced grasses to create vegetative diversity. Establishing a filter strip of native grasses on one side of a water body and a filter strip of introduced grasses on another will create diverse wildlife habitats adjacent to each other (NRCS 2000a). Filter strips may require mowing to stimulate vegetative growth. Mowing should take place before or after the nesting time for ground-nesting birds, which generally occurs during the month of August.

The establishment of riparian buffers strips would create areas of native trees and shrubs located adjacent to streams, lakes, ponds, wetlands, seeps, and groundwater recharge areas. The woody vegetation established in buffers would provide food, cover, and travel corridors for resident wildlife. Riparian buffers 50–180 feet wide may be attached to pre-existing vegetation, such as windbreaks or shelterbelts (NRCS 2000b). Connecting riparian buffers with pre-existing vegetation would maximize local forest habitat for wildlife. Riparian buffers could be planted in specific patterns and with vegetation types to benefit resident wildlife.

Riparian buffers should not be planted in areas of grassland that currently do not contain woody vegetation, as this may increase predation and brood parasitism on grassland nesting species. Non-game migratory songbirds often use grassland areas for nesting and brooding areas. Introducing woody vegetation into these areas could have a detrimental effect on grassland species. Also, as buffers mature, periodic harvesting of some trees may be necessary. Such harvest may temporarily disrupt daily migration patterns of resident wildlife.

Wetland restoration would enhance wildlife habitat; providing valuable resources for migratory shorebirds, waterfowl, reptiles, amphibians and other terrestrial wildlife species. Approximately 30 percent of Oregon's 164 resident terrestrial vertebrate wildlife species use wetland resources regularly for food, water, nesting, and thermal cover (Oregon Habitat Joint Venture [OHJV] 2004). In addition, millions of migratory bird species use these wetlands as stopover areas from the Pacific Flyway (OHJV 2004).

Human disturbances for maintenance procedures of wetland-related CPs should be minimal during the presence of waterfowl. Regular human disturbance may cause waterfowls to relocate to other areas, lowering the productivity of these species or abandonment of young broods. Screened buffer zones could be used to minimize disturbance to these species during maintenance procedures (NRCS 2000c).

Implementation of Marginal Pastureland Wildlife Habitat Buffers (CP29) and Marginal Pastureland Wetland Buffers (CP30) would establish or restore native vegetation communities associated with the

area. While the established vegetation would be planted primarily to restore water quality, these areas would also be valuable habitat for nesting, brooding, thermal cover, food source, and travel corridors for wildlife. Implementation of CP29 and CP30 would establish vegetative buffers adjacent to water sources often frequented by resident and migratory wildlife, offering these species cover from predation and thermal cover in adverse weather. The BMPs for minimizing effects to terrestrial wildlife during vegetation planting, fence installation, riparian, instream, and streambank work, mechanical activities, and livestock watering facilities and spring developments can be found in section 2.4 of the Biological Assessment (Appendix F). Herbicide limitation on deer habitat can be found in section 4.3.1.1 of Appendix F.

4.1.2.3 Aquatic Wildlife

Implementation of the proposed CPs would restore and enhance aquatic species habitat, as well as improve overall water quality and temperature. Establishing permanent vegetative filter strips would reduce sediment, nutrient, pesticide, and other contaminate runoff into water sources. Pollutants would be taken up by the vegetation, while sediment would settle to the bottom of the strips rather than into water sources. Currently, high sedimentation loading accounts for a large portion of water body impairments in Oregon (ODEQ 2002). These sediments may cover larger, gravel-like sediment lining the bottom of water channels. These gravel substrates are required by several aquatic species including trout for spawning areas.

Riparian Buffers (CP22) and Marginal Pastureland Wildlife Habitat Buffers (CP29) would establish native woody and non-woody vegetation around water sources in the ROI. The addition or enhancement of native vegetation would help promote a more diverse selection of aquatic insects available for fish consumption. In the long term, the root systems of trees established in the riparian buffers would stabilize stream banks, resulting in less sedimentation runoff. Once the buffers are mature, fallen trees and debris would eventually create cover areas for aquatic species and induce channel morphology that would create pools, riffles, and gravel beds for spawning habitat. Shade from overstory trees would promote cooler water and higher oxygen contents in streams and rivers. High water temperatures reduce the amount of dissolved oxygen water can retain. High temperature and low dissolved oxygen content are currently among the highest impairments to Oregon surface water resources (ODEQ 2002). In addition, riparian area buffers would filter out large amounts of industrial and agricultural pollution entering streams.

Wetland Restoration (CP23) and the establishment of Marginal Pastureland Wetland Buffers (CP30) would restore or enhance the native vegetation associated with wetlands. Implementation of these CPs would restore the functionalism of degraded wetlands and buffer areas around wetlands to reduce pollutant and sediment loading. Wetlands benefit all aquatic species by acting as nutrient sinks, reducing pollutants such as coliform, and acting as areas for sediment to settle out of water columns. Freshwater fish, such as walleye, yellow perch, bullhead catfish, and bluegill, use wetlands in the floodplains of large rivers for spawning areas and often leave open lakes to spawn in shallow wetlands. Commercial and game fish, such as striped bass, salmon, and shellfish species, depend on the presence of coastal wetlands for spawning and rearing areas (USFS et al. 1995).

Direct physical harm to fish, mammals, invertebrates, and plants is not expected from most CREP projects. However, while fish and wildlife are expected to temporarily vacate construction areas where they could be physically harmed in many cases, ground disturbances and the use of equipment and vehicles could directly affect fish redds, fish in isolated habitats such as springs or ponds, or sites that support invertebrates or plants that are not able to move away from construction disturbances.

The BMPs for minimizing effects to aquatic wildlife during vegetation planting, fence installation, riparian, instream, and streambank work, mechanical activities, livestock watering facilities and spring

developments can be found in section 2.4 of Appendix F with specific BMPs on anadromous fish in section 2.5.1.

Potential physical impacts to fish should be minimized on projects where water is diverted and pumped for livestock watering facilities or irrigation of revegetated areas due to the use of fish screens that meet NMFS screening criteria. The installation of pumps for water diversions over 0.5 cubic feet per second (cfs) is not covered under this programmatic consultation in areas where listed suckers or Oregon chub may occur due to the potential for these species to become entrained or impinged on fish screens, and the need for further effects analyses and project design considerations on larger diversions. However, most if not all CREP activities involving water diversions (i.e., irrigation and watering facilities) will involve less than 0.5 cfs and will be covered.

4.1.2.4 Threatened, Endangered, and Sensitive Species and Their Defined Critical Habitat

The majority of Oregon's threatened and endangered species are fish, primarily salmonids. Salmonid habitat analysis performed by the State of Oregon in 2000 indicated that good habitat would comprise all or some of the following benchmarks: (1) greater than 35 percent pool area, (2) less than 12 percent fine substrate in riffles, (3) greater than or at least 35 percent gravel substrate in riffles, (4) a volume of greater than 20 woody debris pieces lodged within 100 meters of the water channel, (5) greater than 70 percent shaded, and (6) riparian conifer density of greater than 150 large conifers per 305 meters (Flitcroft et al. 2002). Under the proposed action, the benchmark criteria would be reached over time, resulting in a positive effect on threatened and endangered fish species.

Filter Strip (CP21) establishment would reduce the amount of fine sedimentation loading into water sources. Stream bed spawning areas for most salmon, steelhead, trout, and sucker species should consist of pea- to orange-size gravel substrate that is free of fine sedimentation (Pacific States Marine Fisheries Commission [PSMFC] 2006). Juvenile mortality of these species is often due to predation and human disturbances such as high siltation rates that ruin spawning beds or smother eggs. Implementation of filter strips would reduce fine sedimentation loading, as well as reduce pollutants entering water sources.

Implementation of Riparian (CP22) and Marginal Pastureland Wildlife Habitat Buffers (CP29) would provide the highest benefit to threatened and endangered fish species in Oregon. Riparian buffers would be planted adjacent to water sources to minimize pollutant and sediment runoff. The establishment of overstory vegetation would create shade over the water, resulting in decreased water temperatures and increased dissolved oxygen content, two of the highest impairments to Oregon water sources (ODEQ 2002). Salmonids are primarily cold water species that require a temperature of approximately 39.2–55.4 degrees Fahrenheit (4–13 degrees Celsius) (Pacific Fisheries Management Council [PFMC] 2000). In times of increased temperature, egg emergence may be accelerated causing hatching of smaller than average young, increased susceptibility to parasites in adults and young, and an increase in metabolism that makes it necessary for the fish to feed more often. Cooler water also holds dissolved oxygen more efficiently than warmer water. A decrease in dissolved oxygen reduces the survival of salmonid eggs, causes young to be smaller at emergence, increases physiological stress, and reduces salmonid growth (PFMC 2000). After riparian vegetation is mature, debris and downed woody vegetation would help create pools and cover from predation within streams, creating juvenile rearing habitat for listed salmonids. Vegetation would also stabilize stream banks, resulting in less fine sedimentation runoff going into streams and allowing gravel substrate to be available for spawning habitat.

Wetland Restoration (CP23) and the implementation of Marginal Pastureland Wetland Buffers (CP30) would restore and enhance wetlands within Oregon. Wetlands and estuaries offer juvenile-rearing habitat for some salmonids, as well as act as nutrient sinks and water purification areas that restore water quality. The draining and filling of wetlands and coastal estuaries has resulted high numbers of salmonid

mortalities (PSMFC 2006). During their lifecycle, species such as chum salmon rely heavily on wetlands and coastal estuaries to feed on copepods, amphipods, and small crustaceans, as well as areas to provide protection from predation. Wetland buffers would shade wetland and estuary areas to decrease water temperature. Increased water temperature in wetlands leaves salmonids more susceptible to predation and disease.

Implementation of the Alternative 2, the proposed action, is not expected to largely affect terrestrial or avian federally-listed species. Avian species may benefit from increased roosting and nesting areas. Terrestrial species may benefit from increased travel corridors and vegetative diversity. Short-term disturbance to and displacement of threatened and endangered fish and wildlife may occur from CREP activities because of construction noise, human presence, or activities in the area that may disturb or displace animals that may be foraging, resting, nesting, denning or moving through the area. To avoid or minimize these potential effects to fish and wildlife, applicable BMPs discussed below will be followed. It is expected that any adverse effects to listed species due to disturbance or displacement will be minimal in terms of both intensity and duration.

CP practices would be pre-approved by the governing agency to ensure no harm occurs to any fish or wildlife species, or to their terrestrial or aquatic habitats. Applications of any of the above practices will be used strictly according to label directions and directions of the governing agency.

Best management practices for minimizing effects to threatened, endangered, and sensitive species and their defined critical habitat wildlife during vegetation planting, fence installation, riparian, instream, and streambank work, mechanical activities, livestock watering facilities and spring developments can be found in section 2.4 of the Biological Assessment (Appendix F) with specific BMPs for listed inland fish, Colombian white-tailed deer, vernal pool fairy shrimp, Fender's blue butterfly, and listed plants in sections 2.5.2, 2.5.3, 2.5.4, 2.5.5, and 2.5.6 respectively. Herbicide limitation on deer habitat can be found in section 4.3.1.1 of Appendix F.

Soil disturbing activities and the use of equipment will not occur in areas with listed plants and Fender's blue butterfly, with the exception of mowing. There are likely to be short-term adverse effects from mowing. However, the long-term effects have been shown to be almost exclusively beneficial. Extensive research has been conducted in the last decade on the effects of various mowing regimes on rare species; these studies have shown that mowing is an important tool for restoring native prairies and increasing populations of associated sensitive prairie species (U.S. Fish and Wildlife Service 2008a). Herbicide applications also have the potential to cause adverse physical effects to listed species. Possible adverse effects to terrestrial species include impacts from direct spray or drift from herbicide applications, or direct impacts from equipment leaks or fuel spills. Possible adverse effects to aquatic species include runoff of eroded sediment and adsorbed chemicals to streams. BMPs discussed in sections 2.4 and 2.5 of Appendix F have been developed to avoid and minimize these potential effects.

A Biological Opinion was issued by the United States Department of Interior, Fish and Wildlife Service in July of 2009. The Biological Opinion determined that some "take" (incidental harm due to proposed action) may occur to threatened or endangered species, but "this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of designated or proposed critical habitat when the reasonable and prudent alternatives... are implemented".

Reasonable and prudent measures deemed necessary and appropriate by the USFWS to minimize take of the listed species include:

- FSA is responsible for ensuring that CREP activities subject to this programmatic consultation are carried out in a manner that is consistent with its provisions;

- Water diversions in areas with listed suckers and Oregon chub will be limited; and
- FSA will submit an annual report to the Service summarizing CREP activities and listed species encountered.

Additional information on these reasonable and prudent measures can be found in Appendix G (USFWS Biological Opinion).

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) has agreed to allow project implementation under the June 1999 Biological Opinion prepared jointly with the USFWS and NMFS (Appendix H). An updated Biological Opinion is currently being prepared; however, the final completion date has not been determined. Under the 1999 Biological Opinion, it was found that 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 Biological Assessment.

The US Fish and Wildlife Service and NMFS 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 Oregon 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.

- FSA shall ensure the development and implementation of a comprehensive monitoring program to assess the effectiveness of the CREP in meeting its objectives;
- FSA shall avoid take of listed fish in any wetland restoration activities that are part of the Oregon CREP;
- FSA shall 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;
- FSA shall 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
- FSA shall minimize take associated with instream work proposed in the CREP BA (i.e., streambank stabilization, off-channel livestock watering facilities, and livestock crossings) by applying appropriate timing restrictions.

In order to be exempt from the prohibitions of Section 9 of the Endangered Species Act, the FSA must comply with the non-discretionary terms and conditions which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements discussed in section 8.4, Terms and Conditions, of the 2009 Biological Opinion (Appendix G) and Terms and Conditions (page 83) of the 1999 Biological Opinion (Appendix H).

Conservation recommendations are made by the USFWS and NMFS to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. In addition to the BMPs proposed by the Biological Assessment (Appendix F), conservation recommendations are outlined in section 9 of the 2009 Biological Opinion (Appendix G) and on page 87 of the 1999 Biological Opinion (Appendix H).

If in the event the amount or extent of incidental take is exceeded; new information reveals effects of the proposed action that may affect listed species or critical habitat in a manner or to an extent not considered in the Biological Opinion; the proposed action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in the Biological Opinion; or a new species is listed or critical habitat designated that may be affected by the action, formal Section 7 consultation will be required.

4.2 CULTURAL RESOURCES

4.2.1 Alternative 1—No Action

Under the no action alternative, farming practices in the land proposed for CREP enrollment would continue. Though the continuation of farming in previously disturbed areas is not expected to impact cultural resources, a change in farming practices that would disturb previously undisturbed areas may result in impacts to known or unknown archaeological, architectural, or traditional cultural resources.

4.2.2 Alternative 2—Proposed Action

As this PEA does not address specific locations, detailed cultural resource information and determination of effects is not offered at this time and all actions should be reviewed with ORSHPO, tribes, and participating State and Federal agencies during the planning and implementation phases. When specific ROIs are identified by legal description and actions are proposed, a Class I literature search should be conducted to determine if any previous cultural resource inventories have been conducted on these properties and if any further investigations or mitigations are warranted.

Potential may be great for recorded and unidentified archaeological sites to exist on CREP properties, especially those near water sources (rivers and streams, springs, marshes), areas of known habitation or other cultural activities, certain topographic or geologic features, and prehistoric and historic trails.

The following assumptions were considered during the cultural resources analysis for the CREP PEA:

- Actions in this PEA may have potential direct, indirect, and cumulative effects on cultural resources.
- All project planning and work initiated under this PEA will meet required Federal and State historic preservation statutes, regulations, and guidelines. Any permitting or ground-disturbing actions will be preceded by consultation with ORSHPO and tribal representatives, and followed by archival and field investigations as warranted.
- Expected and cumulative adverse effects on identified cultural resources, including physical and visual impacts, will be determined and mitigation plans developed for heritage resource protection and for the treatment of TCPs and unanticipated discoveries.
- Enhancement projects will be conducted on a mosaic of Federal, State, and private lands and different ecologies. Some environmental settings will carry the potential for more cultural and paleontological resources. Each project will require participation by and consultation with several public and private agencies, some of which will have oversight and permitting roles.

4.3 WATER RESOURCES

4.3.1 Alternative 1—No Action

Under the no action alternative, the CPs described in Section 2.2 would not be implemented. Water resources within the State of Oregon are likely to continue to be subject to impairments such as low dissolved oxygen content, the presence of fecal coliform, high sedimentation levels, unbalanced pH levels, fluctuating water temperature, presence of heavy metals, DDT, *E. coli* bacteria, and aquatic weeds and algae blooms.

4.3.2 Alternative 2—Proposed Action

4.3.2.1 *Surface Water*

Implementation of the proposed CREP agreement would have long-term positive effects on surface water used for drinking, cold water fisheries, agricultural usage, industrial water supply, and recreational usage. The CPs described in Section 2.2 are designed primarily to improve water quality.

Under Alternative 2, Filter Strips (CP21) and Riparian Buffers (CP22) would be established on areas immediately adjacent to permanent bodies of water. Filter strips and riparian buffers are designed to reduce the runoff of sediments, nutrients, pesticides, and other contaminants by slowing the velocity of runoff. A decrease in velocity allows sediments to settle and soluble pollutants to be taken up by vegetation before reaching water bodies.

Wetland Restoration (CP23) is designed to restore the functions of natural wetlands. Wetlands purify water by removing phosphorus and nitrogen content commonly found around agricultural communities. Removing phosphorus and nitrogen from water sources reduces algae blooms that deplete the oxygen content in surface water. Implementation of Marginal Pastureland Wetland Buffers (CP30) would restore or enhance plant communities associated with existing or degraded wetlands to reduce nutrient and pollutant levels entering surface water.

Marginal Pastureland Wildlife Habitat Buffers (CP29) would establish buffers of native plant communities on marginal pastureland. These buffers would be situated adjacent to permanent water bodies to stabilize stream banks and reduce pollutant and sediment runoff.

Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary negative impacts to surface water quality. The use of filter fencing or similar mitigation practices would reduce these impacts.

4.3.2.2 *Groundwater*

Implementation of the proposed CREP agreement would result in a positive effect on groundwater quality within the State. The enhancement or addition of native vegetation through the proposed CPs would slow the rate of rainwater flow over the ground, creating greater rates of aquifer recharge. The improvement in surface water quality discussed previously would result in improved quality of groundwater recharged by these surface waters. The leaching of nutrients into the groundwater would be reduced due to the discontinuation of agricultural practices on enrolled acreage.

4.3.2.3 *Wetlands*

Implementation of the proposed action would result in a positive effect on wetlands adjacent to acreage enrolled in CREP. Marginal Pastureland Wetland Buffers (CP30) would be established on degraded pasturelands to restore hydrology and plant communities associated with existing or degraded wetlands.

These buffers are expected to enhance water quality and reduce the amount of nutrients and pollutants entering waterways. The removal of some land from agricultural use may affect the number and size of wetlands formed by anthropogenic features associated with agricultural activities such as reservoirs and drainage channels; however, this effect is expected to be minor.

4.3.2.4 Floodplains

The establishment of native vegetation on enrolled acreage may have a minor positive effect on floodplains. Implementation of the proposed CPs would help reduce erosion and improve the function of floodplains.

4.4 EARTH RESOURCES

4.4.1 Alternative 1—No Action

Under Alternative 1, the no action alternative, the CPs described in Section 2.2 would not be implemented. The current rates of erosion and the changes in topography due to erosion would be expected to continue. There would be negligible effects to paleontological resources.

4.4.2 Alternative 2— Proposed Action

Long-term positive impacts to topography and soils are expected to occur under Alternative 2. Implementation of the proposed CPs would result in localized stabilization of soils and topography as a result of decreased erosion and runoff. In pasturelands, exclusion of cattle from streams and riparian areas bordering streams would reduce stream bank destabilization, resulting in reduced rates of sedimentation and subsequent improvements to water quality. Establishing permanent vegetation on former croplands would reduce erosion by wind and water. Short-term disturbances to soils during implementation of CPs may include tilling or installation of various structures such as fences, breakwaters, and roads. These activities may result in temporary increases in soil erosion. Managed haying and grazing would not be conducted on enrolled CREP lands. There would be negligible effects to paleontological resources.

4.5 AIR QUALITY

Impacts to air quality in attainment areas would be considered significant if:

- Any national, State, or local ambient air quality standard is violated by pollutant emissions associated with the proposed action
- Sensitive receptors (e.g., residential areas, hospitals, daycare facilities, elementary schools, parks, hospices, and outdoor restaurants) are exposed to substantially increased pollutant concentrations during implementation of the proposed action
- Pollutant emissions associated with the proposed action exceed any significance criteria established by the State Implementation Plan.

4.5.1 Alternative 1—No Action

Implementation of Alternative 1 would not change existing air quality conditions. The CPs described in Section 2.2 would not be implemented.

4.5.2 Alternative 2— Proposed Action

Implementation of the CPs proposed in the Oregon CREP may have positive effects on air quality within the ROI. Establishing vegetation would increase the amount of pollutants removed annually by trees each year. Trees remove many pollutants from the environment including nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, and some particulate matter. A study conducted by Dr. Dave Nowak of the USFS estimated that in the metropolitan areas of Portland, Oregon, trees account for 2,000,000 pounds of pollutants being removed from the environment (American Forests 2004). Implementing the proposed CPs in Oregon may result in a benefit to air quality; however, it is not possible to quantify this benefit at this time.

Removing land from agricultural practices and establishing vegetation on these lands would reduce the amount of exposed bare soil within the State. Minimizing soil exposure would have long-term positive impacts to air quality standards at the local scale.

Implementation and maintenance procedures associated with the CPs may include activities such as tilling and burning. These activities may temporarily and negatively impact local air quality. Watering areas before and after tilling would reduce the amount of PM₁₀ concentrations released into the air. Prescribed burns used during implementation would have a short-term negative impact on air quality. The amount of prescribed burning that would be required during implementation is not known, but it is not expected that impacts associated with burning would be significant.

Installation of various structures such as roads, firebreaks, and fences may require the use of heavy-duty diesel construction vehicles. Primary emissions from construction vehicles include carbon monoxide and PM₁₀. Best management practices would be used during construction activities to reduce the amount of emissions.

4.6 RECREATIONAL RESOURCES

4.6.1 Alternative 1—No Action

Under Alternative 1, CREP would not be implemented. CPs would not be used to improve lands and waters used by the public for hunting, fishing, wildlife watching, hiking, boating, swimming, and other water-related activities.

4.6.2 Alternative 2—Proposed Action

Implementation of Alternative 2 would have a positive and long-term impact on recreational resources within the CREP area. Establishing the proposed CPs would increase the availability and quality of habitat for terrestrial wildlife species. This, in turn, would increase the abundance of these species and increase the opportunities for hunting. By improving water quality in the CREP area, the CPs would have beneficial impacts in the CREP area as well as downstream. Improved water quality would be able to support an increase in fish populations and provide for additional fishing opportunities. The increase in game and fish populations may increase funds spent on hunting and fishing licenses and improve socioeconomic conditions in the area (see Section 4.7, *Socioeconomics*). In addition to hunting and fishing impacts, the proposed CPs would increase the desirability of land to be used for hiking or camping by improving overall aesthetics. Construction activities may displace wildlife species during installation of the proposed CPs; however, this impact would be temporary.

4.7 SOCIOECONOMICS

4.7.1 Alternative 1—No Action

Under Alternative 1, CREP would not be implemented and socioeconomic conditions would continue to follow the trends associated with the State of Oregon and the Pacific Northwest region of the U.S. Unique and prime farmland areas would continue to be targeted for the purchase of conservation easements; however, the small percentage of farmland placed in conservation easements is not likely to contribute significantly to slowing farmland conversion.

The loss and degradation of anadromous fish habitat is likely to continue under Alternative 1. As a result, tribal fisheries managers would continue to reduce harvests in response to declining wild salmon populations.

4.7.2 Alternative 2—Proposed Action

The implementation of Alternative 2 would result in a maximum of 100,000 acres being conserved for a period of 10–15 years. This action would result in a net present value of approximately \$9 million (Appendix E). This estimate does not include the potential bonus payments for water right leases and contributions from TWO.

This action would result in a maximum loss of 100,000 acres of agricultural land. In 2002, there were 122,845 hired farm workers on the 17,080,422 acres of farms within the ROI, accounting for a payroll of \$620,422,000 (USDA 2004b). The implementation of Alternative 2 would potentially decrease the agricultural lands to 16,980,422 acres and may result in the loss of approximately 719 hired farm worker positions at an estimated cost of approximately \$3.6 million per year when all 100,000 acres are under contract. The loss of these positions would account for less than 1 percent of the hired farm worker positions available in 2002. The loss of production on 100,000 acres would reduce the amount of total farm production expenditures, less hired farm labor and contract labor, by approximately \$12.3 million per year, or less than 1 percent of the total 2002 farm production expenditures (USDA 2004b).

Based on average Oregon rental rates, CREP enrollment is estimated at an average of \$90 per acre for the 100,000 acres proposed (Loop 2005). In addition, an annual incentive payment of 25 percent of annual rental payments for filter strips and 50 percent for buffers and wetland restoration and an average annual maintenance fee of \$7.50 are provided to participants.

Three types of one-time incentive payments are also available under the proposed CREP agreement. The first is a signing incentive payment for CP21, CP22, CP29, and CP30 (Filter Strips, Riparian Buffer, Marginal Pastureland Wildlife Habitat Buffer, and Marginal Pastureland Wetland Buffer, respectively) of \$10 per acre for each acre enrolled for each full year of the contract (USDA 2000). The second type, a practice incentive payment, would be equal to 40 percent of the total eligible cost of the installation of CP21, CP22, CP29, and CP30 (USDA 2000). The third type is a cumulative impact incentive payment. It is based on enrollment of at least 50 percent of a streambank within a 5-mile stream segment in this CREP agreement, and would equal four times the applicable base rental rate for each acre enrolled. For Wetland Restoration (CP23) a one-time incentive payment of 25 percent of the cost of hydrology restoration would be provided.

Under TWO, CP22 (Riparian Buffer) would be provided with additional payments. CWS would cover all implementation costs not covered by CCC or the State if the producer has CWS implement the practice. Producers would also receive annual incentive payments of \$127.50 per acre for irrigated and \$102.94 per acre for non-irrigated croplands. Direct cumulative impact incentive payments would be provided when a

total of at least 50 percent of a streambank, at least 2 miles long and within a 5-mile stream segment, is enrolled.

It is expected that enrollment in CREP would improve stream habitat for threatened and endangered fish species and wildlife habitat for game species such as black-tailed deer, sage grouse, and ring-necked pheasants. This may increase wildlife-related recreation opportunities and thus generate associated economic activity within the ROI. As reported by the Economic Research Service (ERS) (2004), non-market benefits from wildlife viewing associated with the implementation of CRP in the U.S. are estimated to be \$737 million annually. In Oregon, Washington, and California, these benefits are estimated at \$1 million. These are conservative estimates and do not include improved hunting for many species and the increased protection CRP land affords threatened and endangered species, for which good nationwide data do not exist (ERS 2004).

Hines, Sommer, and Petrulis (1991) noted that enrolling lands into CRP negatively affected agricultural-based industries such as transportation and processing. The replacement of expenditures that would have supported local agriculture-related industries with CRP payments is often spent on other commodities within the local community. Impacts are generally greater where agriculture is the dominant economic activity and CRP enrollment is high.

The purpose of the proposed action is to improve water quality and restore aquatic habitat. By implementing the CREP agreement, the loss and degradation of anadromous fish habitat due to agriculture-related impacts would decrease. Tribes that rely on salmon for their religion, culture, and economics would be directly and positively affected by the proposed action.

As the ROI would not be considered an area of concentrated minority population or a poverty area, there would be no impacts to environmental justice as a result of the proposed action.

5.0 CUMULATIVE IMPACTS AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 CUMULATIVE IMPACTS

5.1.1 Definition of Cumulative Impacts

As defined by CEQ regulations:

“Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (‘Federal or non-Federal’) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR 31 part 1508.7, 2009)

CEQ guidance suggests that the first steps in assessing cumulative impacts involve defining the scope of the proposed action and other actions and evaluating the nature of potential interactions between the actions (CEQ 1997). Scope must consider geographic and temporal relationships between the proposed action and other actions. 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 would tend to offer a higher potential for cumulative effects.

For the purposes of this analysis, the ROI includes land within the Coastal Basin, the Columbia Basin, and the Interior Drainages Basin proposed for enrollment in the CREP and listed in Section 1.2.1. The primary sources of information used to identify reasonably foreseeable future actions are public documents prepared by Federal, State, and local government agencies.

5.1.2 Past, Present, and Reasonably Foreseeable Future Actions

The Oregon NRCS manages the implementation of several programs that are focused on conserving and enhancing natural resources within the State. These programs are summarized in the following subsections to demonstrate the types of past, present, and reasonably foreseeable future actions that may occur in the ROI.

5.1.2.1 Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) provides technical, financial, and educational assistance for farmers and ranchers to address natural resources concerns on their private working lands. EQIP promotes agricultural production and environmental quality as compatible national goals and provides incentive payments and cost shares to implement selected CPs. NRCS provided almost \$18 million in EQIP assistance to Oregon farmers and ranchers in 2003 (NRCS 2005a).

5.1.2.2 Farm and Ranch Lands Protection Program

The Farm and Ranch Lands Protection Program, formerly known as the Farmland Protection Program, protects working agricultural land from conversion to non-agricultural uses. The program provides funding to State, tribal, and local governments and non-governmental organizations to acquire conservation easements from landowners. Participating landowners agree not to convert their land to non-agricultural uses and to develop and implement a conservation plan for any highly erodible land. In 2003, NRCS provided approximately \$1 million to assist in the acquisition of conservation easements on 13,323 acres of farmland in Oregon (NRCS 2005a, 2005b).

5.1.2.3 Grassland Reserve Program

The Grassland Reserve Program (GRP) is a voluntary program for landowners to protect and restore grassland, including rangeland, pastureland, shrubland, and certain other lands, while maintaining these areas as grazing lands. The program emphasizes support for grazing operations, plant and animal biodiversity, and grasslands most vulnerable to conversion to cropland, urban development, or other uses. In 2003, there were 15 GRP projects totaling 11,610 acres in Oregon (NRCS 2005c).

5.1.2.4 Wetlands Reserve Program

WRP is a voluntary land retirement program. It is designed to assist landowners in restoring and protecting wetlands by entering into permanent easements, 30-year easements, and cost-share agreements (NRCS 2005d). In 2003, the WRP allocation to Oregon for 18 contracts covering a total of 2,951 acres was almost \$8.5 million (NRCS 2005a, 2009a).

5.1.2.5 Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) offers opportunities to landowners to develop and improve wildlife habitat on private lands. Through the program, NRCS provides technical and financial assistance to landowners to develop upland, wetland, riparian, and aquatic habitat areas on their property. WHIP places special emphasis on establishing CPs that benefit wildlife and fisheries habitats of threatened and endangered species (NRCS 2009b). In 2003, NRCS obligated \$290,000 in WHIP financial assistance to three contracts covering 311 acres in Oregon (NRCS 2005d).

5.1.3 Analysis of Cumulative Impacts

When considered in combination with other past, present, and reasonably foreseeable future actions, the incremental impact of the proposed action is expected to result in net positive impacts to biological, water, earth, and recreational resources in the area proposed for CREP enrollment and in waters downstream. No negative cumulative impacts to any other resource discussed in Chapter 3 are expected.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

As required by NEPA, any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented must be identified in environmental analyses. Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effect that this use may have on future generations. Irreversible commitments are those that consume a specific resource that is renewable only over a long time period. Irretrievable commitments are those that consume a specific resource that is neither renewable nor recoverable for use by future generations. No irreversible or irretrievable resource commitments are expected from implementation of the proposed action.

6.0 MITIGATION

This chapter presents mitigation measures that would be used to avoid or lessen impacts to biological, cultural, and earth resources. Each measure must be addressed on an individual contract basis through the conservation plan and associated environmental evaluation.

6.1 BIOLOGICAL RESOURCES

- Surveys will be conducted during the appropriate flowering period if a project site is known to be in a potentially suitable habitat or soil type. Surveys will be conducted by a botanist or otherwise qualified individual following a standardized or otherwise appropriate protocol for the specific plant. Project sites occupied by listed plants species may be mowed to control or remove woody vegetation or invasive non-native vegetation when listed plants are dormant and seeds have been dispersed. Mowing activities will require the use of low ground impact equipment. Mowers will be set at a height so that blades gouge no more than five percent of the ground. All equipment will be cleaned of invasive and non-native plant materials before entering an occupied site to prevent the dispersal of seeds or other reproductive plant parts. Other than mowing, mechanical disturbance, such as tillage, fence building, and construction of livestock watering facilities, will not take place in locations that will cause physical harm to listed plants. Opportunities for benefiting listed plants and helping with their recovery will be explored on a case-by-case basis if they occur in the vicinity of CREP projects.
- Only native trees and shrubs will be used for planting. All materials must be from an appropriate seed zone and certified as disease-free. Seeding to establish riparian buffers will use native seed that is certified weed-free.
- Where wildlife movement is a concern, maximum fence height shall not exceed 42 inches. Escape ramps will be installed on all livestock and wildlife watering facilities.
- Technical staff will survey for all listed species that may occur in the area prior to completing the CREP conservation plan for a site. Technical staff will work with landowners to plan construction and other activities to minimize or eliminate adverse effects to listed species during critical activity periods, such as migration, breeding, and nesting. Minimal direct line of sight distances will be used for listed mammalian and avian species to minimize or eliminate noise and visual disturbances. Noise and visual disturbances will be limited to daylight hours for all restoration activities.
- Whenever possible, livestock will be excluded from streams and riparian areas altogether. If livestock crossings are needed, livestock fords will only be constructed on the smallest streams, generally 10 feet or less in width at mean high water level. Fords will not be placed on the mid- to downstream end of gravel point bars. Fords will generally be 30 feet or less in width. Fords will be appropriately rocked to stabilize soils/slopes and prevent erosion. Fords will be placed on bedrock or stable substrates whenever possible. 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.
- 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. Structures/techniques must be placed and/or anchored appropriately to prevent adverse impacts to down slope habitats. 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. Any areas of bare soil left after fence or livestock construction will be seeded to an appropriate cover to prevent erosion.

- To prevent disturbance and harm to fish species from instream work, the Oregon guidelines for the timing of in-water work will be followed for each affected stream reach, unless the Oregon Department of Fish and Wildlife and NMFS approve an extension based on current year site-specific conditions. In reaches where the ODFW inwater work period conflicts with the needs for resident listed fish, ODFW should be contacted for a waiver to the timing restrictions.
- To minimize sediment delivery to streams from mechanical activities and possible physical effects to fish and critical habitat, existing roads or travel paths shall be used to access project sites whenever possible. Any potential spawning habitat shall be surveyed for listed species within 300 feet downstream of a proposed stream crossing. Stream crossings shall not be constructed at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected. Vehicles and machinery must cross streams and riparian areas at right angles to the main channel whenever possible. Equipment use shall be minimized in or adjacent to a stream channel to reduce sedimentation rates and channel instability.
- Hand planting is the preferred technique for all plantings, except for filter strips. Plantings will occur during the appropriate seasonal period for the respective plant species involved. 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 (this consultation only covers projects that involve shaping of up to 30 linear feet of streambank). 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 riprap will be used for streambank stabilization. No streambank stabilization activity will reduce natural stream functions or floodplain connection.
- The boundary of a project site shall be flagged to prevent soil disturbance to areas outside the site. Confine construction impacts to the minimum area necessary to complete the project. Limit the removal of any native vegetation to the amount that is absolutely necessary to complete a construction activity. Slash materials should be gathered by hand or with light machinery to reduce soil disturbance and compaction. Slash control and disposal activities must be conducted in a manner that reduces the occurrence of debris in aquatic habitats. Disturbed areas will be reseeded. Filter strips will be left between disturbed areas and streams.
- Filter strips may need to be mowed periodically to maintain filtering properties. Grassland nesting species may use filter strip areas for nesting, brooding, and cover areas. Before mowing takes place, the area should be inventoried to determine if any grassland species are using the filter strip as habitat. Once species are identified, mowing should be scheduled around nesting and brooding schedules to alleviate detrimental impacts to the species.
- Current or historical grassland areas presently devoid of woody vegetation should not be entered into Riparian Buffers (CP22) or Marginal Pastureland Wildlife Habitat Buffer (CP29) contracts. Areas of grasslands not currently containing woody vegetation should remain so to protect ground-nesting grassland species. Introducing woody vegetation into areas of grassland would increase brood parasitism and predation on grassland nesting species by creating perch sites for avian

predators, such as hawks and owls. Areas of woody vegetation also create travel corridors for terrestrial predators, such as skunks and raccoons. The benefits of woody vegetation in large grassland areas to forest birds and other resident wildlife often do not offset the negative impacts to grassland birds (Naddra and Nyberg 2001).

- Riparian buffers may be harvested periodically to restore productivity of the buffer. Some dead or dying snags should be left for cavity nesting species such as woodpeckers that may inhabit the area. Timing of harvest should not coincide with breeding or rearing times of any sensitive species. Periodic harvesting may temporarily interrupt daily migration patterns of resident wildlife.
- Human disturbances for maintenance procedures of wetland-related CPs should be minimal during the presence of waterfowl. Screened buffer zones may be used to minimize disturbance to these species during maintenance procedures (NRCS 2000c). Regular human disturbance may cause waterfowls to relocate to other areas, lowering the productivity of these species or causing the abandonment of young broods.
- CP implementation that requires the use of herbicides, pesticides, fertilizers, lime, or any other such applications, as well as the timing of implementation, must be pre-approved by the governing agency to ensure no harm occurs to any fish or wildlife species, or to their terrestrial or aquatic habitat. Applications of any of the above practices will be used strictly according to label directions and directions of the governing agency. Herbicides will not be applied on project sites with vernal pools in counties where vernal pool fairy shrimp occur.
- Appropriate materials and supplies (e.g., shovels, disposal containers, absorbent materials, first aid supplies, and clean water) will be available on-site to cleanup any small accidental spills in accordance with product Material Safety Data Sheets and labels. Significant hazardous spills will be reported to the Oregon Emergency Response System at 1-800-452-0311 (system available 24 hours a day). (Also see ODEQ emergency response web site at <http://www.deq.state.or.us/wmc/cleanup/spl0.htm> for more information.) The Oregon Poison Control Center will be contacted at 1-800-222-1222 (24 hours) for assistance in responding to emergency exposures. Project managers will ensure that each applicator is familiar with spill response procedures before commencing herbicide application operations.
- If an area shall disturb 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.
- Project sites within the Alkali subbasin will be surveyed for the Hutton tui chub prior to designing the planting plan. Planting plans will be designed not to create excessive shade that will reduce algae production
- Staging and refueling areas shall be set at least 150 feet from any stream or other waterbody. The size of staging and refueling areas shall be limited and only store enough supplies, materials, and equipment onsite to complete the project. All equipment shall be cleaned to remove external oil, grease, dirt, and mud before beginning operations below the high water mark elevation of a stream. All equipment operated within 150 feet of an aquatic habitat must be inspected daily for fuel leaks before leaving the equipment staging area. All detected leaks must be repaired in the staging area before the equipment resumes operation. All stationary power equipment (e.g., generators) operated within 150 feet of any aquatic habitat must be diapered to prevent leaks and/or enclosed in a containment device (e.g., non permeable drip plan) of adequate capacity to retain equipment fluids (e.g., gasoline, diesel fuel, and oil) if a leak occurs.

- Spring developments shall always be fenced when spring developments are constructed to provide off-stream watering for livestock for CREP projects. Spring development projects will not occur from springs where listed species occur, and water will not be redirected from springs where listed species occur. All troughs and other watering facilities will be equipped with float valves to minimize mud and runoff.
- On project areas where listed species within NMFS jurisdiction may be affected, pumps must meet NMFS' fish screen criteria and be self-cleaning or maintained and operated properly by a designated responsible party.
- On project areas where listed fish species within USFWS jurisdiction may be affected, pumps may be installed if water delivery is under 0.5 cfs (minor volume diversions), self-maintaining pumps are used, and NMFS screen criteria are used. All pumps must be sized to only use water amounts that fall within the allowances of the landowner's documented or estimated historic water use and legal water right(s). Periodic maintenance of fish screens (e.g. cleaning debris buildup and replacement of parts) must be conducted to ensure they are properly functioning.
- On sites where deer occur, landowners will be encouraged to use mechanical methods to control competition around newly planted trees to reduce the need for herbicides. Project personnel will be instructed to reduce vehicle speed around project sites where Columbian white-tailed deer occur to avoid vehicle-deer collisions. Restoration activities (i.e. above ambient noise and activity levels) will not occur in fawning areas from June 1 to July 15. On sites where deer occur, maximum fence height will be 42 inches. Where construction activities are planned in habitat of this species, a pre-construction meeting should be conducted to inform landowners and/or contractors about construction guidelines in Columbia white-tailed deer habitat.
- If Fender's blue butterfly may be present, botanical surveys will be conducted to determine the presence or absence of Kincaid's, spur, or sickle-keeled lupine host plants at each project location. The optimal survey period is May to June. Surveys will be conducted for Fender's blue butterfly during the mid-May to early July flight period on any project sites that support or may support Kincaid's, spur, or sickle-keeled lupine within the Willamette Valley. Site preparation, fence construction, and maintenance of plantings will be conducted when lupine and nectar plants have completed seed production and the butterflies are in a dormant state (i.e. August 15 to February 28). Maintenance activities include: mowing, hand-clearing vegetation from around plantings, and spot-spraying vegetation around plantings. No more than 75 percent of the occupied habitat at any given site will be mowed. Untreated strips of occupied habitat, approximately twelve meters wide, will be evenly distributed throughout the mowed portions of a site. The center of a mowed area will be within 100 meters of untreated occupied habitat, which can serve as a recolonization source. Mowers will be set at a height so that the blades gouge no more than five percent of the ground. Trees will only be planted outside of habitats where the Fender's blue butterfly or Kincaid's lupine occurs or important areas, such as critical habitat, where these species could occur in the future. Early spring mowing (i.e. March 1 to May 15) may be used for management purposes in unoccupied habitat. Mowers will be set at a height to avoid harming low-stature native plants and gouging the ground. Mowing will not occur during this time if Kincaid's lupine is present in the habitat unoccupied by Fender's blue butterflies.

6.2 CULTURAL RESOURCES

- The ORSHPO, along with tribal, Federal, and State agencies with environmental and heritage resources oversight, would be consulted as each individual CREP project is developed and implemented. These offices would be able to indicate if any cultural resources are known within

the ROI or if additional field inventories would be necessary. The ORSHPO and tribal cultural resource offices would offer advice and technical background for specific areas of the State and would support compliance efforts under the *Oregon Historic Preservation Plan* (ORSHPO 2001).

- FSA and ORSHPO offices will communicate with participating tribes to integrate planning with cultural resource protection and mitigation of adverse impacts, as well as soliciting input on the identification and protection of any TCPs.

6.3 EARTH RESOURCES

- Inquiries about Oregon paleontological resources and review of potential impacts by project plans on these resources should be made to the ORSHPO or appropriate Federal and tribal land managers.

This page intentionally left blank

7.0 LIST OF PREPARERS

John Beller

Project Manager, Portage Environmental, Inc.

B.S., Mining Engineering, University of Idaho, 1984

Years Experience: 20

Diane Wheeler

Environmental Scientist/Geographical Information System Specialist, Portage Environmental, Inc.

M.S., Geology with emphasis in Environmental Geoscience, Idaho State University, 2003

Years Experience: 15

Heidi Hall

Wildlife Biologist, Portage Environmental, Inc.

B.S., Biology, University of Idaho, 2003

A.S., Fisheries and Wildlife Management, Hocking College (Ohio), 1999

Years Experience: 4

Susanne Miller

Cultural Specialist, Portage Environmental, Inc.

B.A., Biology, Dana College (Nebraska), 1965

M.A., Anthropology, Idaho State University, 1972

Years Experience: 35

Margo Lasky

Ecologist/Scientific Writer/Editor, Portage Environmental, Inc.

B.S., Ecology, Idaho State University, 1992

Years Experience: 14

Lisa Aldrich

Technical Publications, Portage Environmental, Inc.

Years Experience: 10

Tony Cecchi

Vice President of Planning, Geo-Marine, Inc.

B.S., Industrial Technology, Southern Illinois University, 1992

M.B.A., Business, University of Texas at Dallas, 2004

Years Experience: 18

John Bland

Senior NEPA Program Manager, Geo-Marine, Inc.

B.S., Mathematics, Wake Forest University, 1970

M.A., Economics, University of South Carolina, 1982

Years Experience 25 years

Susan Miller

NEPA Project Manager, Geo-Marine, Inc.

M.A., Anthropology, University of New Mexico, 1988

Years Experience: 19

LIST OF PREPARERS (cont'd.)

Felicia Griego
NEPA Analyst, Geo-Marine, Inc.
B.S., Biology, University of Nevada, Las Vegas, 2001
Years Experience: 4

David Brown
Document Production Manager
Years Experience: 25

8.0 PERSONS AND AGENCIES CONTACTED

Table 12 shows the Federal, State, and local agencies; American Indian tribes; and interest groups contacted for the CREP PEA.

Table 12. CREP PEA Consultation

Name	Title	Agency
Allen, Jeff	Executive Director	Oregon Environmental Council
Ball, Lindsay	Director	Oregon Department of Fish and Wildlife
Beebe, Spencer B.	President	Ecotrust
Bierly, Ken	Acting Director	Oregon Watershed Enhancement Board
Brian, Tom	Chairman, Board of Directors	Clean Water Services
Brunoe, Bruce, Sr.	Chairman	Confederated Tribes of the Warm Springs Reservation
Coba, Katy	Director	Oregon Department of Agriculture
Cowart, Coy	President	Oregon Cattlemen's Association
DeVoe, John	Executive Director	Waterwatch of Oregon
Dillon, Dave	Executive Vice President	Oregon Farm Bureau
Foreman, Allan	Chairman	Klamath Tribes
Hobernicht, Richard W., Col.	District Engineer	U.S. Army Corps of Engineers
Loop, Lois	Conservation Program Specialist	Farm Service Agency, Oregon State Office
Mercier, Mark	Chairman	Confederated Tribes of the Grande Ronde Tribal Council
Merritt, Regna	Executive Director	Oregon Natural Resources Council
Mulkey, Gwen	President	Oregon Women for Agriculture
Paulus, Fritz	Executive Director	Oregon Water Trust
Pigsley, Delores	Chairman	Confederated Tribes of Siletz Indians
Rosen, Rudolph	Director	Ducks Unlimited, Western Regional Office
Sampson, Donald	Chairman	Umatilla Board of Trustees
Scronce, Karl	President	Oregon Wheat Growers League
Severson, Dick	President	Agri-Business Council of Oregon
Shively, Paul	Regional Manager	Sierra Club, Northwest Regional Office
Stacey, Bob	Executive Director	1000 Friends of Oregon
Sundstrom, Johnny	President	Oregon Association of Conservation Districts
Teeman, Albert	Chairperson	Burns-Paiute General Council
Whitworth, Joe S.	Executive Director	Oregon Trout

This page intentionally left blank.

9.0 REFERENCES

- 7 CFR 7 parts 799 et seq., 2005, Environmental Quality and Related Environmental Concerns—Compliance with the National Environmental Policy Act: Farm Service Agency, Department of Agriculture, Code of Federal Regulations, U.S. Government Printing Office via GPO Access. http://www.access.gpo.gov/nara/cfr/waisidx_02/7cfr799_02.html: Accessed June 26, 2009.
- 33 CFR 2 part 328.3, 2009, Definitions, Navigation and Navigable Waters, Definition of Waters of the United States: Corps of Engineers, Department of the Army, Department of Defense, Code of Federal Regulation,. U.S. Government Printing Office via GPO Access. <http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=70cb7834a07cbf149aa36c31ba5d21e7&rgn=div8&view=text&node=33:3.0.1.1.35.0.10.3&idno=33>: Accessed June 26, 2009.
- 36 CFR 1 part 2.1, 2009, Preservation of natural, cultural and archeological resources, Resource Protection, Public Use and Recreation: Parks, Forests, and Public Property: National Park Service, Department of the Interior, Code of Federal Regulations, Electronic Code of Federal Regulations, U.S. Government Printing Office via GPO Access. <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=ba00fd2e40458bf19f626f3b7eb10c0a&rgn=div8&view=text&node=36:1.0.1.1.2.0.1.1&idno=36>: Accessed June 26, 2009.
- 36 CFR 2 part 261.9, 2009, Property, Prohibitions, Parks, Forests, and Public Property: Forest Service, Department of Agriculture, Code of Federal Regulations, U.S. Government Printing Office via GPO Access. http://www.access.gpo.gov/nara/cfr/waisidx_02/36cfr261_02.html: Accessed June 26, 2009.
- 36 CFR 8 parts 800.3–800.13, 2009, Subpart B—The Section 106 Process, Protection of Historic Properties, Parks, Forests, and Public Property, Advisory Council on Historic Preservation: Code of Federal Regulations, Electronic Code of Federal Regulations, U.S. Government Printing Office via GPO Access. <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=19c12d26f99d0a8f304dbda6860d51f9&rgn=div5&view=text&node=36:3.0.6.1.1&idno=36>: Accessed June 26, 2009.
- 40 CFR 17 part 81.338, 2009, Oregon, Subpart C—Section 107 Attainment Status Designations. Designation of Areas for Air Quality Planning Purposes, Protection of the Environment: Environmental Protection Agency, Code of Federal Regulations, Electronic Code of Federal Regulations, U.S. Government Printing Office via GPO Access. <http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=fd798d4486edd2200dc2b32ea13a3df3&rgn=div8&view=text&node=40:17.0.1.1.1.3.1.39&idno=40>: Accessed June 26, 2009.
- 40 CFR 31 parts 1500 et seq., 2009, Purpose, Policy, and Mandate, Chapter 5: Council on Environmental Quality, Executive Office of the President, Code of Federal Regulations, U.S. Government Printing Office via GPO Access. <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=fd798d4486edd2200dc2b32ea13a3df3&rgn=div5&view=text&node=40:31.0.3.5.1&idno=40>: Accessed June 26, 2009.
- 35 FR 4247, 1970, Executive Order 11514, as amended, Protection and Enhancement of Environmental Quality: Federal Register, U.S. National Archives and Records Administration <http://www.archives.gov/federal-register/codification/executive-order/11514.html>: Accessed June 26, 2009.

- 42 FR 26951, 1979, Executive Order 11988, as amended, Floodplain Management: Federal Register, U.S. National Archives and Records Administration. <http://www.epa.gov/owow/wetlands/regs/eo11988.html>: Accessed June 26, 2009.
- 45 FR 129, 1980, Listing the Oregon Silverspot Butterfly as a Threatened Species with Critical Habitat, Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service, Interior, pp. 44935-44939. <http://www.naba.org/chapters/nabaes/images/OregonSilverspotRule.pdf>: Accessed June 26, 2009.
- 47 FR 193, 1982, Endangered and Threatened Wildlife and Plants; Endangered Status and Critical Habitat for Borax Lake Chub (*Gila boraxobius*), Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 43957–43963. http://ecos.fws.gov/docs/federal_register/fr635.pdf: Accessed June 29, 2009.
- 47 FR 218, 1982, Determination of *Stephanomeria malheurensis* (Malheur Wire-Lettuce) to be an Endangered Species with Determination of its Critical Habitat, Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 50881–50886. <https://ecos.fws.gov/docs/frdocs/1982/82-30881.pdf>: Accessed June 29, 2009.
- 50 FR 188, 1985, Endangered and Threatened Wildlife and Plants; Determination that the Warner Sucker is a Threatened Species and Designation of its Critical Habitat, Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 39117–39123. <https://ecos.fws.gov/docs/frdocs/1985/85-23075.pdf>: Accessed June 29, 2009.
- 57 FR 10, 1992, Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Northern Spotted Owl, Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 1796–1838. <https://ecos.fws.gov/docs/frdocs/1992/92-874.pdf>: Accessed June 29, 2009.
- 58 FR 247, 1993, Designated Critical Habitat; Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, and Snake River Fall Chinook Salmon, Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 68543–68554.
- 61 FR 102, 1996, Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Marbled Murrelet; Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 26256–26320. http://ecos.fws.gov/docs/federal_register/fr2961.pdf: Accessed June 29, 2009.
- 64 FR 234, 1999. “Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover; Final Rule.” *Federal Register*. 50 CFR part 17. Fish and Wildlife Service Interior, pp. 68508–68544.
- 65 FR 32, 2000, Designated Critical Habitat: Critical Habitat for 19 Evolutionary Significant Units of Salmon and Steelhead in Washington, Oregon, Idaho, and California, Final Rule: Federal Register, 50 CFR part 17, National Oceanic and Atmospheric Administration, pp. 7764–7787.
- 68 FR 151, 2003, Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 46684–46732.

- 68 FR 188, 2003, Endangered and Threatened Species: Amendment of the Code of Federal Regulations to Withdraw Critical Habitat Designations Vacated by Court Order, Final Rule: Federal Register, 50 CFR part 17, National Oceanic and Atmospheric Administration, p. 55900.
- 69 FR 193, 2004, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Klamath River and Columbia River Populations of Bull Trout; Bull Trout: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 59996–60076.
- 70 FR 188, 2005, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover; Final Rule: Federal Register, 50 CFR part 17, Fish and Wildlife Service Interior, pp. 56969–57018. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2005_register&docid=fr29se05-14: Accessed June 29, 2009.
- 7 USC 100 parts 7201 et seq., 2008, Federal Agriculture Improvement and Reform Act of 1996, as amended, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode07/usc_sup_01_7_10_100.html: Accessed June 29, 2009.
- 16 USC 1 parts 431–433, 2008, Antiquities Act of 1906, as amended, Conservation, National Parks, Military Parks, Monuments, and Seashores, National and International Monuments and Memorials, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_1_20_LXI.html: Accessed June 26, 2009.
- 16 USC 1A parts 461–462, 464–467, 1935, Historic Sites, Buildings, and Antiquities Act, Conservation, Historic Sites, Buildings, Objects, and Antiquities, General Provisions, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_1A_20_I.html: Accessed June 26, 2009.
- 16 USC 1A part 470, 2008, National Historic Preservation Act of 1966, as amended, Conservation, Historic Sites, Buildings, Objects, and Antiquities: National Historic Preservation, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sec_16_00000470---000-.html: Accessed June 26, 2009.
- 16 USC 1B parts 470aa–470mm, 2008, Archaeological Resources Protection Act of 1979, as amended, Conservation, Archaeological Resources Protection, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sup_01_16_10_1B.html: Accessed June 26, 2009.
- 16 USC 35 parts 1531 et seq., 2008, Endangered Species Act of 1973, as amended, Conservation, Endangered Species, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sec_16_00001531----000-.html: Accessed June 26, 2009.
- 16 USC 58 part 3831, 2008, Conservation Reserve, as amended, Erodible Land and Wetland Conservation and Reserve Program, Agricultural Resources Conservation Program, Comprehensive Conservation Enhancement Program, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode16/usc_sec_16_00003831----000-.html: Accessed June 26, 2009.

- 25 USC 32 parts 3001 et seq., 2008, Native American Graves Protection and Repatriation Act, as amended, Indians, United States Code: Legal Information Institute, Cornell Law School. <http://assembler.law.cornell.edu/uscode/html/uscode25/>: Accessed June 26, 2009.
- 33 USC 26 parts 1251 et seq., 2008, Federal Water Pollution Control Act of 1972, commonly referred to as the Clean Water Act, as amended, Navigation and Navigable Waters, Water Pollution Prevention and Control, Research and Related Programs, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode33/usc_sec_33_00001251----000-.html: Accessed June 26, 2009.
- 42 USC 21 part 1996, 2007, American Indian Religious Freedom Act of 1978, as amended, The Public Health and Welfare, Civil Rights, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode42/usc_sec_42_00001996----000-.html: Accessed June 26, 2009.
- 42 USC 55 parts 4321 et seq., 2007, National Environmental Policy Act of 1969, as amended, The Public Health and Welfare, National Environmental Policy, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode42/usc_sup_01_42_10_55.html: Accessed June 26, 2009.
- 42 USC 85 parts 7401 et seq., 2007, Clean Air Act, as amended, The Public Health and Welfare, Air Pollution Prevention and Control, Programs and Activities, Air Quality and Emission Limitations, United States Code: Legal Information Institute, Cornell Law School. <http://www4.law.cornell.edu/uscode/42/7401.html>: Accessed June 26, 2009.
- 43 USC 35 parts 1701, et seq., 2007, Federal Land Policy and Management Act of 1976, as amended, Public Land, United States Code: Legal Information Institute, Cornell Law School. http://assembler.law.cornell.edu/uscode/html/uscode43/usc_sup_01_43_10_35.html: Accessed June 26, 2009.
- Aikens, C.M., 1993, The Archaeology of Oregon: Portland, U.S. Department of the Interior, Bureau of Land Management, Oregon State Office. Portland, Oregon. 302 pp. <http://www.blm.gov/or/resources/heritage/cularcheooregon.php>: Accessed June 30, 2009.
- Alt, D.D., and Hyndman, D.W., 1995, Northwest Exposures: A Geologic Story of the Northwest: Missoula, Montana, Mountain Press Publishing. Missoula, Montana. 443 pp.
- Alt, D.D., and Hyndman, D.W., 1978, Roadside Geology of Oregon: Missoula, Montana, Mountain Press Publishing. Missoula, Montana. 272 pp.
- American Forests, 2004, Trees and Air Quality: CITYgreen Manual Air Pollution Removal Section. <http://www.americanforests.org/graytgreen/air/>: Accessed June 26, 2009.
- BEA, 2004, SA45—Farm Income and Expenses. Annual State Personal Income. Regional Economic Accounts. Bureau of Economic Analysis, U.S. Department of Commerce. <http://www.bea.gov/regional/spi/default.cfm?selTable=SA45>: Accessed June 26 2009.
- BLM, 2009, Archaeology, History, and Paleontology: Oregon/Washington Bureau of Land Management. <http://www.blm.gov/or/resources/heritage/index.php>: Accessed June 26, 2009.

- BLS, 2003, Customized Table. Local Area Unemployment Statistics. Bureau of Labor Statistics, U.S. Department of Labor. <http://www.bls.gov/data/>: Accessed June 26, 2009.
- Bryce, S.A., Woods, A.J., Morefield, J.D., Omernik, J.M., McKay, T.R., Brackley, G.K., Hall, R.K., Higgins, D.K., McMorran, D.C., Vargas, K.E., Peterson, E.B., Zamudio, D.C., and Comstock, J.A., 2003, Ecoregions of Nevada, Color poster with map, descriptive text, summary tables, and photographs: U.S. Geological Survey, Reston, Virginia, Map scale 1:1,350,000. http://www.epa.gov/wed/pages/ecoregions/nv_eco.htm: Accessed June 26, 2009.
- CEQ, 1997, Considering Cumulative Effects under the National Environmental Policy Act: Council on Environmental Quality, Executive Office of the President. <http://www.nepa.gov/nepa/ccenepa/ccenepa.htm>: Accessed June 26, 2009.
- CRITFC, 1999, “Tribal Fishers to Sell Fresh Catch to Public in Upcoming Fishery.” Columbia River Inter-Tribal Fish Commission. <http://www.critfc.org/oldsite/text/99aug25.htm>. August 25: Accessed June 26, 2009.
- CRITFC, 2005, Columbia River Treaty Tribes. Columbia River Inter-Tribal Fish Commission. <http://www.critfc.org/text/tribes.html>: Accessed June 26, 2009.
- CRITFC, 2009, A Short Chronology of Treaty Fishing on the Columbia River: Columbia River Inter-Tribal Fish Commission. <http://www.critfc.org/text/timeline.html>: Accessed June 26, 2009.
- Currey, S, 2001, Agricultural Productivity: The Impact of Income, Earnings, and Employment. Feature Article. Oregon Labor Market Information System, Oregon Employment Department. May 25, 2001.
- d’Azevedo, W.L., ed., 1986, Handbook of North American Indians, Volume 11: Great Basin: Washington, D.C., Smithsonian Institution. Washington, DC. 852 pp.
- Encarta, 2009, Oregon: Microsoft Encarta Online Encyclopedia. http://encarta.msn.com/encyclopedia_761558216/Oregon.html: Accessed June 26, 2009.
- EPA, 2007, Nonattainment Areas Map—Criteria Air Pollutants, Geographic Area: Oregon. Air Data: U.S. Environmental Protection Agency. <http://www.epa.gov/air/data/nonat.html?st~OR~Oregon>: Accessed June 26, 2009.
- EPA, 2009, Designated Sole Source Aquifers in EPA Region X: Alaska, Idaho, Oregon and Washington, Source Water Protection, Ground Water and Drinking Water: U.S. Environmental Protection Agency. http://www.epa.gov/safewater/sourcewater/pubs/qrg_ssamap_reg10.pdf: Accessed June 26, 2009.
- ERS, 2004, Conservation Reserve Program: Economic and Social Impacts on Rural Counties. Report to Congress. Economic Research Service, U.S. Department of Agriculture. <http://www.npcn.net/CRP%20Economic%20Rpt.pdf>. February 2004: Accessed June 26, 2009.
- Flitcroft, R.L., Jones, K.K., Reis, K.E.M., and Thom, B.A., 2002, Year 2000 Stream Habitat Conditions in Western Oregon, Oregon Plan for Salmon and Watersheds, Monitoring Program Report Number OPSW–ODFW–2001–05: Oregon Department of Fish and Wildlife, Aquatic Inventories Project. <http://oregonstate.edu/Dept/ODFW/freshwater/inventory/pdffiles/orplanhab00.pdf>: Accessed June 26, 2009

- FSA, n.d., Farm Service Agency Strategic Plan 2005–2011: Farm Service Agency, U.S. Department of Agriculture. http://www.fsa.usda.gov/Internet/FSA_File/fsa-strategicplanfy2005-2011.pdf: Accessed June 30, 2009.
- FSA, 2003a, Conservation Reserve Program Final Programmatic Environmental Impact Statement: Farm Service Agency, U.S. Department of Agriculture. http://www.fsa.usda.gov/Internet/FSA_File/chapter1.pdf: Accessed June 30, 2009.
- FSA, 2003b, Agricultural Resource Conservation Program for State and County Offices (2–CRP Handbook, Revision 4): Washington, D.C., Farm Service Agency, U.S. Department of Agriculture. http://www.fsa.usda.gov/Internet/FSA_File/2-crp.pdf 152 pp and 48 exhibits: Accessed June 26, 2009.
- FSA, 2004, National Table 1, CRP Signup 29 Summary Information: Farm Service Agency, U.S. Department of Agriculture. <http://www.fsa.usda.gov/dafp/cepd/29th/county.htm>: Accessed February 9, 2005.
- FSA, 2009, State Updates, Conservation Reserve Enhancement Program (CREP): Farm Service Agency, U.S. Department of Agriculture. <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep-su>: Accessed June 29, 2009.
- FWS, 2009, Threatened and Endangered Species System (TESS): U.S. Fish and Wildlife Service. http://ecos.fws.gov/tess_public/: Accessed June 26, 2009.
- FWS, EPA, and USACE, 2002, Development of an Integrated River Management Strategy, Public Review Final Report September 21, 2002: U.S. Fish and Wildlife Service, Environmental Protection Agency, and U.S. Army Corps of Engineers. [http://yosemite.epa.gov/R10/ecocomm.nsf/af6d4571f3e2b1698825650f0071180a/321bbc6939c3a7f388256cc5005d4e53/\\$FILE/Tillamook_River_Strategy_final_report.pdf](http://yosemite.epa.gov/R10/ecocomm.nsf/af6d4571f3e2b1698825650f0071180a/321bbc6939c3a7f388256cc5005d4e53/$FILE/Tillamook_River_Strategy_final_report.pdf): Accessed June 26, 2009.
- FWS and USCB, 2001, National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Fish and Wildlife Service and U.S. Census Bureau. <http://www.census.gov/prod/www/abs/fishing.html>: Accessed June 26, 2009.
- GORP, 2009, Resources: Great Outdoor Recreation Pages. http://gorp.away.com/gorp/resource/us_national_park/main.htm: Accessed June 26, 2009.
- Hines, F., J. Sommer, and M. Petrusis. 1991. “How the CRP affects local economies—Conservation Reserve Program affects farmers and farm communities—U.S. Dept. of Agriculture, Economic Research Service report.” *Agricultural Outlook*. http://www.findarticles.com/p/articles/mi_m3778/is_1991_Sept/ai_12059657. September: Accessed June 26, 2009.
- Lavender, D., 1958, Land of Giants: The Drive to the Pacific Northwest, 1750–1950: Garden City, New York, Doubleday and Company. Garden City, New York. 468 pp.
- Loop, Lois, 2005, Personal communication between Lois Loop, Conservation Program Specialist, Oregon State Office, Farm Service Agency, and J. Beller, Project Manager, Portage Environmental, Inc. 14 March, 2005.

- McGrath, C.L., Woods, A.J., Omernik, J.M., Bryce, S.A., Edmondson, M., Nesser, J.A., Sheldon, J., Crawford, R.C., Comstock, J.A., and Plocher, M.D., 2002, Ecoregions of Idaho, Color poster with map, descriptive text, summary tables, and photographs.: U.S. Geological Survey, Reston, Virginia, Map scale 1:1,350,000. http://www.epa.gov/wed/pages/ecoregions/id_eco.htm: Accessed June 26, 2009.
- Meinig, D.W., 1968, The Great Columbia Plain: A Historical Geography, 1805–1910: Seattle, University of Washington Press. Seattle, Washington. 576 pp.
- Naddra, R., and Nyberg, D., 2001, Effects of Afforestation of Pastures on Bird Abundance: Transactions of Illinois State Academy of Science, 94:243–250.
- National Wild and Scenic Rivers, 2009, Designated Wild & Scenic Rivers, <http://www.rivers.gov/wildriverslist.html>; Accessed June 26, 2009.
- NRCS, 2000a, Filter Strips: Conservation Reserve Enhancement Program, CREP-CP21: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.michigan.gov/documents/mda_CP-21_FILTERSTRIPS_9617_7.pdf: Accessed June 26, 2009.
- NRCS, 2000b, Riparian Forest Buffer: Conservation Reserve Enhancement Program, CREP-CP22: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.michigan.gov/documents/mda_CP-22_riparian_9618_7.pdf: Accessed June 26, 2009.
- NRCS, 2000c, Wetland Restoration: Conservation Reserve Enhancement Program, CREP-CP23: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.michigan.gov/documents/mda_CP-23_wetland_9620_7.pdf: Accessed June 26, 2009.
- NRCS, 2003, Wetlands and Deepwater Habitat Findings, State of Oregon and National 1997 National Resource Inventory Results (revised December 2000): Natural Resource Conservation Service, U.S. Department of Agriculture. <http://www.or.nrcs.usda.gov/technical/>: Accessed June 26, 2009.
- NRCS, 2005a, FY-2003 Conservation Program Allocations to States: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.nrcs.usda.gov/programs/2003Allocations/2003_Allocations.html#wrp: Accessed June 26, 2009.
- NRCS, 2005b, FY-2003 FRPP Acres Protected: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.nrcs.usda.gov/programs/frpp/2003_Easements/2003_FRPPEasements.html: Accessed June 26, 2009.
- NRCS, 2005c, FY-2003 GRP Project Information: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.nrcs.usda.gov/programs/GRP/FY2003_ProgStats/2003_ProgInfo.html: Accessed June 26, 2009.
- NRCS, 2005d, FY-2003 WRP Contract Information: Natural Resources Conservation Service, U.S. Department of Agriculture. http://www.nrcs.usda.gov/programs/whip/FY03data/2003_WHIPcontracts.html: Accessed June 26, 2009.
- NRCS, 2009a, 2004 Oregon Fact Sheet, Wetlands Reserve Program: Natural Resources Conservation Service, U.S. Department of Agriculture. <http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/WRPFct.pdf>: Accessed June 26, 2009.

- NRCS, 2009b, Wildlife Habitat Incentives Program: Natural Resources Conservation Service, U.S. Department of Agriculture. <http://www.nrcs.usda.gov/programs/whip/>: Accessed June 26, 2009.
- ODA, 2004, "Oregon Agriculture: Facts and Figures." Oregon Statistical Office, Oregon Department of Agriculture. <http://www.ofsonline.org/August/ff.pdf>. August 2005: Accessed June 26, 2009.
- ODA, 2009, 100 Most Dangerous Invaders to Keep Out: Oregon Invasive Species Council, Plant Division, Oregon Department of Agriculture. http://www.oregon.gov/OISC/most_dangerous.shtml: Accessed June 26, 2009.
- ODEQ, 2002, *Oregon Final 303(d) List of Impaired Waters*. Oregon Department of Environmental Quality. <http://www.deq.state.or.us/WQ/assessment/rpt02/view303dlist.asp>: Accessed June 26, 2009.
- ODEQ, 2003a, Fact Sheet: The 2002 303(d) List of Impaired Waters in Oregon: Water Quality Program Policy and Project Assistance, Oregon Department of Environmental Quality. <http://www.deq.state.or.us/wq/pubs/factsheets/assessment/final02303dlist.pdf>: Accessed June 26, 2009.
- ODEQ, 2003b, 2003 Oregon Ground Water Conditions: Water Quality Division, Oregon Department of Environmental Quality. <http://www.deq.state.or.us/wq/groundwater/docs/orgwconds.pdf>: Accessed June 26, 2009.
- ODEQ, 2008, 2008 Air Quality Data Summaries: State of Oregon Department of Environmental Quality, Air Quality Division. <http://www.deq.state.or.us/aq/forms/2008AQreport.pdf>: Accessed June 26, 2009.
- ODEQ, 2009, Groundwater Management Areas: Water Quality Division, Oregon Department of Environmental Quality. <http://www.deq.state.or.us/wq/groundwater/gwmas.htm>: Accessed June 26, 2009.
- ODF, 2007, Forest Management Division: Oregon Department of Forestry. http://www.oregon.gov/ODF/STATE_FORESTS/state_forest_management.shtml: Accessed June 26, 2009.
- ODFW, 1996, Oregon Wildlife Diversity Program 1996 Annual Report: Oregon Department of Fish and Wildlife. <http://www.dfw.state.or.us/ODFWhtml/InfoCntrWild/Diversity/1996RPT.html>: Accessed November 17, 2004.
- ODFW, 2003, Oregon's Mule Deer Management Plan: Oregon Department of Fish and Wildlife. 32 pp. Available via <http://www.dfw.state.or.us/ODFWhtml/InfoCntrWild/PDFs/MuleDeerPlanFinal.PDF>: Accessed June 26, 2009.
- ODFW, 2004a, 2004 Fall Hunting Forecast: Oregon Department of Fish and Wildlife. <http://www.dfw.state.or.us/news/2004/releases/175.asp>: Accessed June 26, 2009.
- ODFW, 2004b, Licenses and Sales Statistics: Sales and Fees of Big Game Tags Grouped by Species, and Bird Stamps by Calendar Year 1975–2003. Oregon Department of Fish and Wildlife. http://www.dfw.state.or.us/odfwhtml/economic_information/salesbyspecies_1975-2003.pdf: Accessed November 9, 2004.

- ODFW, 2004c, License and Sales Statistics: Sales and Fees of Fishing Licenses and Tags by Calendar Year 1975–2003. Oregon Department of Fish and Wildlife. http://www.dfw.state.or.us/odfwhtml/economic_information/salesbyfish_1975-2003.pdf. Accessed November 9, 2004.
- ODFW, 2008a, Oregon Big Game Statistics: Oregon Department of Fish and Wildlife. http://www.dfw.state.or.us/resources/hunting/big_game/controlled_hunts/reports/hunting_statistics_08/Stats_Book_2008_final.pdf: Accessed June 29, 2009.
- ODFW, 2008b, Wildlife Division: Wildlife Diversity (Nongame) Program: Oregon Department of Fish and Wildlife. <http://www.dfw.state.or.us/wildlife/diversity/index.asp>: Accessed June 26, 2009.
- ODFW, 2009a, Hatchery Information: Oregon Department of Fish and Wildlife, Fish Division. <http://www.dfw.state.or.us/fish/hatchery/>: Accessed June 26, 2009.
- ODFW, 2009b, Hunting in Oregon, Rules and Regulations: Oregon Department of Fish and Wildlife. <http://www.dfw.state.or.us/resources/hunting/>. Accessed June 26, 2009.
- ODFW, 2009c, 2009 Oregon Sport Fishing Regulations: Oregon Department of Fish and Wildlife. http://www.dfw.state.or.us/fish/docs/2009_oregon_sport_fishing_regs.pdf: Accessed June 26, 2009.
- OHJV, 2004, Wetlands in Oregon: Oregon Habitat Joint Venture. http://www.ohjv.org/oregons_wetlands.html. Accessed June 29, 2009.
- ONHIC, 2007, Rare, Threatened and Endangered Species of Oregon: Oregon Natural Heritage Information Center, Oregon State University. 105 pp. http://oregonstate.edu/ornhic/documents/2007_t&e_book.pdf: Accessed June 29, 2009.
- OPRD, 2007, 9 Facts about Oregon Heritage Resources: Oregon Heritage Commission, Oregon Parks and Recreation Department. <http://egov.oregon.gov/OPRD/HCD/OHC/facts.shtml>: Accessed June 29, 2009.
- OPRD, 2009a, National Register Historic Districts in Oregon: Oregon National Register and Survey Program, Oregon Parks and Recreation Department. http://www.oregon.gov/OPRD/HCD/NATREG/docs/nrhd_list_200901.pdf: Accessed June 29, 2009.
- OPRD, 2009b, Home Page, Oregon Parks and Recreation Department. <http://egov.oregon.gov/OPRD/index.shtml>: Accessed June 29, 2009.
- Oregon Department of Geology and Mineral Industries, 2009, Geologic Sightseeing. <http://www.oregongeology.org/sub/learnmore/GeologisSightseeing.HTM>: Accessed June 29, 2009.
- Oregon Department of Land Conservation and Development, 1999, Oregon’s Natural Hazards Mitigation Program. <http://www.wou.edu/las/physci/taylor/erth350/hazards.htm>: Accessed June 29, 2009.
- ORS 358 parts 015–961, 2007, Museums; Historical Societies; Preservation of Historical and Archaeological Properties and Objects; Oregon Historic Families Database, Oregon Revised Statutes: Legislative Counsel Committee of the Oregon Legislative Assembly. <http://www.leg.state.or.us/ors/358.html>: Accessed June 29, 2009.

- ORS 451 parts 010 et seq, 2007, County Service Facilities, Oregon Revised Statutes: Legislative Counsel Committee of the Oregon Legislative Assembly. <http://www.leg.state.or.us/ors/451.html>: Accessed June 29, 2009.
- ORS 468B parts 155, 160, and 180, 2007, Groundwater, Oregon Revised Statutes: Legislative Counsel Committee of the Oregon Legislative Assembly. <http://www.leg.state.or.us/ors/468b.html>: Accessed June 29, 2009.
- ORS 568 parts 930–933. 2007, Agricultural Water Quality Management, Oregon Revised Statutes: Legislative Counsel Committee of the Oregon Legislative Assembly. <http://www.leg.state.or.us/ors/568.html>: Accessed June 29, 2009.
- ORSHPO, 2001, Oregon Historic Preservation Plan: Salem, Oregon State Historic Preservation Office. http://egov.oregon.gov/OPRD/HCD/SHPO/docs/shpo_preservation_plan.pdf: Accessed June 29, 2009.
- OWEB, 2007, The Oregon Plan for Salmon and Watersheds, 2005–2007 Biennial Report: Oregon Watershed Enhancement Board. http://www.oregon.gov/OWEB/biennialreport/0507.shtml#Oregon_Plan_for_Salmon_and_Watersheds_Reports: Accessed June 29, 2009.
- Pater, D.E., Bryce, S.A., Thorson, T.D., Kagan, J., Chapell, C., Omernik, J.M., Azevedo, S.H., and Woods, A.J., 1998, Ecoregions of Western Washington and Oregon: U.S. Geological Survey, Reston, Virginia, Map scale 1:1,350,000. <http://www.epa.gov/wed/pages/ecoregions/>: Accessed June 29, 2009.
- PFMC, 2000, Incorporating the Regulatory Impact Review/Initial Regulatory Flexibility Analysis and Final Supplemental Environmental Impact Statement, Amendment 14 to the Pacific Coast Salmon Plan (1997): Pacific Fishery Management Council. <http://www.pcouncil.org/salmon/salfmp/a14.html>: Accessed June 29, 2009.
- PSMFC, 2006, Essential Fish Habitat, Pacific States Marine Fisheries Commission. <http://www.psmfc.org/efh/efh.html>: Accessed June 29, 2009.
- Thorson, T.D., Bryce, S.A., Lammers, D.A., Woods, A.J., Omernik, J.M., Kagan, J., Pater, D.E., and Comstock, J.A., 2003, Ecoregions of Oregon, Color poster with map, descriptive text, summary tables, and photographs: U.S. Geological Survey, Reston, Virginia, Map scale 1:1,500,000. http://www.epa.gov/wed/pages/ecoregions/or_eco.htm: Accessed June 29, 2009.
- University of Idaho, 2009, The Twelve Soil Orders. Soil Taxonomy: Soil and Land Resources Division, College of Agricultural and Life Sciences, University of Idaho. <http://soils.ag.uidaho.edu/soilorders/orders.htm>: Accessed June 29, 2009.
- USACE, 2002, Columbia Basin Water Management Division, North Pacific Water Management Division, U.S. Army Corps of Engineers. <http://www.nwd-wc.usace.army.mil/>: Accessed June 29, 2009.
- USACE, Environmental Laboratory, 1987, Corps of Engineers Wetland Delineation Manual, Wetlands Research Program Technical Report Y-87-1 (on-line edition): Environment Laboratory, Waterways Experiment Station, U.S. Army Corps of Engineers. <http://www.wetlands.com/pdf/wdm0225e.pdf>: Accessed June 29, 2009.

- USCB, 1993a, P001 – Persons. Detailed Table. 1990 Summary Tape File 1 (STF 1) 100-Percent Data. Data Sets. U.S. Census Bureau. http://factfinder.census.gov/servlet/MetadataBrowserServlet?type=dataset&id=DEC_1990_STF1_&lang=en: Accessed June 29, 2009.
- USCB, 1993b, P004 – Urban and Rural. Detailed Table. 1990 Summary Tape File 1 (STF 1) 100-Percent Data. Data Sets. U.S. Census Bureau. http://factfinder.census.gov/servlet/MetadataBrowserServlet?type=dataset&id=DEC_1990_STF1_&lang=en: Accessed June 29, 2009.
- USCB, 2003a, P2 – Urban and Rural. Detailed Table. Census 2000 Summary File 1 (SF 1) 100-Percent Data. Data Sets. U.S. Census Bureau. http://factfinder.census.gov/servlet/DatasetMainPageServlet?lang=en&ts=269445816327&ds_name=DEC_2000_SF1_U&program: Accessed June 29, 2009.
- USCB, 2003b, P53 – Median Household Income in 1999. Detailed Table. Census 2000 Summary File 3 (SF 3) Sample Data. Data Sets. U.S. Census Bureau. http://factfinder.census.gov/servlet/DatasetMainPageServlet?lang=en&ts=269445816327&ds_name=DEC_2000_SF1_U&program: Accessed June 29, 2009.
- USDA, 2000, Addendum to the Oregon CREP Agreement: U.S. Department of Agriculture Commodity Credit Corporation and the State of Oregon, L. Mitchell, USDA, and J.A. Kitzhaber, M.D., Governor, Oregon, signatories.
- USDA, 2004a, Agreement Between the U.S. Department of Agriculture Commodity Credit Corporation and the State of Oregon and Clean Water Services Concerning the Implementation of a Conservation Reserve Enhancement Program, as amended: U.S. Department of Agriculture Commodity Credit Corporation, the State of Oregon, and Clean Water Services, J. Johnson, USDA; K. Bierly, Director, Oregon Watershed Enhancement Board; and B. Gaffi, Clean Water Services; signatories.
- USDA, 2004b, Volume 1 Chapter 2: Oregon County Level Data. 2002 Census of Agriculture. National Agricultural Statistics Service. U.S. Department of Agriculture. http://www.agcensus.usda.gov/Publications/2002/Volume_1_Chapter_2_County_Level/Oregon/index.asp: Accessed June 29, 2009.
- USFS, NRCS, USACE, EPA, and FWS, 1995, Forested Wetlands: Functions, Benefits, and the Use of Best Management Practices, Document NA-PR-01-95: U.S. Department of Agriculture, U.S. Forest Service, Natural Resources Conservation Service, U.S. Army Corp of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service. http://www.na.fs.fed.us/spfo/pubs/n_resource/: Accessed June 29, 2009.
- USGS, 2000, Oregon: Wetland Resources: U.S. Geological Survey. <http://oregon.usgs.gov/pubs/Online/Html/WSP2425/>: Accessed June 29, 2009.
- Walker, D.E., Jr., ed, 1998, Handbook of North American Indians, Volume 12: Plateau: Washington, D.C., Smithsonian Institution.
- Washington State Conservation Commission, 2009, Habitat Limiting Factors: Executive Summary, Water Resource Inventory Area 13, Deschutes Watershed. <http://www.scc.wa.gov/index.php/276-WRIA-13-Deschutes-River-Watershed/View-category.html>: Accessed June 29, 2009.

Walker, D.E., Jr., ed. 1998. Handbook of North American Indians. Volume 12: Plateau. Smithsonian Institution. Washington, DC. 791 pp.

Wikipedia, 2009, List of Rivers of Oregon: Wikipedia: The Free Encyclopedia. http://en.wikipedia.org/wiki/List_of_Oregon_rivers: Accessed June 29, 2009.