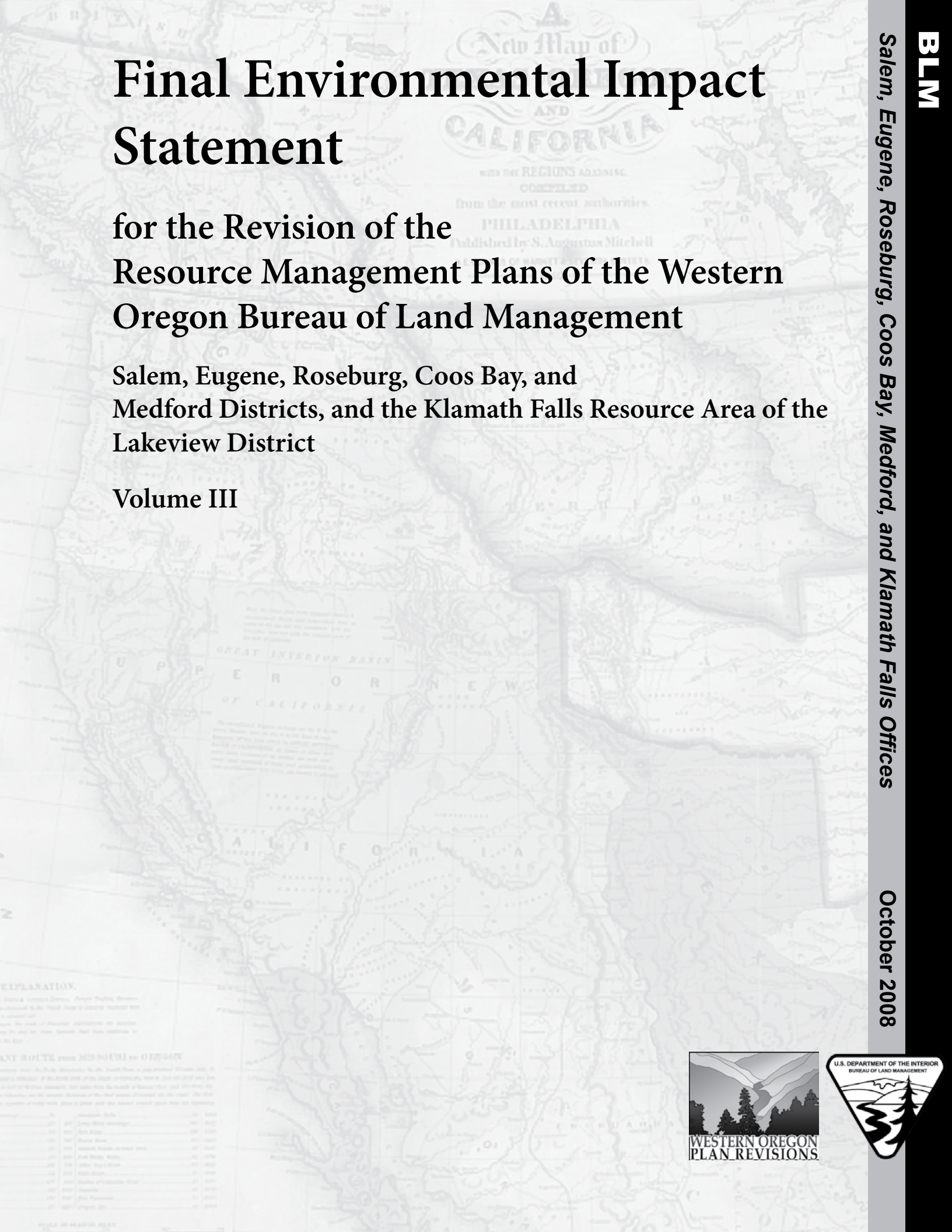


# Final Environmental Impact Statement

## for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management

Salem, Eugene, Roseburg, Coos Bay, and Medford Districts, and the Klamath Falls Resource Area of the Lakeview District

Volume III



EXPLANATION.  
A dashed contour line...  
A solid contour line...  
A dotted contour line...

TABLE OF ELEVATIONS

Elevation	Area
10000	Sierra Nevada
9000	Sierra Nevada
8000	Sierra Nevada
7000	Sierra Nevada
6000	Sierra Nevada
5000	Sierra Nevada
4000	Sierra Nevada
3000	Sierra Nevada
2000	Sierra Nevada
1000	Sierra Nevada
0	Sea Level



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

# Appendices

## Volume III

Appendix A. Legal Authorities .....	3
Appendix B. Forest Structure and Spatial Pattern .....	11
Appendix C. Carbon Storage Modeling.....	27
Appendix D. Socioeconomics .....	31
Appendix E. Timber .....	143
Appendix F. Botany.....	149
Appendix G. Invasive Plants .....	195
Appendix H. Wildlife .....	203
Appendix I. Water .....	225
Appendix J. Fish.....	323
Appendix K. Recreation .....	387
Appendix L. Wilderness Characteristics .....	439
Appendix M. Grazing .....	443

## ***Appendices N - T in Volume IV***

*Appendix N. Areas of Critical Environmental Concern*

*Appendix O. Federally Recognized Indian Tribes With Interests in the Planning Area*

*Appendix P. Lands*

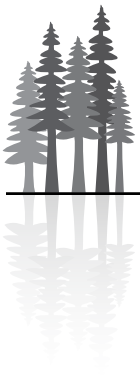
*Appendix Q. Energy and Minerals*

*Appendix R. Vegetation Modeling*

*Appendix S. Wood River Wetland and West Eugene Wetlands Management Plans*

*Appendix T. Responses to Public Comments and Comment Letters*

*From Congressional Representatives; Indian Tribes; and Federal,  
State, and Local Government Agencies*



# Appendix A

## Legal Authorities



---

This appendix provides the background on the legal authorities and major court rulings that are related to this final environmental impact statement.

**In this appendix:**

Settlement Agreement .....	4
Major Court Rulings .....	4
Major Legal Authorities .....	6



## Settlement Agreement

In 1997, timber industry groups, county governments, and others filed a lawsuit (*AFRC v. Clarke*, Civil No. 94-1031-TPJ [D.D.C.]) in the United States District Court for the District of Columbia (D.C. District Court). This lawsuit alleged that the O&C Act had not been appropriately considered in applying the Northwest Forest Plan's management direction to the O&C lands. The allegation was that the Northwest Forest Plan's system of large reserves and its standards and guidelines, which restrict timber harvesting for the purpose of achieving conservation principles, differs from the ruling of the United States Court of Appeals for the Ninth Circuit (Ninth Circuit Court) regarding the statutory direction for managing the O&C lands. The ruling from the Ninth Circuit Court (*Headwaters, Inc. v. BLM*, 914 F.2d 1174, 1183 [9th Cir., 1990]) stated that "exempting certain timber resources from harvesting to serve as wildlife habitat ... is inconsistent with the principles of sustained yield." The *AFRC v. Clarke* lawsuit also alleged that the specific contribution of the BLM-administered lands to the overall conservation strategy of the Northwest Forest Plan was not sufficiently analyzed in the Northwest Forest Plan's supplemental environmental impact statement to determine whether the extensive reservation of the O&C lands from timber harvesting in the Northwest Forest Plan was required to comply with the Endangered Species Act.

To resolve the lawsuit, the Secretary of Interior, the American Forest Resource Council, and the Association of O&C Counties entered into a settlement agreement that was approved by the United States District Court for the District of Columbia (D.C. District Court) on August 28, 2003. At the time of the settlement, the case was pending review in the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit Court) for the D.C. District Court's dismissal of the case as *res judicata*. Under the settlement agreement, the BLM agreed to revise its resource management plans in western Oregon, and in that revision the BLM would consider an alternative that would not create any reserves on the O&C lands, except those reserves required to avoid jeopardy to species listed as threatened or endangered under the Endangered Species Act. The BLM also agreed that all resource management plan revisions shall be consistent with the O&C Act as interpreted by the Ninth Circuit Court.

### ***Res judicata***

A rule of civil law that says an issue cannot be relitigated after a final judgment has been rendered.

## Major Court Rulings

Following are descriptions of court rulings that are the most relevant to the decisions that must be made in revising the resource management plans for BLM-administered lands in western Oregon.

### ***Headwaters, Inc. v. BLM, 914 F.2d 1174 (9th Cir. 1990)***

In a 1990 lawsuit by Headwaters, Inc., the plaintiffs argued that the O&C Act requires the BLM to manage O&C lands for multiple uses, including wildlife conservation, rather than for the dominant use of timber production. There were several issues in this case, including compliance with the National Environmental Policy Act. The issue most relevant to this revision of the resource management plans, however, is interpretation of the O&C Act's reference to forest production.

In ruling on this case, the United States Court of Appeals for the Ninth Circuit (Ninth Circuit Court) stated that "the primary purpose of the O&C Act lands is for timber production in conformity with the provision of sustained yield." Even more explicitly, the Ninth Circuit Court held that "exempting certain timber resources from harvesting to serve as wildlife habitat is inconsistent with the principle of sustained yield." The court also stated that "[i]t is entirely consistent with these goals to conclude that the O&C Act envisions timber production as a dominant use." The court further stated that "[t]he purposes of the O&C Act were



twofold. First, the O&C Act was intended to provide the counties ... with [a] stream of revenue. Second, the O&C Act was intended to halt previous practices of clearcutting without reforestation” (*Headwaters, Inc. v. BLM*, 914 F.2d 1174 [9th Cir. 1990]). Citing the legislative history of the O&C Act, the Ninth Circuit Court explained that “[t]his type of [sustained-yield] management will make for a more permanent type of community, contribute to the local dependent industries, protect watersheds, and aid in regulating streamflow.” In other words, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries were expected outcomes of managing these lands under the principles of sustained-yield management. The Ninth Circuit Court found nothing in the legislative history to “suggest that wildlife habitat conservation or conservation of old growth forest is a goal on a par with timber production, or indeed that it is a goal of the O&C Act at all” (*Headwaters, Inc. v. BLM*, 914 F.2d 1183-84 [9th Cir. 1990]).

This opinion was not the first to rule on management of BLM lands under the O&C Act. However, it is the most explicit. It followed previous rulings of the Ninth Circuit Court on the purposes of the O&C Act, specifically: *O’Neal v. United States*, 814 F.2d 1285, 1287 (9th Cir. 1987); and *Skoko v. Andrus*, 638 F.2d 1154, 1156 (9th Cir.), *cert. denied*, 444 U.S. 927, 62 L. Ed. 2d 183, 100 S. Ct. 266 (1979).

## **Portland Audubon Society v. Babbitt, 998 F.2d 705 (9th Cir. 1993)**

In this case, environmental groups challenged a decision made by the BLM to not supplement timber management plans with new information concerning the plan’s effect on the northern spotted owl and asked the court to issue an injunction against logging operations in BLM forests that contained northern spotted owl habitat until a supplemental environmental impact statement was prepared. The BLM argued that the holding of the Ninth Circuit Court in *Headwaters, Inc. v. BLM*, 914 F.2d 1174, 1178- 80 (9th Cir. 1990), *reh’g denied*, 940 F.2d 435 (1991), supports the conclusion that the BLM’s decision not to supplement the environmental impact statements was reasonable, that the O&C Act requires the BLM to sell 500 million board feet of timber per year, and that relief provided by the court must not conflict with this congressional direction. The court, however, found that the National Environmental Policy Act (passed after the O&C Act) does apply to all government actions having significant environmental impact, even though the actions may be authorized by other legislation. The court also found that the O&C Act did not establish a minimum volume that must be offered every year notwithstanding any other law. Therefore, compliance with the National Environmental Policy Act, or enjoining timber harvests until the BLM complies with the National Environmental Policy Act, is not inconsistent with either the volume requirements of the O&C Act or management of the lands entrusted to its care.

## **Seattle Audubon Society v. Lyons, 871 F. Supp. 1291, 1314 (W.D. Wash., 1994)**

This case was a challenge to the Northwest Forest Plan and was filed soon after the filing of *AFRC v. Clarke* (Civil No. 94-1031-TPJ [D.D.C.]). In the challenge of the Northwest Forest Plan in the United States District Court for the Western District of Washington (Western Washington District Court), the court found that the management decision made about the O&C lands was a lawful exercise of the discretion of the Secretary of the Interior under the O&C Act, because of the broad mandate to manage federal lands to conserve habitat for species listed for protection under the Endangered Species Act. The Western Washington District Court, however, did not identify the Northwest Forest Plan as the *only* decision that would meet the requirements of the Endangered Species Act (*Seattle Audubon Society v. Lyons*, 871 F. Supp. 1291, 1313-1314 [W.D. Wash., 1994]).



## Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service, 378 F.3d 1059 (9th Cir. 2004)

In this case (United States Court of Appeals for the Ninth Circuit), the Ninth Circuit Court rejected the regulatory definition of “destruction or adverse modification of critical habitat” and directed consulting agencies to consider the effects of an action on the critical habitat network without reference to other conservation programs, such as the late-successional reserves in the Northwest Forest Plan. The court stated that critical habitat must provide for both the survival and the recovery of a listed species, and that the analysis of whether there is adverse modification always requires consideration of the impacts on the recovery of a species. This case highlighted the issue that resulted from the difference in the Northwest Forest Plan’s late-successional reserves and the designated critical habitat for the northern spotted owl.

## Major Legal Authorities

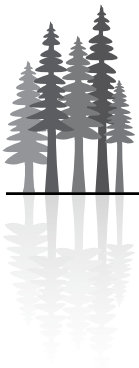
The following is a list of the major legal authorities that are relevant to the BLM land use planning process. It is not an inclusive list.

- The Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act (O&C Act) (43 U.S.C. §1181a, *et seq.*) provides the legal authority for management of O&C lands by the Secretary of the Interior. The O&C Act requires that the O&C lands be managed “for permanent forest production, and the timber thereon shall be sold, cut, and removed in conformity with the principal (sic) of sustained yield for the purpose of providing a permanent source of timber supply, protecting watersheds, regulating stream flow, and contributing to the economic stability of local communities and industries, and providing recreational facilities.” (43 U.S.C. §1181a)
- The Federal Land Policy and Management Act of 1976 (FLPMA), as amended, 43 U.S.C. 1701 *et seq.*, provides the authority for BLM land use planning.
  - Sec. 102 (a) (7) and (8) sets forth the policy of the United States concerning management of the public lands.
  - Sec. 201 requires the Secretary of the Interior to prepare and maintain an inventory of the public lands and their resource and other values, giving priority to areas of critical environmental concern (ACECs), and, as funding and workforce are available, to determine the boundaries of the public lands, provide signs and maps to the public, and provide inventory data to State and local governments.
  - Sec. 202 (a) requires the Secretary, with public involvement, to develop, maintain, and when appropriate, revise land use plans that provide by tracts or areas for the use of the public lands.
  - Sec. 202(c)(1-9) requires that, in developing land use plans, the BLM shall use and observe the principles of multiple use and sustained yield; use a systematic interdisciplinary approach; give priority to the designation and protection of areas of critical environmental concern; rely, to the extent it is available, on the inventory of the public lands; consider present and potential uses of the public lands; consider the relative scarcity of the values involved and the availability of alternative means and sites for realizing those values; weigh long-term benefits to the public against short term benefits; provide for compliance with applicable pollution control laws, including State and Federal air, water, noise, or other pollution standards or implementation plans; and consider the policies of approved State and tribal land resource management programs, developing land use plans that are consistent with State and local plans to the maximum extent possible consistent with Federal law and the purposes of this Act.
  - Sec. 202 (d) provides that all public lands, regardless of classification, are subject to inclusion in land use plans, and that the Secretary may modify or terminate classifications consistent with land use plans.





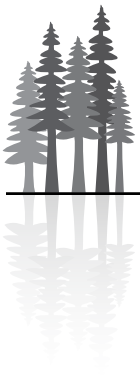
- Sec. 202 (f) and Sec. 309 (e) provide that Federal, State, and local governments and the public be given adequate notice and an opportunity to comment on the formulation of standards and criteria for, and to participate in, the preparation and execution of plans and programs for management of the public lands.
- Sec. 302 (a) requires the Secretary to manage BLM lands under the principles of multiple use and sustained yield, in accordance with available land use plans developed under Sec. 202 of FLPMA. There is one exception: where a tract of the BLM lands has been dedicated to specific uses according to other provisions of law, it shall be managed in accordance with such laws.
- Sec. 302 (b) recognizes the entry and development rights of mining claimants, while directing the Secretary to prevent unnecessary or undue degradation of the public lands.
- Sec. 701 (b) provides that notwithstanding any provision of FLPMA, in the event of conflict with or inconsistency between FLPMA and the O&C Act, insofar as they relate to management of timber resources and disposition of revenues from lands and resources, the O&C Act shall prevail.
- The National Environmental Policy Act of 1969 (NEPA), as amended, 42 U.S.C. 4321 *et seq.*, requires the consideration and public availability of information regarding the environmental impacts of major Federal actions significantly affecting the quality of the human environment. This includes consideration of alternatives and mitigation of impacts.
- The Clean Air Act of 1990, as amended, 42 U.S.C. 7418, requires Federal agencies to comply with all Federal, State and local requirements regarding control and abatement of air pollution. This includes abiding by requirements of State Implementation Plans.
- The Clean Water Act of 1987, as amended, 33 U.S.C. 1251, establishes objectives to restore and maintain the chemical, physical, and biological integrity of the Nation's water.
- The Healthy Forests Restoration Act of 2003, 16 U.S.C. 6501, contains a variety of provisions to expedite hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of wildland fire or insect and disease epidemics. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships.
- The Federal Water Pollution Control Act, 33 U.S.C. 1323, requires Federal land managers to comply with all Federal, State, and local requirements, administrative authorities, process, and sanctions regarding the control and abatement of water pollution in the same manner and to the same extent as any nongovernmental entity.
- The Safe Drinking Water Act, 42 U.S.C. 201, is designed to make the Nation's waters "drinkable" as well as "swimmable." Amendments in 1996 establish a direct connection between safe drinking water and watershed protection and management.
- The Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531 *et seq.*:
  - Provides a means whereby the ecosystems upon which endangered and threatened species depend may be conserved and provides a program for the conservation of such endangered and threatened species (Sec. 1531 [b], Purposes).
  - Requires all Federal agencies to seek to conserve endangered and threatened species and utilize applicable authorities in furtherance of the purposes of the Endangered Species Act (Sec. 1531 [c] [1], Policy).
  - Requires all Federal agencies to avoid jeopardizing the continued existence of any species that is listed or proposed for listing as threatened or endangered, or destroying or adversely modifying its designated or proposed critical habitat (Sec. 1536 [a], Interagency Cooperation).
  - Requires all Federal agencies to consult (or confer) in accordance with Sec. 7 of the ESA with the Secretary of the Interior, through the Fish and Wildlife Service and/or the National Marine Fisheries Service, to ensure that any Federal action (including land use plans) or activity is not likely to jeopardize the continued existence of any species listed or proposed to be listed under the provisions of the ESA, or result in the destruction or adverse modification of designated or proposed critical habitat (Sec. 1536 [a], Interagency Cooperation, and 50 CFR 402).



- The Migratory Bird Treaty Act of 1918 decrees that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected. The Migratory Bird Treaty Act is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource.
- The Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 *et seq.*, requires Federal land management agencies to identify potential river systems and then study them for potential designation as wild, scenic, or recreational rivers.
- The Wilderness Act, as amended, 16 U.S.C. 1131 *et seq.*, authorizes the President to make recommendations to the Congress for Federal lands to be set aside for preservation as wilderness.
- The Antiquities Act of 1906, 16 U.S.C. 431-433, protects cultural resources on Federal lands and authorizes the President to designate National Monuments on Federal lands.
- The National Historic Preservation Act (NHPA), as amended, 16 U.S.C. 470, expands protection of historic and archaeological properties to include those of national, State, and local significance and directs Federal agencies to consider the effects of proposed actions on properties eligible for or included in the National Register of Historic Places. It also directs the pro-active management of historic resources.
- The American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996, establishes a national policy to protect and preserve the right of American Indians to exercise traditional Indian religious beliefs or practices.
- The Recreation and Public Purposes Act of 1926, as amended, 43 U.S.C. 869 *et seq.*, authorizes the Secretary of the Interior to lease or convey BLM lands for recreational and public purposes under specified conditions.
- The Federal Coal Leasing Amendments Act of 1976, 30 U.S.C. 201 (a) (3) (A) (i), requires that coal leases be issued in conformance with a comprehensive land use plan.
- The Surface Mining Control and Reclamation Act of 1977, 30 U.S.C. 1201 *et seq.*, requires application of unsuitability criteria prior to coal leasing and also to proposed mining operations for minerals or mineral materials other than coal.
- The Mineral Leasing Act of 1920, as amended, 30 U.S.C. 181 *et seq.*, authorizes the development and conservation of oil and gas resources.
- The Onshore Oil and Gas Leasing Reform Act of 1987, 30 U.S.C. 181 *et seq.*, provides that a study be conducted by the National Academy of Sciences and the Comptroller General that results in recommendations for improvements which may be necessary to ensure the following are adequately addressed in Federal land use plans:
  - Potential oil and gas resources are identified.
  - The social, economic, and environmental consequences of exploration for and development of oil and gas resources are determined.
  - Any stipulations to be applied to oil and gas leases are clearly identified.
- The General Mining Law of 1872, as amended, 30 U.S.C. 21 *et seq.*, allows the location, use, and patenting of mining claims on sites on public domain lands of the United States.
- The Mining and Mineral Policy Act of 1970, 30 U.S.C. 21a, establishes a policy of fostering the orderly development of economically stable mining and minerals industries and studying methods for reclamation and the disposal of waste.
- The Taylor Grazing Act of 1934, 43 U.S.C. 315, authorizes the Secretary of the Interior “to establish grazing districts, or additions thereto and/or to modify the boundaries thereof of vacant, inappropriate and unreserved lands from any part of the public domain . . . which in his opinion are chiefly valuable for grazing and raising forage crops[.] . . .” The Act also provides for classification of lands for particular uses.
- Executive Orders 11644 (1972) and 11989 (1997) establish policies and procedures to ensure that off-road vehicle use shall be controlled so as to protect public lands.



- Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), 49 *Fed. Reg.* 7629 (1994), requires that each Federal agency consider the impacts of its programs on minority and low-income populations.
- Executive Order 13007 (Indian Sacred Sites), 61 *Fed. Reg.* 26771 (1996), requires Federal agencies to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions to:
  - Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners; and
  - Avoid adversely affecting the physical integrity of such sacred sites.
- Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments) provides, in part, that each Federal agency shall establish regular and meaningful consultation and collaboration with Indian tribal governments in developing regulatory practices on Federal matters that significantly or uniquely affect their communities.
- Executive Order 13112 (Invasive Species) provides that no Federal agency shall authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk or harm will be taken in conjunction with the actions.
- Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs the Fish and Wildlife Service, in coordination with Federal agencies and Executive departments, to take certain actions to further the implementation of the Migratory Bird Treaty Act in promoting conservation of migratory bird populations.
- Executive Order 13443 (Facilitation of Hunting Heritage and Wildlife Conservation) provides, in part, that Federal agencies shall, consistent with agency missions evaluate the effects of agency actions on game species and their habitats; manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities; work collaboratively with State governments to manage and conserve game species and their habitats; and seek the advice of State fish and wildlife agencies.
- Secretarial Order 3175 (incorporated into the Departmental Manual at 512 DM 2) requires that if Department of the Interior (DOI) agency actions might impact Indian trust resources, the agency must explicitly address those potential impacts in planning and decision documents, as well as consult with the tribal government whose trust resources are potentially affected by the Federal action.
- Secretarial Order 3206 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act) requires DOI agencies to consult with Indian tribes when agency actions to protect a listed species, as a result of compliance with ESA, affect or may affect Indian lands, tribal trust resources, or the exercise of American Indian tribal rights.
- Secretarial Order 3215 (Principles for the Discharge of the Secretary's Trust Responsibility) guides DOI officials by defining the relatively limited nature and extent of Indian trust assets, and by setting out the principles that govern the Trustee's fulfillment of the trust responsibility with respect to Indian trust assets.



# Appendix B

## Forest Structure and Spatial Pattern



This appendix provides background on the analysis of forest structure and spatial pattern.

**In this appendix:**

Structural Stage Classification .....	12
Interagency Vegetation Mapping Project Data .....	16
Average Historical Conditions and the Historic Range of Variability .....	16
FRAGSTATS .....	18



## Structural Stage Classification

Conifer forests within the planning area are classified in this analysis by a four-stage structural classification:

- Stand Establishment
- Young
- Mature
- Structurally Complex

These four structural classes are further sub-divided by additional structural divisions and by tree species composition groupings.

### Vegetation Series (by plant series)

The vegetation series are groupings that have been made for this analysis based on plant series and do not exactly correspond to mapped plant series or plant association groupings. The data on plant series was modeled at a very fine scale and has been coarsened in scale for this analysis. Adjustments have been made to the geographic boundaries of these vegetation series grouping to provide explicit boundaries without interspersions.

- **Western Hemlock and Tanoak:** Western Hemlock, Sitka Spruce, Pacific Silver Fir, Tanoak
- **Douglas-fir:** Douglas-fir, Grand Fir, White Fir, Shasta Red Fir, Mountain Hemlock, Ponderosa Pine
- **Non-forest:** Jeffrey Pine, Oregon White Oak, Juniper, Sagebrush, Grassland, Water

### Classification

Each class appended with Vegetation Series:

- Western Hemlock and Tanoak
- Douglas-fir

#### 1) Stand Establishment

<200 years old in current Forest Operations Inventory Average tree height <50 feet

##### 1a.) Without Structural Legacies

<6 trees per acre  $\geq 20$  inches diameter breast height

##### 1b.) With Structural Legacies

$\geq 6$  trees per acre  $\geq 20$  inches diameter breast height

The Stand Establishment stage extends from stand initiation until stands have reached canopy closure and density-dependent tree mortality begins. Average tree height reflects the influence of site productivity on tree growth. At an average tree height of 50 feet, stands have passed the point at which they are typically pre-commercial thinned. The minimum density of structural legacies is set at 6 trees per acre to maintain consistency with the minimum green tree requirements in the No Action Alternative.



**2) Young**

<200 years old in current Forest Operations Inventory Average tree height  $\geq 50$  feet

Western Hemlock and Tanoak

<24 trees per acre  $\geq 20$  inches diameter breast height

Douglas-fir

<12 trees per acre  $\geq 20$  inches diameter breast height

**2a.) Young High Density**

relative density (Curtis RD)  $\geq 25$

**2a1.) Without Structural Legacies**

Descended from Stand Establishment without Structural Legacies

**2a2.) With Structural Legacies**

Descended from Stand Establishment with Structural Legacies

**2b.) Young Low Density**

relative density (Curtis RD)  $< 25$

**2b1.) Without Structural Legacies**

Descended from Stand Establishment without Structural Legacies

**2b2.) With Structural Legacies**

Descended from Stand Establishment with Structural Legacies

The Young stage is characterized by the predominance of density-dependent tree mortality, and, in high density stands, a small range of tree diameters. Young stands have not yet acquired the density of large diameter trees that characterize Mature stands. Young Low Density stands are those with a tree density sufficiently low to largely eliminate the influence of density-dependent tree mortality.

**3) Mature**

<200 years old in current Forest Operations Inventory

Western Hemlock and Tanoak  $\geq 24$  trees per acre  $\geq 20$  inches diameter breast height

Douglas-fir

$\geq 12$  trees per acre  $\geq 20$  inches diameter breast height

**3a.) Single Canopy**

Western Hemlock and Tanoak

Coefficient of Variation of tree diameters  $> 10$  inches diameter breast height  
(CVgt[10])  $< 0.35$

Douglas-fir

CVgt(10)  $< 0.34$

**3b.) Multiple Canopy**

Western Hemlock and Tanoak

CVgt(10)  $\geq 0.35$

$< 4.7$  trees per acre  $\geq 40$  inches diameter breast height

Douglas-fir

CVgt(10)  $\geq 0.34$

$< 2.1$  trees per acre  $\geq 40$  inches diameter breast height



The Mature stage generally begins as tree growth rates stop increasing (after culmination of mean annual increment), as tree mortality shifts from density-dependent mortality to density-independent mortality. The threshold values for the Mature stage are derived from Poage (*unpublished*), which comprises BLM timber cruise data for timber sales in the late 1980s and early 1990s. This data presents a precise and accurate sample of the population of trees in timber sale areas. Because timber harvest during that period was predominately in Mature and Structurally Complex forest, this data set, described in Poage (2000), provides a characterization of Mature and Structurally Complex forest on BLM-administered lands.

The thresholds presented here for Mature forest are intended to establish a threshold that represents the structural conditions of most Mature forests, but not necessarily absolute minimum conditions found in all Mature forests. Therefore, the density of large trees (greater than 20 inches in diameter) was derived from the 66<sup>th</sup> percentile of sample values from the Poage dataset, separating the data for the Western Hemlock and Tanoak, and Douglas-fir vegetation series.

The threshold for canopy layering was derived from the coefficient of variation in tree diameters, inferring that variation in tree diameters is reflected by variation in tree heights. The threshold here was derived by the mean coefficient of variation of tree heights minus one standard deviation from the Poage dataset.

This analysis initially examined other measures of canopy layering, included a Canopy Height Diversity index (Spies and Cohen 1992), a Diameter Diversity Index (McComb et al. 2002), and a canopy classification technique in Baker and Wilson (2000).

The Canopy Height Diversity index uses data on tree heights directly, but classified most existing stands over 200 years old in this analysis as “single canopy,” and therefore would be too restrictive.

The Diameter Diversity Index infers canopy height diversity from weighted values of tree diameters. The weighting values produce results that may be more effective at classifying existing stands than evaluating modeled stands. The Diameter Diversity Index results do not appear to accurately reflect future changes in canopy layering resulting from thinning or partial disturbance and would classify relatively young, even-aged stands as “multiple canopy.”

The technique in Baker and Wilson (2000) uses tree height and canopy measurements, but would classify almost all stands in this analysis as “multiple canopy.”

Coefficient of variation in tree diameters provides greater discrimination among the stands in this analysis than the other measures and appears to be sensitive to future changes in stand conditions. Coefficient of variation in tree diameters could provide misleading results in strongly bi-modal stands (i.e., very large trees and very small trees), which would be a concern if this analysis were attempting to provide continuous values of canopy layering. But this analysis is only attempting to classify stands as either single canopy layered or multiple canopies.

#### 4) Structurally Complex

##### 4a.) Existing Old Forest

≥ 200-years old in current Forest Operations Inventory

##### 4a1.) Existing Very Old Forest

≥ 400-years old in current Forest Operations Inventory

##### 4b.) Developed Structurally Complex

< 200-years old in current Forest Operations Inventory





Western Hemlock and Tanoak  
 CVgt(10)  $\geq 0.35$   
 $\geq 24$  trees per acre  $\geq 20$  inches diameter breast height  
 $\geq 4.7$  trees per acre  $\geq 40$  inches diameter breast height

Douglas-fir  
 CVgt(10)  $\geq 0.34$   
 $\geq 12$  trees per acre  $\geq 20$  inches diameter breast height  
 $\geq 2.1$  trees per acre  $\geq 40$  inches diameter breast height

This analysis assumes that stands identified as 200 years old or older in the current stand inventory are Structurally Complex forest. In addition, stands that are not 200 years old or older but meet threshold values for Developed Structurally Complex described above are identified as Structurally Complex forest. Threshold values for Developed Structurally Complex include density of very large trees (greater than 40 inches in diameter) derived from the 66<sup>th</sup> percentile of sample values from the Poage dataset, separating data for the Western Hemlock and Tanoak and Douglas-fir vegetation series.

Structurally Complex stands approximate “old-growth” stands described in many analyses (see, e.g., District RMP/EISs), “Medium/large Conifer Multi-story” stands described in the FEMAT Report, and “Large, Multi-storied Older Forest” stands described in the LSOG Monitoring Report. In this analysis, “late-successional forest” encompasses both Mature and Structurally Complex stands, similar to how the Northwest Forest Plan FSEIS used “late-successional forest” to encompass mature and old-growth forests. The LSOG Monitoring Report (pp. 9-10) summarized the difficulties in describing and classifying older forest conditions.

**TABLE B-1.** COMPARISON OF DIFFERENT STAND CLASSIFICATION SCHEMES AND THE STRUCTURAL STAGE CLASSIFICATION USED IN THIS RMP/EIS<sup>a</sup>

Typical stand age <sup>b</sup> (years)	Oliver (1981) stand development stages	Franklin et al. (2002) structural stage	1994 RMP/EIS Seral stage	Structural stages (This RMP/EIS)
0	Disturbance and legacy creation			
20	Stand Initiation	Cohort establishment	Early seral	Stand Establishment
30	Stem Exclusion		Mid seral	
50		Canopy Closure	Late seral	Young
	Biomass accumulation/ competitive exclusion			
80	Understory Reinitiation	Maturation		Mature
150	Old Growth	Vertical diversification	Mature seral	Structurally Complex
300		Horizontal diversification	Old-growth	
800-1200		Pioneer cohort loss		

<sup>a</sup>A more extensive comparison of classification schemes can be found in Franklin et al. 2002.

<sup>b</sup>Stand ages are provided as references. However, stands can achieve structural classes at different stand ages, depending on disturbance and site conditions.



## Interagency Vegetation Mapping Project Data

Existing vegetation mapping for the planning area was based on the Interagency Vegetation Mapping Project (IVMP), which provides maps of existing vegetation, canopy cover, size, and cover type for the entire range of the Northern Spotted Owl using satellite imagery from Landsat Thematic Mapper (TM). The LSOG Monitoring Report contains detailed descriptions of the IVMP data and evaluations of IVMP map accuracy (Moeur et al. 2005, pp. 18-30, 108-109, 123- 128). Those descriptions and evaluations are incorporated here by reference.

The IVMP was initiated in 1998 under joint program management and funding by the Bureau of Land Management-Oregon and the Forest Service-Region 6. The project's goal was to provide consistent spatial data for monitoring older forests within the portions of the Plan area in Washington and Oregon. The IVMP mapped existing vegetation in the nine physiographic provinces in Washington (Eastern and Western Cascades, Olympic Peninsula, and Western Lowlands) and Oregon (Eastern and Western Cascades, Coast Range, Willamette Valley, and Klamath Mountains).

The IVMP modeling approach combined remotely sensed satellite imagery (25-m Landsat TM), digital elevation models, interpreted aerial photos, and inventory information collected on the ground to classify existing vegetation. Landsat scenes used in the IVMP project ranged from fall 1992 through summer 1996. Of the 17 scenes, 2 were acquired in 1992, 1 each in 1994 and 1995, and 13 in 1996. A regression modeling approach was used to predict vegetation characteristics from this Landsat data.

Inventory plot data were used as reference information for IVMP model building and accuracy assessment. Almost 10,000 plots were used for model building and testing, and another 2,800 plots were held out for an independent accuracy assessment. These data came primarily from Current Vegetation Survey (CVS) plots maintained by Forest Service-Region 6 and Bureau of Land Management-Oregon on Forest Service and Bureau of Land Management lands in Washington and Oregon, and from Forest Inventory and Analysis (FIA) plots administered by Pacific Northwest Research Station on nonfederal lands.

All IVMP map data and supporting documentation are available online at:  
<http://www.or.blm.gov/gis/projects/ivmp.asp>

## Average Historical Conditions and the Historic Range of Variability

The description of the Affected Environment and the analysis of effects include a comparison of current and future conditions to the Historic Range of Variability. Characterization of historic landscape conditions can provide a reference point for comparison in the analysis of effects of different land management strategies. Historic landscape conditions were dynamic, which requires characterization of landscape conditions as a range, rather than a discrete point.

There are several challenges in describing the Historic Range of Variability, as discussed below.

### Selecting metrics

Historic Range of Variability is often described by abundance of habitat types and frequency of disturbance, such as mean fire return interval. Some descriptions have included spatial pattern of habitats, such as patch



size. Because the Historic Range of Variability is a range, it is not easily quantified, and at many spatial scales, the range is very broad (see, e.g., Wimberly et al. 2000). Simply describing an upper and lower bound of historic conditions may overemphasize the rare, extreme events that defined the bounds (Landres et al. 1999). However, more sophisticated descriptions may be difficult to communicate to decision-makers and the public, and may be difficult to compare to the effects of different land management strategies.

## Selecting the portion of history

Historical conditions varied not only in a range of natural disturbance frequencies, but with patterns of pre-European anthropogenic disturbances and with climate changes. The selection of the portion of history to characterize can strongly influence the resulting “range” that is described (Millar and Woolfenden 1999, Long et al. 1998).

## Insufficient information

Our knowledge of historical landscape conditions is fragmentary at best. Descriptions of Historic Range of Variability have been built from pollen deposits in lake sediments, tree-ring data, fire-scar data, even animal deposits, such as pack-rat middens. These records are incomplete. Reconstructions from such data sources require inference and modeling to derive a description of Historic Range of Variability.

## Change from historical conditions

Some biological and physical characteristics have changed irreversibly from historic conditions and may distort any comparison to Historic Range of Variability. Climate conditions have changed and are continuing to change at a rapid rate. Species introductions and species extirpations have altered biological relationships.

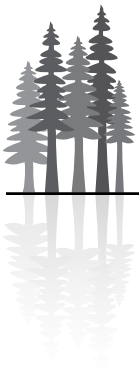
## Discussion

These challenges should be considered in interpreting the Historic Range of Variability and caution against using it as an explicit target or management objective.

Several commentators have hypothesized that a landscape that reflects the abundance and arrangement of habitats within the Historic Range of Variability will support the species and processes that were historically present, and that the further the landscape is outside the Historic Range of Variability, the less likely it will support those species and processes (see, e.g., Landres et al. 1999). These hypotheses remain largely untested, but several studies have characterized the historic range of variability in western Oregon and used it as a reference point to compare the effects of management strategies (Nonaka and Spies 2005, Wimberly 2002, Wimberly et al. 2000, Cissel et al. 1999, Rasmussen and Ripple 1998).

This analysis uses the description of habitat abundances and mean fire return intervals from the draft Rapid Assessment Reference Condition Models (USFS and BLM 2005). These models derived historic abundances by modeling disturbance probabilities generated from mean fire return intervals combined with the probabilities of other disturbances such as wind, insect and pathogens. These models described the average amount of the landscape that would be expected in each of the broad vegetation classes, which are roughly equivalent to the structural classes used in this analysis.

This analysis used the description of spatial patterns of habitat types from Nonaka and Spies (2005), which modeled historic spatial pattern in the Coast Range. This modeling of historical conditions was parameterized to the historical fire regimes prior to Euro-American settlement around the mid-1800s



(Nonaka and Spies 2005). Although this research applies to only a portion of the planning area, it presents an available description of historic spatial pattern. The historic spatial pattern in the other provinces in the planning area likely differed from the Coast Range, and therefore the comparative value of this description of Historic Range of Variability is limited and must be used with caution.

## FRAGSTATS

The FRAGSTATS is a computer software program designed to compute a wide variety of landscape metrics for categorical map patterns. The original software (version 2) was released in the public domain during 1995 in association with the publication of a USDA Forest Service General Technical Report (McGarigal and Marks 1995).

The following discussion is summarized from the FRAGSTATS website (<http://www.umass.edu/landeco/research/fragstats/fragstats.html>), which describes FRAGSTATS in detail. Those descriptions are incorporated here by reference.

The FRAGSTATS is a spatial pattern analysis program for categorical maps. The landscape subject to analysis is user-defined and can represent any spatial phenomenon. FRAGSTATS simply quantifies the areal extent and spatial configuration of patches within a landscape; it is incumbent upon the user to establish a sound basis for defining and scaling the landscape (including the extent and grain of the landscape) and the scheme upon which patches are classified and delineated. The output from FRAGSTATS is meaningful only if the landscape mosaic is meaningful relative to the phenomenon under consideration.

The FRAGSTATS computes three groups of metrics. For a given landscape mosaic, it computes several metrics for: (1) each patch in the mosaic; (2) each patch type (class) in the mosaic; and (3) the landscape mosaic as a whole. The FRAGSTATS website contains a detailed description of the metrics.

The FRAGSTATS website includes a discussion on the conceptual background of FRAGSTATS analysis, including advice and caveats about use of the software. Key points from that discussion are summarized here.

A landscape is not necessarily defined by its size; rather, it is defined by an interacting mosaic of patches relevant to the phenomenon under consideration (at any scale). It is incumbent upon the investigator or manager to define landscape in an appropriate manner. The essential first step in any landscape-level research or management endeavor is to define the landscape, and this is of course prerequisite to quantifying landscape patterns.

## Classes of Landscape Pattern

Real landscapes, at any scale, contain complex spatial patterns in the distribution of resources that vary over time. Quantifying these patterns and their dynamics is the purview of landscape pattern analysis. Landscape patterns can be quantified in a variety of ways depending on the type of data collected, the manner in which it is collected, and the objectives of the investigation. Broadly considered, landscape pattern analysis involves four basic types of spatial data corresponding to different representations of landscape pattern. These look rather different numerically, but they share a concern with the relative concentration of spatial variability:

- (1) **Spatial point patterns** represent collections of entities where the geographic locations of the entities are of primary interest, rather than any quantitative or qualitative attribute of the entity itself.
- (2) **Linear network patterns** represent collections of linear landscape elements that intersect to form a network.



(3) **Surface patterns** represent quantitative measurements that vary continuously across the landscape; there are no explicit boundaries (i.e., patches are not delineated). Here, the data can be conceptualized as representing a three-dimensional surface, where the measured value at each geographic location is represented by the height of the surface.

(4) **Categorical (or thematic; choropleth) map patterns** represent data in which the system property of interest is represented as a mosaic of discrete patches. From an ecological perspective, patches represent relatively discrete areas of relatively homogeneous environmental conditions at a particular scale. The patch boundaries are distinguished from their surroundings by abrupt discontinuities (boundaries) in environmental character states of magnitudes that are relevant to the ecological phenomenon under consideration.

## Patch-Corridor-Matrix Model

Patch must be defined relative to the phenomenon under investigation or management; regardless of the phenomenon under consideration (e.g., a species, geomorphological disturbances, etc), patches are dynamic and occur at multiple scales; and patch boundaries are only meaningful when referenced to a particular scale.

It is incumbent upon the investigator or manager to establish the basis for delineating among patches and at a scale appropriate to the phenomenon under consideration.

Corridors are distinguished from patches by their linear nature and can be defined on the basis of either structure or function or both. If a corridor is specified, it is incumbent upon the investigator or manager to define the structure and implied function relative to the phenomena (e.g., species) under consideration.

It is incumbent upon the investigator or manager to determine whether a matrix element exists and should be designated given the scale and phenomenon under consideration.

## The Importance of Scale

One of the most important considerations in any landscape ecological investigation or landscape structural analysis is (1) to explicitly define the scale of the investigation or analysis, (2) to describe any observed patterns or relationships relative to the scale of the investigation, and (3) to be especially cautious when attempting to compare landscapes measured at different scales.

## Landscape Context

A landscape should be defined relative to both the patch mosaic within the landscape as well as the landscape context. Moreover, consideration should always be given to the landscape context and the openness of the landscape relative to the phenomenon under consideration when choosing and interpreting landscape metrics.

## FRAGSTATS Metrics Used in this Analysis

This analysis analyzes the following FRAGSTATS class metrics:

- % BLM cover – the % of BLM cover in each class
- Patch density (PD) – the number of patches per unit area)
- Largest Patch Index (LPI) – the percentage of the landscape comprised by the largest patch in a class



- Edge density – edge length per unit area; edge is defined as abutting patches of different classes
- Mean patch size (ha) – mean average of the distribution of patch sizes
- Median size (ha) – median average of the distribution of patch sizes
- Patch size SD – standard deviation of the distribution of patch sizes
- Patch size CV – coefficient of variation of the distribution of patch sizes
- PAFRAC - perimeter-area fractal dimension; the complexity of patch shapes
- Core % BLM - % of BLM in core patch areas of each class; core areas are defined as the patch that is further than the specified depth-of-edge distance from the patch perimeter
- Disjunct core area density - number of disjunct core areas contained within each patch per unit area
- Core mean patch size (ha) - mean average of the distribution of core area
- Core median patch size (ha) – median average of the distribution of core areas
- Core patch size SD – standard deviation of the distribution of core areas
- Core patch size CV – coefficient of variation of the distribution of core areas
- Clumpiness – the aggregation of patches in each class; the frequency with which different pairs of patch types appear side-by-side on the map
- Connectance - number of functional joinings between patches of the same structural stage; this analysis defines patches as functionally joined if they are within 1,969 feet (600 m). This threshold distance represents the approximate distance within which northern spotted owls are expected to be able to move freely between stands of suitable habitat (Lint personal communication). This threshold distance does not provide an analysis of how well-connected habitat patches are for all species, because the effects of habitat fragmentation are highly species-specific. However, this threshold distance provides analysis directly applicable to northern spotted owls and generally relevant for highly mobile species associated with mature and structurally complex forests.

## Landscape metrics

- Simpson's diversity – the diversity of patch types across the landscape; the probability that any 2 pixels selected at random would be different patch types
- Modified Simpson's diversity – the diversity of patch types (see McGarigal and Marks 1995)
- Simpson's evenness – the distribution of area among patch types
- Modified Simpson's evenness - the distribution of area among patch types (see McGarigal and Marks 1995).

Core patch metrics require definition of a depth of edge distance. The depth of edge habitat varies for specific biophysical characteristics and ecological processes, and is strongly influenced by the degree of contrast between habitat types and physical conditions, such as slope and aspect. Although some aspects of altered microclimate may extend almost 1,000 feet into old-growth forest from a clearcut edge, most effects of edges extend less than 150 feet from an edge (Chan et al. 2004; Brososfske et al. 1997; Chen et al.1995). This analysis defines an edge of 164 feet (which corresponds to 50 meters – the data for spatial analysis is in units of 25 meters). Interior forest habitat is the portion of the patch beyond that distance from an edge with another structural stage.

See tables B-2, B-3, B4 and B-5 on the following pages.



**TABLE B-2. SPATIAL PATTERN RESULTS FOR BLM-MANAGED LANDS IN THE COAST RANGE PROVINCE FOR CURRENT CONDITION AND IN 2106 FOR ALL STRUCTURAL STAGES**

Coast Range Variable	Current			No Harvest 2106			No Action 2106			Alt 1 2106			Alt 2 2106			Alt 3 2106		
	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC
% BLM cover	4.21	42.88	46.77	N/A	0.02	94.92	3.11	4.16	87.67	4.88	6.09	83.97	10.02	13.72	70.13	15.96	8.83	69.08
Patch density (PD)	0.41	1.02	1.04	N/A	0.00	0.23	0.90	1.08	0.64	1.08	1.19	0.81	1.95	3.12	1.71	1.72	1.04	4.57
Largest Patch Index (LPI)	0.04	2.17	1.46	N/A	0.01	21.94	0.04	0.03	16.98	0.09	0.05	16.74	0.11	0.10	6.73	0.09	0.08	8.23
Edge density	7.11	48.34	40.79	N/A	0.01	45.19	8.78	11.87	54.67	11.76	15.08	57.67	22.07	28.74	64.20	36.95	19.25	72.35
Mean patch size (ha)	10.30	42.23	44.83	N/A	10.48	408.11	3.46	3.84	137.65	4.53	5.13	103.25	5.13	4.40	41.09	9.30	8.51	15.12
Median size (ha)	9.06	12.13	7.75	N/A	6.13	31.25	1.00	1.06	3.88	1.25	1.38	1.88	0.38	0.19	0.44	3.63	2.06	0.13
Patch size SD	9.66	201.98	195.60	N/A	10.39	3181.14	6.74	7.61	1560.03	10.31	10.86	1338.81	13.67	14.32	606.58	16.65	18.94	309.13
Patch size CV	93.79	478.25	436.32	N/A	99.19	779.48	194.75	198.15	1133.29	227.75	211.69	1296.68	266.54	325.32	1476.09	178.95	222.59	2044.85
PAFRAC	1.26	1.38	1.32	N/A	N/A	1.44	1.33	1.34	1.36	1.31	1.34	1.38	1.30	1.30	1.36	1.37	1.35	1.35
Core % BLM	1.69	22.67	28.49	N/A	0.01	66.46	0.69	0.88	58.31	1.32	1.57	55.25	3.14	4.84	42.69	4.41	2.71	41.06
Disjunct core area density	0.49	2.68	2.09	N/A	0.00	1.87	0.51	0.72	2.57	0.76	1.00	2.31	1.41	1.69	2.66	2.61	1.29	2.70
Core mean patch size (ha)	4.14	22.33	27.31	N/A	5.32	285.73	0.77	0.82	91.56	1.23	1.32	67.94	1.61	1.55	25.02	2.57	2.61	8.99
Core median patch size (ha)	3.06	4.31	2.06	N/A	1.78	17.44	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00
Core patch size SD	5.04	124.22	138.15	N/A	7.57	2270.06	2.65	2.57	1086.68	4.44	4.12	937.13	5.70	6.65	418.63	6.02	7.85	200.07
Core patch size CV	121.76	556.33	505.96	N/A	142.14	794.47	345.32	315.80	1186.90	361.03	312.23	1379.42	354.19	427.66	1673.42	234.24	300.97	2226.51
Clumpiness	0.87	0.85	0.87	N/A	0.95	0.11	0.80	0.80	0.56	0.82	0.82	0.64	0.83	0.83	0.76	0.81	0.83	0.74
Connectance	0.13	0.09	0.09	N/A	6.67	0.22	0.16	0.15	0.17	0.15	0.15	0.15	0.10	0.09	0.11	0.08	0.12	0.07
<b>Landscape metrics</b>																		
Simpson's diversity	0.59			0.10			0.23			0.29			0.48			0.49		
Mod Simpson's diversity	0.90			0.10			0.26			0.34			0.65			0.67		
Simpson's evenness	0.79			0.14			0.30			0.38			0.63			0.65		
Mod Simpson's evenness	0.65			0.09			0.18			0.24			0.47			0.48		

SE - Stand Establishment Y - Young M&SC - Mature and Structurally Complex



**TABLE B-3. SPATIAL PATTERN RESULTS FOR BLM-MANAGED LANDS IN THE WEST CASCADES PROVINCE FOR CURRENT CONDITION AND IN 2106 FOR ALL STRUCTURAL STAGES**

Variable	Current			No Harvest 2106			No Action 2106			Alt 1 2106			Alt 2 2106			Alt 3 2106		
	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC
% BLM cover	6.97	38.96	44.40	0.02	2.35	88.93	8.58	11.14	71.58	11.05	17.44	62.80	14.56	21.59	54.18	15.27	9.16	65.89
Patch density (PD)	0.59	1.17	1.03	0.00	0.12	0.35	1.77	1.83	1.18	1.85	2.28	1.65	2.55	3.58	2.20	1.60	0.77	3.38
Largest Patch Index (LPI)	0.10	1.05	2.64	0.01	0.28	7.27	0.06	0.26	3.72	0.10	0.28	3.63	0.13	0.28	2.46	0.22	0.28	2.83
Edge density	11.51	44.37	45.12	0.04	3.05	50.67	20.69	23.95	64.46	23.60	34.46	67.96	29.98	40.55	67.53	31.83	16.01	68.85
Mean patch size (ha)	11.83	33.21	43.16	6.92	19.72	253.74	4.84	6.10	60.63	5.97	7.64	38.09	5.72	6.04	24.64	9.57	11.89	19.51
Median size (ha)	8.31	9.50	7.06	7.00	8.50	8.19	1.31	1.38	3.25	1.56	1.75	1.75	0.88	0.25	1.31	3.06	3.19	0.19
Patch size SD	16.84	112.69	233.61	3.78	53.87	1218.07	10.02	17.14	408.11	13.57	20.69	325.32	16.36	20.42	212.55	24.21	30.63	190.48
Patch size CV	140.68	339.32	541.30	54.66	273.17	480.05	206.92	280.93	673.09	227.44	270.92	854.05	286.04	338.34	862.48	252.93	257.61	976.12
PAFRAC	1.30	1.37	1.36	N/A	1.35	1.44	1.31	1.31	1.38	1.30	1.31	1.39	1.29	1.29	1.36	1.35	1.33	1.32
Core % BLM	2.82	20.24	25.32	0.00	1.19	59.61	2.41	3.68	42.53	3.60	6.18	35.71	5.06	8.43	28.86	4.99	3.71	38.14
Disjunct core area density	0.82	2.71	2.46	0.00	0.18	2.28	1.29	1.49	3.65	1.50	2.20	2.99	1.87	2.41	2.93	2.14	1.01	3.00
Core mean patch size (ha)	4.77	17.25	24.61	1.33	10.00	170.08	1.36	2.02	36.02	1.94	2.70	21.66	1.99	2.36	13.13	3.13	4.82	11.30
Core median patch size (ha)	2.50	2.81	1.69	0.69	2.56	10.88	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.19	0.00
Core patch size SD	9.44	71.00	154.26	1.08	36.95	855.84	4.31	9.94	272.60	6.32	11.48	216.73	7.69	11.29	132.20	11.13	18.19	120.37
Core patch size CV	197.67	411.48	626.89	81.48	369.56	503.19	317.16	493.00	756.79	324.96	424.48	1000.57	386.52	479.09	1006.84	356.08	377.12	1065.67
Clumpiness	0.87	0.86	0.86	0.86	0.90	0.54	0.82	0.83	0.75	0.83	0.83	0.78	0.83	0.83	0.80	0.83	0.86	0.76
Connectance	0.13	0.10	0.11	0.00	0.42	0.25	0.10	0.10	0.12	0.11	0.09	0.10	0.09	0.09	0.09	0.10	0.17	0.09
<b>Landscape metrics</b>																		
Simpson's diversity	0.64			0.20			0.46			0.56			0.63			0.52		
Mod Simpson's diversity	1.01			0.22			0.62			0.81			0.99			0.74		
Simpson's evenness	0.85			0.27			0.61			0.74			0.84			0.70		
Mod Simpson's evenness	0.73			0.16			0.44			0.58			0.72			0.54		

SE - Stand Establishment Y - Young M&SC - Mature and Structurally Complex





**TABLE B-4. SPATIAL PATTERN RESULTS FOR BLM-MANAGED LANDS IN THE KLAMATH PROVINCE FOR CURRENT CONDITION AND IN 2106 FOR ALL STRUCTURAL STAGES**

Klamath Variable	Current			No Harvest 2106			No Action 2106			Alt 1 2106			Alt 2 2106			Alt 3 2106		
	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC
% BLM cover	8.18	33.45	51.45	0.04	2.44	90.65	10.08	7.01	76.03	11.51	18.11	63.49	14.77	21.96	56.34	22.27	11.96	58.84
Patch density (PD)	0.67	1.27	0.93	0.00	0.21	0.27	2.17	1.37	0.98	2.09	2.50	1.71	2.12	2.74	1.76	1.78	1.35	5.39
Largest Patch Index (LPI)	0.25	2.94	4.08	0.02	0.08	25.94	0.06	0.08	17.06	0.08	0.09	13.78	0.08	0.15	17.58	0.22	0.10	11.37
Edge density	12.46	40.85	46.69	0.08	3.56	43.57	24.34	15.68	61.06	26.66	35.62	66.17	28.74	36.60	55.48	42.11	25.13	69.03
Mean patch size (ha)	12.23	26.32	55.56	8.53	11.63	341.53	4.65	5.12	77.88	5.52	7.25	37.12	6.98	8.01	31.97	12.53	8.88	10.92
Median size (ha)	7.16	8.19	8.81	4.13	4.25	17.06	1.25	1.25	2.88	1.50	1.53	1.50	0.88	0.44	1.31	3.31	3.06	0.13
Patch size SD	28.81	163.11	372.39	14.71	23.53	3550.25	10.05	12.47	1172.62	12.29	18.08	707.06	16.76	24.70	805.02	30.04	17.68	304.58
Patch size CV	235.48	619.73	670.23	172.45	202.28	1039.53	216.14	243.80	1505.74	222.83	249.46	1904.57	240.04	308.29	2518.16	239.69	199.22	2789.21
PAFRAC	1.28	1.38	1.38	1.49	1.29	1.44	1.30	1.30	1.38	1.31	1.30	1.41	1.29	1.28	1.33	1.35	1.34	1.34
Core % BLM	3.62	17.48	30.91	0.01	1.14	64.15	2.89	2.31	47.74	3.49	6.73	37.97	5.41	9.58	34.00	8.30	3.99	34.03
Disjunct core area density	0.88	2.50	2.52	0.00	0.22	1.84	1.46	0.93	3.37	1.63	2.05	2.70	1.81	2.05	2.54	2.64	1.65	2.76
Core mean patch size (ha)	5.41	13.76	33.38	2.95	5.43	241.68	1.34	1.68	48.90	1.67	2.69	22.20	2.56	3.49	19.29	4.67	2.96	6.32
Core median patch size (ha)	2.00	2.25	2.44	0.69	0.50	9.34	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.13	0.00
Core patch size SD	19.82	125.60	269.61	7.59	16.12	2635.52	4.49	7.10	854.13	5.40	9.71	536.18	8.41	14.51	598.10	14.82	9.16	208.90
Core patch size CV	366.36	913.12	807.72	257.54	296.89	1090.48	336.52	422.08	1746.64	323.15	360.54	2414.84	329.29	415.30	3099.91	317.09	309.29	3307.90
Clumpiness	0.88	0.86	0.85	0.88	0.89	0.52	0.81	0.83	0.73	0.82	0.83	0.78	0.84	0.85	0.83	0.83	0.83	0.79
Connectance	0.10	0.08	0.10	3.81	0.29	0.23	0.08	0.12	0.12	0.09	0.08	0.09	0.09	0.08	0.09	0.08	0.10	0.07
<b>Landscape metrics</b>																		
Simpson's diversity	0.61			0.17			0.40			0.55			0.61			0.59		
Mod Simpson's diversity	0.95			0.19			0.51			0.79			0.94			0.88		
Simpson's evenness	0.82			0.23			0.54			0.73			0.81			0.78		
Mod Simpson's evenness	0.68			0.14			0.37			0.57			0.68			0.63		

SE - Stand Establishment Y - Young M&SC - Mature and Structurally Complex



**TABLE B-5. SPATIAL PATTERN RESULTS FOR BLM-MANAGED LANDS IN THE EASTERN CASCADES PROVINCE FOR CURRENT CONDITION AND IN 2106 FOR ALL STRUCTURAL STAGES**

East Cascades Variable	Current			No Harvest 2106			No Action 2106			Alt 1 2106			Alt 2 2106			Alt 3 2106		
	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC	SE	Y	M&SC
% BLM cover	9.59	20.83	59.39	0.00	4.54	86.24	7.33	20.77	62.69	26.52	27.18	37.09	26.75	25.48	37.58	55.83	4.33	29.59
Patch density (PD)	0.53	1.04	0.80	0.00	0.21	0.52	0.60	1.41	1.03	0.99	1.30	1.54	0.78	1.38	2.31	61.78	13.12	9.64
Largest Patch Index (LPI)	1.01	4.28	20.46	0.00	0.63	30.62	1.08	0.86	16.86	2.11	2.34	2.75	2.50	1.60	1.91	7.06	2.44	0.19
Edge density	12.21	25.30	52.64	0.00	5.20	51.61	12.46	27.78	54.39	30.38	33.37	45.84	30.37	32.38	46.81	221.60	29.47	69.11
Mean patch size (ha)	17.97	19.94	73.98	1.00	21.65	165.84	12.26	14.69	61.08	26.91	20.84	24.13	34.10	18.50	16.25	61.78	13.12	9.64
Median size (ha)	9.19	6.25	12.56	1.00	9.84	15.81	6.13	5.03	7.38	7.00	5.09	5.50	9.88	2.75	1.00	7.06	2.44	0.19
Patch size SD	29.08	67.83	356.97	0.00	33.25	700.47	23.27	27.98	273.30	56.23	51.76	60.55	71.03	41.90	44.91	221.60	29.47	69.11
Patch size CV	161.86	340.11	482.55	0.00	153.60	422.38	189.78	190.46	447.43	208.92	248.43	250.99	208.31	226.50	276.41	358.68	224.63	716.74
PAFRAC	1.26	1.31	1.40	N/A	1.30	1.39	1.31	1.29	1.36	1.31	1.29	1.33	1.34	1.25	1.28	1.36	1.26	1.32
Core % BLM	5.00	10.49	34.09	0.00	2.37	56.01	2.94	9.75	36.94	13.72	13.83	19.07	13.99	12.73	19.57	32.58	2.21	16.44
Disjunct core area density	0.71	1.57	3.14	0.00	0.33	2.76	0.84	1.79	3.15	1.88	1.98	2.51	1.85	1.93	2.48	2.90	0.30	1.45
Core mean patch size (ha)	9.37	10.04	42.46	0.00	11.32	107.70	4.93	6.89	35.99	13.93	10.60	12.41	17.84	9.24	8.46	36.05	6.68	5.36
Core median patch size (ha)	3.13	1.50	3.72	0.00	5.06	7.28	1.56	0.81	2.38	1.78	0.78	0.81	3.44	3.38	0.00	1.25	0.00	0.00
Core patch size SD	20.59	43.96	222.04	0.00	23.22	480.74	10.88	17.24	173.27	33.52	30.70	36.96	40.76	23.70	27.39	142.23	19.08	43.13
Core patch size CV	219.73	437.77	522.95	0.00	205.21	446.35	220.94	250.06	481.39	240.73	289.53	297.86	228.53	256.50	323.62	394.48	285.86	805.22
Clumpiness	2.42	1.22	1.64	0.83	0.91	0.61	0.88	0.87	0.81	0.88	0.88	0.85	0.88	0.87	0.85	0.84	0.90	0.87
Connectance	1.26	1.31	1.40	0.00	2.80	2.44	2.18	0.94	1.46	1.21	1.40	1.14	1.33	1.37	1.15	1.57	3.29	1.12
<b>Landscape metrics</b>																		
Simpson's diversity	0.58			0.25			0.55			0.71			0.71			0.59		
Mod Simpson's diversity	0.78			0.28			0.73			0.95			1.24			0.78		
Simpson's evenness	0.88			0.33			0.80			1.24			0.95			0.89		
Mod Simpson's evenness	0.63			0.20			0.58			0.89			0.90			0.64		

SE - Stand Establishment Y - Young M&SC - Mature and Structurally Complex



These metrics were generated for the draft EIS even though only three were used in the analysis: mean patch size, connectance, and edge density. The other metrics were generated to evaluate the relative changes in the metrics used in the analysis as a quality control check. Many of the metrics are correlated, and comparison of the results can provide a check for errors in the analysis. The change in these additional metrics over time was generally consistent with the change in the metrics used in the draft EIS analysis and revealed no errors in the analysis. Therefore, FRAGSTATS results for the PRMP in the final EIS were generated only for the metrics used in the analysis: mean patch size, connectance, and edge density.

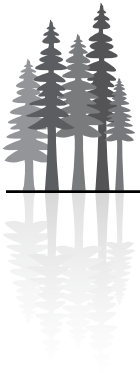
As noted in *Forest Structure and Spatial Pattern* in Chapter 3, all ownerships within a province comprise too large a database for computing most metrics, including connectance. Therefore, only mean patch size was computed for all ownerships at the province scale. Even the computation of mean patch size across all ownerships was lengthy and cumbersome in the draft EIS. Because of limitations in the ability of FRAGSTATS to analyze raster datasets beyond an unknown file size threshold, the final EIS used an alternative approach to calculating mean patch size across all ownerships for the PRMP.

The multi-resolution image segmentation utility available in the commercial software eCognition Professional 4.0 ([www.definiens.com](http://www.definiens.com)) groups pixels into discrete image objects (patches) with numerous spectral, spatial, and contextual attributes that can be used in subsequent analyses. Mean patch area was calculated using eCognition across all ownerships within provinces by dividing the total area of image segments containing pixels with the same forest structural stage classification by the total number of patches for that class. The results were tested by using eCognition to calculate mean patch size for draft EIS alternatives for a sample of years and provinces for which mean patch size results had been calculated in the draft EIS using FRAGSTATS. For example, Table B-6 compares the results from the two methods for Alternative 3 in 2006 (*Comparison of Mean Patch Size Results for Alternative 3 in 2006 by FRAGSTATS and eCognition*).

These results are in very close agreement, and results for other years and alternatives showed similar agreement between eCognition and FRAGSTATS results. Based on this agreement, the eCognition results for the PRMP can be accurately compared to FRAGSTATS results for the other alternatives.

**TABLE B-6. COMPARISON OF MEAN PATCH SIZE RESULTS FOR ALTERNATIVE 3 IN 2006 BY FRAGSTATS AND ECOGNITION.**

Structural stage	Mean Patch Size (acres)	
	FRAGSTATS	eCognition
Stand Establishment	41.96	41.98
Young	6.16	6.16
Mature & Structurally Complex	28.81	28.82



# Appendix C

## Carbon Storage

### Modeling



---

This appendix provides background on the calculation of carbon storage for the alternatives.

**In this appendix:**

Carbon Storage in Live Trees.....	28
Carbon Storage in Forests Other than Live Trees.....	29
Carbon Storage in Harvested Wood.....	30



# Analysis of Carbon Storage

The analysis of carbon storage modeled the amount of carbon stored in the forest and in harvested wood products. The analysis divided carbon storage into three pools:

- live trees
- forest carbon other than live trees
- harvested wood

The carbon in these three pools was summed to calculate the total carbon stored by alternative.

## Carbon Storage in Live Trees

1. Live tree carbon was derived in this analysis using the outputs from the OPTIONS model for standing tree volume by species over time for each alternative. This analysis derived live tree volumes from the modeling results based on detailed forest inventory data and site-specific growth and yield curves. See *Appendix R – Vegetation Modeling*.
2. Standing tree volumes measured in board feet were converted to cubic feet using a conversion factor of 6.00 board feet/cubic foot.
3. The cubic foot tree volumes were converted to pounds of biomass according to the conversion factors (Simpson 1993, USDA 1987) shown in *Table C-1*:
4. The pounds of biomass derived from tree volumes were expanded to a total biomass for entire trees (including branches, bark, and roots) by multiplying by 1.85.
5. The total biomass for entire trees was converted to pounds of carbon by multiplying by 0.50 (DOE 2007, Smith et al. 2006).
6. Pounds of carbon were converted to tonnes of carbon by dividing by 2200.

**TABLE C-1. FACTORS FOR CONVERTING TREE VOLUME TO POUNDS OF BIOMASS**

Species Group	Pounds/Cubic foot
Douglas-fir	35
Northern hardwoods (e.g., red alder, bigleaf maple)	25
True fir	25
Southern hardwoods (e.g., madrone, tanoak, oaks)	44
Ponderosa pine	27
Juniper	25



## Carbon Storage in Forests Other than Live Trees

The analysis calculated a total non-live-tree carbon pool for each of the following structural stages: stand establishment, young, mature, and developed structurally complex from values in DOE (2007) for Douglas-fir stands in the Pacific Northwest, West. In addition, the analysis calculated a total non-live-tree carbon pool for existing old forest from values in Smithwick et al. (2002). The values from Smithwick et al. (2002) for stands in the Oregon Coast Range and Oregon West Cascades were averaged to obtain a value for forests classified in this analysis as existing old forest.

The regional averages in DOE (2007) describe tonnes of carbon per acre for stands of various ages. This analysis assigned values to structural stages using stand ages from DOE (2007) as follows:

Stand establishment	age 5
Young	age 35
Mature	age 95
Developed Structurally Complex	age 125

Because the regional averages in DOE (2007) only describe values for stands up to age 125, this analysis used values for existing old forest from Smithwick et al. (2002). The values from Smithwick et al. (2002) for stands in the Oregon Coast Range and Oregon West Cascades were averaged to obtain a value for forests classified in this analysis as existing old forest. Studies of forest ecosystem carbon differ in how they partition the different ecosystem components. As a result, the values for individual ecosystem components cannot be directly compared among different studies as readily as the total carbon values. For example, the values from Smithwick et al. (2002) for soil organic carbon are far higher than the values from DOE (2007), but the values for forest floor and down dead carbon are lower than for values for 125-year-old stands from DOE (2007). These differences most likely reflect a difference in how the pools of carbon were partitioned and measured. Therefore, comparisons among studies are more reliably made for the total forest ecosystem carbon, rather than individual ecosystem components. The Forest Ecosystem carbon (excluding live trees) by structural stage is shown in *Table C-2*.

**TABLE C-2. FOREST ECOSYSTEM CARBON (EXCLUDING LIVE TREES) BY STRUCTURAL STAGE**

Structural Stage	Tonnes Of Carbon Per Acre					
	Snags	Understory	Down Dead	Forest Floor	Soil Organic	Total
Stand establishment	0.3	1.8	17.8	9.6	38.3	67.8
Young	7.1	1.3	14.2	9.4	38.3	70.3
Mature	12.8	1.2	20.0	15.9	38.3	88.2
Developed structurally complex	14.2	1.1	22.9	18.3	38.3	94.8
Existing old forest	12.3	0.5	22.8	13.5	81.7	130.9



## Carbon Storage in Harvested Wood

The calculation of the carbon stored in harvested wood depends on the amount of wood harvested and how much of the carbon in that wood is emitted through harvesting, processing, waste, disposal, and decomposition.

1. The total volume of harvested wood in board feet for each alternative was derived from the outputs from the OPTIONS model. See *Appendix R – Vegetation Modeling*. This volume represents saw log volume only and does not account for pulpwood or chip volume. The total volume of harvest wood in board feet for past harvests was derived from historical records of timber sales by year, from 1962-2005. No pulpwood or chip volume is calculated for past harvests.
2. The board feet of harvested wood was converted to mass of carbon by the conversion factor for softwood lumber from Smith et al. (2006: 35): 1,000 board feet = 0.443 tonnes of carbon.
3. Pulpwood volume is calculated as an additional 5% of the total volume of harvested wood as described above in (1). The volume of pulpwood or chip harvest would be highly variable, in response to many variables, including sale location, topography, stand conditions, yarding systems, and market prices. This calculation was based on the low range of the estimate of past harvests on BLM-administered lands, in which an additional 5% to 10% of the standing merchantable volume of stands harvested was typically harvested as pulpwood or chips. Thinnings would usually have material consisting mainly of tops and sub-merchantable stems, while older stands would include more cull material and broken pieces. Topography, vegetation and yarding systems would affect the availability by reducing the recovery level of material. Areas suitable for ground-based equipment would have a higher recovery level, while areas of steep dense brush would have a lower recovery, because of the difficulty in bringing the material to the landing with cable yarding systems.
4. The amount of carbon emitted from harvested wood over time was subtracted from the total carbon in harvested wood for each decade based on the values for Pacific Northwest softwood saw logs and pulpwood in Smith et al. (2006) and DOE (2007) as shown below in *Tables C-3 and C-4*.

**TABLE C-3. CARBON EMITTED FROM HARVESTED SAW LOGS**

Time Since Harvest	Cumulative Percentage of Carbon Emitted Without Energy Capture
10 years after harvest	20.4
20 years after harvest	23.9
50 years after harvest	29.8
100 years after harvest	34.9

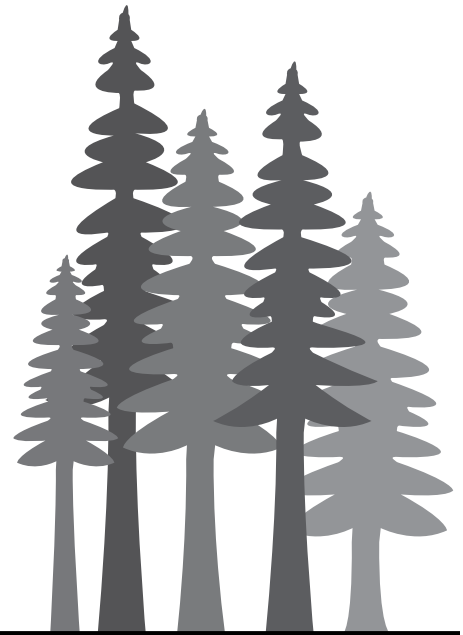
**TABLE C-4. CARBON EMITTED FROM HARVESTED PULPWOOD**

Time Since Harvest	Cumulative Percentage of Carbon Emitted Without Energy Capture
10 years after harvest	27.0
20 years after harvest	30.9
50 years after harvest	34.5
100 years after harvest	35.5



# Appendix D

## Socioeconomics



---

This appendix provides background on the analysis of socioeconomic conditions.

**In this appendix:**

Introduction .....	32
The Western Oregon Model .....	33
County Level Input/Output Models .....	34
Timber Assessment Market Model .....	36
Survey of Counties .....	37
BLM Budget .....	37
Timber Program Costs .....	37



# Introduction

The socioeconomic analysis describes the impacts of the alternatives in terms of:

- Employment – full time equivalent jobs by economic sector.
- Income – wages associated with employment.
- Payments to Counties – Counties' share of the revenues paid to BLM.
- BLM budget – Money spent for BLM personnel, services, equipment, etc.
- Contract costs – Money spent on contracting certain silvicultural costs.
- Present net value – Sum of discounted revenues and costs associated with the timber sale program.

Employment, income and payments to counties were calculated at the County level, for each of the eighteen O&C Counties. BLM budgets and contract costs were calculated at the BLM District level. The present net value was calculated for the entire planning area.

## Process Overview

The OPTIONS model provided data about the volume and size of timber in each harvest unit, and the type of harvest (regeneration, partial cut, thinning). Historic BLM timber sale data were used to estimate species mix and log grade for each proposed harvest unit and values by grade and species. A stumpage value was estimated for each harvest unit, based on the volume and grade of timber, logging costs and average road costs. For the first decade, the estimated stumpage was reduced 3.5 percent based on an analysis of the market price impact of selling additional BLM timber. The adjusted estimated stumpage value formed the basis for calculating total BLM timber revenues and BLM payments to counties.

Harvest by county was allocated to specific manufacturing centers using the Western Oregon Model, described below. In addition, the Western Oregon Model projected the impact of additional BLM timber on the market price of timber, and the effect on private harvest levels. This model also projected the value of the products produced at each manufacturing center – data used in the county-level input output models.

County-level Input/Output (I/O) models were built for each of the O&C Counties, and calibrated to local economies based on field visits and additional research. Given the value of wood products production in each County, and the federal payments to each County, changes to employment and income were projected.

Changes to the BLM budget were estimated using a unit cost associated with timber harvest. Contractor costs were based on the amount and type of harvest specified by the OPTIONS model.

The present net value calculation is based on the stumpage values derived from the OPTIONS model for five decades, and the estimated cost of the BLM timber program.

Information about County budgets, how reliant each County is on BLM payments, and how each County spends the BLM payments was based on a survey of the 18 O&C Counties.

The following sections describe each of these processes in more detail. More complete descriptions can be found in the references.



# The Western Oregon Model

The Western Oregon Model was developed at Oregon State University by Darius Adams and Greg Latta. It is used to analyze questions about timber supply, public policies and how markets might respond to changes in fundamental factors.

The Western Oregon Model has five basic components: (i) inventory data describing private lands; (ii) assumptions about likely future silvicultural regimes to be applied to those lands; (iii) projections of future timber yields under the several regimes; (iv) assumptions about changes in timberland area through gains or losses to other uses or owners; and (v) a model that projects future harvests based on inventory and other assumptions, applies the management regimes, and updates the inventory over time.

## Inventory

The approach involved projecting and harvesting the plots in a simulation system designed to mimic actual growth and harvest. Inventories were brought to a common starting point (2003) using a harvest scheduling model that selected plots (condition classes in western Oregon) for harvest to maximize the present net worth of timber returns over the period from the inventory date to 2003. Simulated harvesting was constrained to mimic actual historical cut by year and owner at the county level. Cut by species group, period-to-period changes in harvest per acre, and the area partial cut were constrained at the half-state level (the finest scale for which historical data are available). In this process, tree lists from the original plots were updated using a version of the Forest Vegetation Simulator (Dixon 2003).

## Management Intensity Classes

A Management Intensity Class is a regime of silvicultural activities applied over the life of a stand. In this analysis, stands are classified as either: (i) “existing,” those that are part of the original inventory at the start of the projection, or (ii) “new,” those that are regenerated during the projection. There are seven Management Intensity Classes for existing stands and eight for new stands.

## Yield Projections

Yields for each Management Intensity Class in each stand were generated using one of three regional variants of the Forest Vegetation Simulator. It is assumed that, by ecoregion, the stems per acre and species composition in new naturally regenerated stands were the same as that derived from averages for all young stands from the Forest Inventory Analysis database.

## Land Area Changes

It is assumed that the general direction of past area trends will continue over the next 15 years but at reduced rates. The recent historical gain in western Oregon’s private base was small, and a constant timberland area for that region is assumed.

## Market Model

Timber harvest is a measure of the processing activity on the supply side of the regional log market. A model of the western Oregon log market that explicitly recognizes the spatial dispersion of log processing facilities



and the forested lands that supply logs was constructed. Demand is derived from lumber and plywood production and log exports, all of which are sensitive to the delivered price of logs. The supply of logs in the short term is based on private owners' decisions about harvest timing to optimize the value of their timber investments given stand growth and interest rates. In the longer term, it depends on management (silvicultural) investments because these are influenced by anticipated yield increments, management costs, interest rates, and price expectations.

Log processing is grouped into specific milling or processing centers in the region. Mills generate a demand for delivered logs at these centers, which varies with log price up to the point of capacity. Log demand would shift depending on product prices, technology, non-wood costs, and capacity. Capacity itself is not fixed but varies with product prices, equipment costs, depreciation, and interest rate. Potential sources of private log supply lie at various distances from the processing center and have varying cost characteristics depending on the types of forest management, logging conditions, haul distances, and the interest rate.

## Additional Assumptions

In the projections, assumptions about future prices of products and of labor and "other" variable inputs were derived from the 2005 Resource Planning Act Timber Assessment Update (U.S. Forest Service 2005, Timber Assessment Update). Draft (last accessed 01/27/2006) available online at: [www.fs.fed.us/pnw/about/programs/hnri/index.shtml](http://www.fs.fed.us/pnw/about/programs/hnri/index.shtml)

Harvest from public lands is determined by policies within the respective managing agencies and generally is not sensitive to log price over the five-year time interval used in this analysis. Consequently, public log supply is treated as exogenous and it is assumed that it will remain constant at recent (2000–2002) average levels throughout the projection. Alternative scenarios of BLM timber harvest were constructed by varying the exogenous levels of BLM cut according to the conditions of the scenario.

Public harvest is set at the county level in the model and the costs of moving logs from public lands to mills estimated using an average haul distance from each county to each milling center.

## County Level Input/Output Models

Input/output models (I/O) are automated process models that scale national-level economic relationships to fixed-structure county databases. Critical input/output data was abstracted from published source data and active field surveys. Detailed outputs of the models are contained in the tables at the end of this appendix (See *Table D-3*). The general approach contains four analytical phases:

## Collecting Secondary Economic Indicator Data for County Level

Those data sources form a large database for each separate county model. The data matrix is recalibrated from field survey data for key sectors such as wood products and major manufacturers. Data on unearned income, including transfer payments and property income comes from the U.S. Bureau of Economic Analysis' Regional Economic Information System database. Data on seasonal homes in the study area, population and household comes from the U.S. Census Bureau website and Portland State University. County-level wage rates are found in the Oregon Labor Market Information System (OLMIS).



## Comparing Similar Data from Multiple Sources and Refining by Using Field Calibration

We received primary source records of BLM harvests, budget allocations and practices as well as historical payments to counties (BLM records, Association of O&C Counties Tabulation 10/5/2006, and USFS ASR payments to counties by national forest tabulation 12/22/2006). BLM payments were put in context to all county budget sources (Davis, Association of O&C Counties). We used secondary state historical data to establish the relative BLM harvest contribution (Lettman, Oregon Department of Forestry forest economist). Spatial log flows are proportioned based on an earlier flow survey (Jason Brandt, Montana Bureau of Business and Economic Research). For loggers, we gathered logger data (Oregon Department of Labor), found discrepancies in association estimates (Oregon Association of Loggers) and logger safety records (Oregon Dept of Logger Safety), so we augmented these estimates from federal proprietor data (US Department of Commerce). Industrial production data came from numerous surveys and models. These estimates were tested and augmented by ForestEcon, Inc. field surveys. We used two sources of log using mill location and activities (Oregon State University), (Ehinger, 2006, Western Oregon Wood Products Mill survey) which were later adjusted to compromise with other estimates (Western Oregon Model *ibid*).

## Conducting Field Surveys for Detailed Data on Socioeconomic Conditions

Field interviews are augmented by follow-up telephone surveys. In each county, Dr. Dan Green, regional economist, and Maryann Green, resource biologist, both of Economic Analysis Systems contacted county government leaders, wood products industry employers, and businessmen in leading or potentially sensitive economic sectors. Their objective was to test the accuracy of secondary data, add detail to quantitative descriptions of each county's total economy and selective precision for expected critical sectors and ensure that revised data are generally acknowledged as accurate and representative.

## Analysis of Data

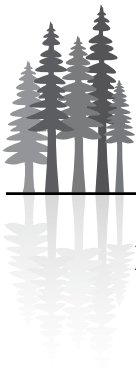
The Timber Assessment Market Model provided regional estimates of stumpage price and owner harvest substitution estimates (Adams, Oregon State University). These estimates are used to estimate alternative payments to counties (Rasmussen, Mason, Bruce and Girard Inc). The Western Oregon timber model runs generate new spatial log use, and wood products production patterns by BLM alternative (Latta, Oregon State University).

## Model Development Process

A field survey calibration of county economic data bases was used to build a unique selective precision spreadsheet Input/Output model. The Economic Analysis Systems modeling process is based on a unique resource economy representation technique (Robison, 1997). The methodology was developed for USDA-Forest Service spatially-sensitive community impact analyses where canned I/O models obscure or misrepresent impacts.

### Establish Model Geography and Resolution

We chose a county level of resolution so that most O&C impacts would be captured. That required a set of 17 county models as we decided to represent counties where O&C lands were few, but that O&C operations had economic influences.



## **Develop County-Level Databases**

A database for each of the models is first assembled from published, on-line data sources, and survey data collected in 2006. The county databases included employment, wage and salary earnings, total industry output, unearned income, seasonal home spending, population, households, commuting patterns, wage rates, residency, employment status, tax rates, and savings and consumption rates (marginal and average propensity to consume locally).

## **Construct Preliminary County Models**

A preliminary county model for the model areas is constructed from the secondary data sources. Its content and structure are similar to that used by IMPLAN. Employment and earnings totals in the models are controlled to Regional Economic Information System totals for each county. Industrial output by industry for each of the county models was derived using employment/output ratios obtained from the respective county models. The Economic Analysis Systems approach used the “selective precision” approach (Richardson, 1972). With this approach, on-the-ground verification focuses on a select number of sectors that are expected to play a significant role in the analysis. Each of the county models is constructed using a combination of spreadsheet programs along with a mathematical software program, GAUSS (Aptech Systems Software) which handles complex mathematical operations.

## **Calibrate County Models**

In general, data and relationships for sectors that play an important role in the local economy and that are a key component of the economic base were adjusted with on-the-ground verified data as appropriate.

## **Modify Export Base in Key Economic Sectors**

Use of mechanical techniques typically results in local absorption of the output of a variety of local industries that export all of their output (i.e., an extreme case of underestimating exports). Export sales are adjusted based on survey data for all key sectors in the analysis (such as wood products) and other sectors such as agriculture that are principal components of the economic base.

## **Perform Sensitivity Analyses and Adjustments**

Preliminary runs of the models using a range of input variables are undertaken to determine whether the model’s projections of impacts were reasonable. This procedure focuses on the wood products sector of the county model. Multipliers from the model are also compared to multipliers developed by the U.S. Bureau of Economic Analysis Regional Input-Output Modeling multipliers and for IMPLAN models of the area and to a county model (Western Oregon).

# **Timber Assessment Market Model**

The Timber Assessment Market Model focuses on the solid wood products sector and also provides the linkage between products markets (solid wood and pulpwood) and the timber inventory. Since its inception in the late 1970s, the model has undergone a number of extensions and revisions designed to improve the realism of its projections and the utility of its output to resource analysts and policymakers.

The Timber Assessment Market Model is a special model of the solid wood and timber inventory elements of the United States forest products sector and of softwood lumber and OSB production in Canada.



The Timber Assessment Market Model provides annual projections of volumes and prices in the solid wood products and sawtimber stumpage markets, and estimates of total timber harvest and inventory by geographic region for periods of up to 50 years.

The demand module for softwood solid wood products uses Spelter's diffusion analysis of demands for softwood lumber, softwood plywood, and oriented strand board/ waferboard. The current wood products supply module assumes that product output is obtained in fixed proportions to log input (the product recovery factor linkage) but in variable proportions to all other factors, implying that logs are separable from other inputs in production. Given the assumptions of fixed log input-product output relations in the Timber Assessment Market Model, the derived demand for logs is simply the product of recovery factors times output. The supply of wood to processing facilities is modeled as a mixture of price-sensitive relations, and exogenous flows describing the volumes of timber available for immediate harvest and the volumes of logs delivered to mills. The Timber Assessment Market Model also includes a program module that provides linkage to the ATLAS timber inventory system for the solid wood, paper and board, and fuelwood models.

## Survey of Counties

To better understand County budgets, and the role that BLM payments play in those budgets, MB&G sent a questionnaire to each of the 18 O&C counties. Follow-up phone calls clarified unclear answers. Tables D-1 and D-2 show the information requested.

## BLM Budget

To calculate changes to the BLM budget, the non-timber portion of each district's budget was calculated from the FY 2006 budget data. The timber portion of the budget was calculated using a fixed rate of \$159/Mbf. This figure was based on historic budget information.

## Timber Program Costs

Timber program costs for the present net value calculation were based on historic BLM budget data as \$200/Mbf. This includes overhead at the district and State offices.



**TABLE D-1. COUNTY QUESTIONNAIRE REGARDING BUDGET AND EXPENDITURES**

<b>Part I. Fiscal Year 2005 Budget.</b>		
<b>County Expenditures</b>	<b>Total Budget (including Discretionary Budget)</b>	<b>Discretionary Budget Only</b>
Health & Community Services		
Public Safety		
Economic Dev., Natural Res. & Recreation		
Transportation & Land Use		
Other Community Services		
Debt Service		
Other (Specify):		
<b>Total Expenditures</b>		
<b>County Revenues</b>		
State Transfers & Reimbursements		
Property Taxes		
Safety Net Payments associated with O&C Lands		
Safety Net Payments associated with USFS Lands		
Other Federal Grants & Payments		
Fees, Charges for Services		
City, Special District & Other County Payments & Reimbursements		
Interest Earnings		
Bonding or other borrowing		
Other (Specify):		
<b>Total Revenues</b>		
<b>PART 2 – HISTORIC COUNTY EXPENDITURES</b>		
<b>Fiscal Year</b>	<b>Total Budget (including Discretionary Budget)</b>	<b>Discretionary Budget Only</b>
1985		
1990		
1995		
2000		
2001		
2002		
2003		
2004		
2005		
<b>Part 3 - Describe primary expenditures of discretionary funding</b>		
Please describe in as much detail as possible the specific uses for discretionary funds in your County. Your responses to Part 1 above puts expenditures in general categories. It would be very helpful to have more detail about specific programs and projects supported by O&C and other discretionary funds in recent years. Please feel free to attach graphs, charts, or other descriptive budget documents that help explain how your County uses its discretionary funds.		





**TABLE D-2. EXPENDITURE CATEGORIES**

<b>Expenditure Categories</b>		
Health & Community Services	<ul style="list-style-type: none"> <li>• Aging Services</li> <li>• Alcohol &amp; Drug Addiction Services</li> <li>• Services for Children &amp; Families</li> <li>• Developmentally Disabled</li> <li>• Mental Health Services</li> <li>• Oregon Health Plan Services</li> </ul>	<ul style="list-style-type: none"> <li>• Veterans Services</li> <li>• Public Health Services</li> <li>• Environmental Health Services</li> <li>• Housing Services</li> <li>• Medical Examiner</li> <li>• Solid Waste Disposal/Recycling</li> </ul>
Public Safety	<ul style="list-style-type: none"> <li>• Trial Courts</li> <li>• District Attorney</li> <li>• County Jail</li> <li>• 911/Emergency Communications</li> <li>• Emergency Management</li> <li>• Homeland Security</li> </ul>	<ul style="list-style-type: none"> <li>• Community Corrections</li> <li>• Court Security</li> <li>• Juvenile Services</li> <li>• County Law Library</li> <li>• Sheriff Patrol</li> <li>• Animal Control</li> </ul>
Economic Development, Natural Resources, and Recreation	<ul style="list-style-type: none"> <li>• Oregon Plan Implementation</li> <li>• State Forest Management</li> <li>• Federal Land Policy</li> <li>• Extension Services</li> <li>• Telecommunications</li> <li>• County Fair</li> </ul>	<ul style="list-style-type: none"> <li>• Watermaster</li> <li>• County Forests</li> <li>• County Library</li> <li>• County Parks</li> <li>• County Museums</li> </ul>
Transportation & Land Use	<ul style="list-style-type: none"> <li>• Highway &amp; Road Systems</li> <li>• Land Use Planning &amp; Coordination</li> <li>• Senior &amp; Disabled Transportation</li> <li>• Development Services</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering</li> <li>• Building Permitting &amp; Inspections</li> <li>• Surveying</li> <li>• Capital Projects</li> </ul>
Other Community Services	<ul style="list-style-type: none"> <li>• Management &amp; Administration</li> <li>• Elections</li> <li>• Assessment &amp; taxation</li> <li>• Human Resources &amp; Employee Relations</li> </ul>	<ul style="list-style-type: none"> <li>• Property &amp; Facilities Management</li> <li>• Procurement</li> <li>• Recording Public Documents</li> </ul>



**TABLE D-3. DETAILED RESULTS OF COUNTY INPUT/OUTPUT MODEL**

This multi-page table shows county-level socio economic effects on 17 O&C counties in western Oregon. Each county economy has effects represented for each of five BLM alternatives. These include: current conditions (BLM base year 2005 contribution + PL 106-393 payments to counties), and changes for each of the No Action Alternative (NAA), Alternative 1, Alternative 2, Alternative 3, and the PMRP. In each table, 528 detailed sector impacts are aggregated into 16 summary sectors to provide an overview of how economic effects could occur. Effects are generated in Input/Output models adjusted for three concurrent economic changes: (1) BLM - FEIS management alternatives; (2) the termination of PL 106-393 payments; and (3) other projected continued declines in the plywood sector.

BENTON COUNTY	Industry		Industry		Percent		Employment		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
Current Conditions	\$ Thousands		\$ Thousands						\$ Thousands			
Agriculture & Ag Services	211,265	2,241	1,723	11	1%	1,723	11	1%	50,309	414	1%	1%
Mining / Sand & Gravel	9,589	9	99	0	0%	99	0	0%	4,348	4	0%	0%
Construction	145,603	288	1,600	3	0%	1,600	3	0%	64,000	127	0%	0%
Food & Wood Processing	190,405	3,245	1,008	17	2%	1,008	17	2%	41,513	673	2%	2%
Other Manufacturing	1,885,160	21	333	0	0%	333	0	0%	12,346	5	0%	0%
Transportation	46,736	633	511	6	1%	511	6	1%	18,247	236	1%	1%
Publishing & Communications	41,149	119	131	0	0%	131	0	0%	6,056	18	0%	0%
Public Utilities	179,224	30	1,015	0	0%	1,015	0	0%	57,554	10	0%	0%
Trade	249,669	386	3,925	6	0%	3,925	6	0%	111,886	174	0%	0%
Finance/ Insurance/ Real Estate	148,004	256	4,245	7	0%	4,245	7	0%	52,792	89	0%	0%
Hospitality Services	396,953	741	3,598	7	0%	3,598	7	0%	117,550	208	0%	0%
Consumer Services	213,432	298	4,243	6	0%	4,243	6	0%	120,609	169	0%	0%
Business Services	451,250	819	8,219	15	0%	8,219	15	0%	254,568	460	0%	0%
Medical / Education / Social Services	116,548	30	967	0	0%	967	0	0%	57,173	24	0%	0%
Federal Government	116,548	7	967	0	0%	967	0	0%	57,173	6	0%	0%
State & Local Government	99,920	3,828	1,407	54	4%	1,407	54	4%	53,407	2,046	4%	4%
<b>TOTAL</b>	<b>4,384,906</b>	<b>12,946</b>	<b>33,025</b>	<b>134</b>	<b>0%</b>	<b>33,025</b>	<b>134</b>	<b>0%</b>	<b>1,022,357</b>	<b>4,657</b>	<b>0%</b>	<b>0%</b>

BENTON COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	211,265	3,857	2%	1,723	19	1%	50,309	707	1%	1%				1%
Mining / Sand & Gravel	9,589	2	0%	99	0	0%	4,348	1	0%	0%				0%
Construction	145,603	70	0%	1,600	1	0%	64,000	31	0%	0%				0%
Food & Wood Processing	61,766	19	0%	444	44	10%	14,699	4	10%	10%				0%
Other Manufacturing	1,720,264	26	0%	4,734	0	0%	393,510	6	0%	0%				0%
Transportation	116,996	14	0%	742	0	0%	39,432	5	0%	0%				0%
Publishing & Communications	46,736	415	1%	511	4	1%	18,247	154	1%	1%				1%
Public Utilities	41,149	76	0%	131	0	0%	6,056	11	0%	0%				0%
Trade	179,224	13	0%	1,015	0	0%	57,554	5	0%	0%				0%
Finance/ Insurance/ Real Estate	266,354	275	0%	1,351	2	0%	56,404	62	0%	0%				0%
Hospitality Services	397,673	418	0%	8,170	8	0%	164,678	172	0%	0%				0%
Consumer Services	130,599	118	0%	2,247	3	0%	61,146	53	0%	0%				0%
Business Services	213,432	161	0%	4,243	3	0%	120,609	89	0%	0%				0%
Medical / Education / Social Services	451,250	415	0%	8,219	8	0%	254,568	234	0%	0%				0%
Federal Government	116,548	7	0%	967	0	0%	57,173	6	0%	0%				0%
State & Local Government	99,920	(2,453)	(2%)	1,407	(35)	(2%)	53,407	(1,311)	(2%)	(2%)				(2%)
<b>TOTAL</b>	<b>4,208,367</b>	<b>3,433</b>	<b>0%</b>	<b>37,603</b>	<b>57</b>	<b>0%</b>	<b>1,416,139</b>	<b>226</b>	<b>0%</b>	<b>0%</b>				<b>0%</b>

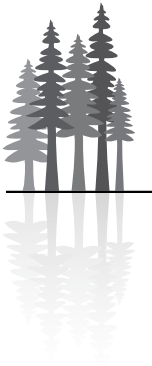




BENTON COUNTY Alternative 1	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	211,265	5,261	1,723	26	2%	1,723	26	1%	50,309	966	1%	50,309	966	2%
Mining / Sand & Gravel	9,589	5	99	0	0%	99	0	0%	4,348	2	0%	4,348	2	0%
Construction	145,603	175	1,600	2	0%	1,600	2	0%	64,000	77	0%	64,000	77	0%
Food & Wood Processing	190,406	11,334	1,008	57	6%	1,008	57	6%	41,513	2,347	6%	41,513	2,347	6%
Other Manufacturing	1,885,160	85	5809	0	0%	5809	0	0%	445,288	21	0%	445,288	21	0%
Transportation	46,736	692	511	7	1%	511	7	1%	18,247	257	1%	18,247	257	1%
Publishing & Communications	41,149	128	131	0	0%	131	0	0%	6,056	19	0%	6,056	19	0%
Public Utilities	179,224	25	1,015	0	0%	1,015	0	0%	57,554	9	0%	57,554	9	0%
Trade	249,669	451	3,925	7	0%	3,925	7	0%	111,886	199	0%	111,886	199	0%
Finance/ Insurance/ Real Estate	266,354	496	1,351	3	0%	1,351	3	0%	56,404	110	0%	56,404	110	0%
Hospitality Services	148,004	249	4,245	7	0%	4,245	7	0%	52,792	87	0%	52,792	87	0%
Consumer Services	130,599	206	2,247	4	0%	2,247	4	0%	61,146	92	0%	61,146	92	0%
Business Services	213,432	286	4,243	6	0%	4,243	6	0%	120,609	159	0%	120,609	159	0%
Medical / Education / Social Services	451,250	752	8,219	14	0%	8,219	14	0%	254,568	424	0%	254,568	424	0%
Federal Government	116,548	18	967	0	0%	967	0	0%	57,173	14	0%	57,173	14	0%
State & Local Government	99,920	(1,649)	1,407	(23)	(2%)	1,407	(23)	(2%)	53,407	(881)	(2%)	53,407	(881)	(2%)
<b>TOTAL</b>	<b>4,384,906</b>	<b>18,514</b>	<b>38,500</b>	<b>111</b>	<b>0%</b>	<b>38,500</b>	<b>111</b>	<b>0%</b>	<b>1,455,299</b>	<b>3,903</b>	<b>0%</b>	<b>1,455,299</b>	<b>3,903</b>	<b>0%</b>

BENTON COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Employment		%		\$ Thousands		%	
Agriculture & Ag Services	211,265	8,428	4%	1,723	41	2%	50,309	1,548	3%					
Mining / Sand & Gravel	9,589	11	0%	99	0	0%	4,348	5	0%					
Construction	145,603	372	0%	1,600	4	0%	64,000	164	0%					
Food & Wood Processing	190,406	15,861	8%	1,008	80	8%	41,513	3,286	8%					
Other Manufacturing	1,885,160	148	0%	5,809	0	0%	445,288	38	0%					
Transportation	46,736	1,577	3%	511	15	3%	18,247	585	3%					
Publishing & Communications	41,149	223	1%	131	1	1%	6,056	33	1%					
Public Utilities	179,224	48	0%	1,015	0	0%	57,554	17	0%					
Trade	249,669	791	0%	3,925	12	0%	111,886	352	0%					
Finance / Insurance / Real Estate	266,354	929	0%	1,351	5	0%	56,404	206	0%					
Hospitality Services	148,004	456	0%	4,245	13	0%	52,792	160	0%					
Consumer Services	130,599	375	0%	2,247	8	0%	61,146	167	0%					
Business Services	213,432	524	0%	4,243	11	0%	120,609	292	0%					
Medical / Education / Social Services	451,250	1,408	0%	8,219	26	0%	254,568	792	0%					
Federal Government	116,548	38	0%	967	0	0%	57,173	31	0%					
State & Local Government	99,920	(443)	0%	1,407	(6)	0%	53,407	(237)	0%					
<b>TOTAL</b>	<b>4,384,906</b>	<b>30,746</b>	<b>1%</b>	<b>38,500</b>	<b>212</b>	<b>1%</b>	<b>1,455,299</b>	<b>7,437</b>	<b>1%</b>					





BENTON COUNTY	Industry Output		Industry Change	Percent Change		Employment	Employment Change		Earnings	Earnings Change		Percent Change
	\$ Thousands									\$ Thousands		
Alternative 3												
Agriculture & Ag Services	211,265	5,107	2%	1,723	25	1%	50,309	937	2%			
Mining / Sand & Gravel	9,589	4	0%	99	0	0%	4,348	2	0%			
Construction	145,603	127	0%	1,600	1	0%	64,000	56	0%			
Food & Wood Processing	190,406	9,657	5%	1,008	49	5%	41,513	2,000	5%			
Other Manufacturing	1,885,160	73	0%	5,809	0	0%	445,288	18	0%			
Transportation	46,736	936	2%	511	9	2%	18,247	347	2%			
Publishing & Communications	41,149	101	0%	131	0	0%	6,056	15	0%			
Public Utilities	179,224	20	0%	1,015	0	0%	57,554	7	0%			
Trade	249,669	384	0%	3,925	6	0%	111,886	170	0%			
Finance / Insurance / Real Estate	266,354	413	0%	1,351	2	0%	56,404	92	0%			
Hospitality Services	148,004	205	0%	4,245	6	0%	52,792	72	0%			
Consumer Services	130,599	170	0%	2,247	4	0%	61,146	76	0%			
Business Services	213,432	233	0%	4,243	5	0%	120,609	128	0%			
Medical / Education / Social Services	451,250	619	0%	8,219	11	0%	254,568	349	0%			
Federal Government	116,548	13	0%	967	0	0%	57,173	10	0%			
State & Local Government	99,920	(2,239)	(2%)	1,407	(32)	(2%)	53,407	(1,197)	(2%)			
<b>TOTAL</b>	<b>4,384,906</b>	<b>15,824</b>	<b>0%</b>	<b>38,500</b>	<b>87</b>	<b>0%</b>	<b>1,455,299</b>	<b>3,082</b>	<b>0%</b>			<b>0%</b>



BENTON COUNTY PRMP	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	211,265	4,554					1,723	22			50,309	836		2%
Mining / Sand & Gravel	9,589	5					99	-			4,348	2		0%
Construction	145,603	147					1,600	2			64,000	65		0%
Food & Wood Processing	190,405	9,659					1,008	49			41,513	2,000		5%
Other Manufacturing	1,885,160	73					5,809	0			445,288	18		0%
Transportation	46,736	629					511	6			18,247	233		1%
Publishing & Communications	41,149	108					131	0			6,056	16		0%
Public Utilities	179,224	21					1,015	0			57,554	7		0%
Trade	249,669	385					3,925	6			111,886	170		0%
Finance / Insurance / Real Estate	266,354	423					1,351	2			56,404	94		0%
Hospitality Services	148,004	212					4,245	6			52,792	74		0%
Consumer Services	130,599	175					2,247	4			61,146	79		0%
Business Services	213,432	243					4,243	5			120,609	135		0%
Medical / Education / Social Services	451,250	640					8,219	12			254,568	361		0%
Federal Government	116,548	15					967	0			57,173	12		0%
State & Local Government	99,920	(1,487)					1,407	(21)			53,407	(795)		(1%)
<b>TOTAL</b>	<b>4,384,906</b>	<b>15,802</b>					<b>38,500</b>	<b>94</b>			<b>1,455,299</b>	<b>3,308</b>		<b>0%</b>



CLACKAMAS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
Current Conditions	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	530,051	3,706	530,051	3,706	1%	10,077	33	0%	122,776	805	1%			
Mining / Sand & Gravel	27,213	4	27,213	4	0%	227	0	0%	9,180	2	0%			
Construction	1,420,862	337	1,420,862	337	0%	14,674	3	0%	624,540	148	0%			
Food & Wood Processing	950,361	10,576	950,361	10,576	1%	3,783	27	1%	156,017	1,076	1%			
Other Manufacturing	2,944,827	407	2,944,827	407	0%	15,846	2	0%	850,013	117	0%			
Transportation	548,299	196	548,299	196	0%	4,616	1	0%	227,735	76	0%			
Public Utilities	433,789	541	433,789	541	0%	1,514	2	0%	64,121	80	0%			
Publishing & Communications	378,604	81	378,604	81	0%	2,507	1	0%	111,366	23	0%			
Trade	2,908,966	737	2,908,966	737	0%	35,071	10	0%	1,232,581	317	0%			
Finance / Insurance / Real Estate	3,116,068	384	3,116,068	384	0%	20,685	2	0%	726,906	81	0%			
Hospitality Services	708,442	557	708,442	557	0%	15,317	12	0%	250,743	194	0%			
Consumer Services	796,201	613	796,201	613	0%	12,101	10	0%	323,578	269	0%			
Business Services	1,340,854	984	1,340,854	984	0%	19,805	15	0%	711,098	516	0%			
Medical / Educational / Social Services	1,723,814	937	1,723,814	937	0%	29,949	16	0%	951,936	527	0%			
Federal Government	381,062	3	381,062	3	0%	3,175	0	0%	184,580	3	0%			
State & Local Government	837,412	13,579	837,412	13,579	2%	8,057	131	2%	447,597	7,258	2%			
<b>TOTAL</b>	<b>19,046,826</b>	<b>33,642</b>	<b>19,046,826</b>	<b>33,642</b>	<b>0%</b>	<b>197,405</b>	<b>265</b>	<b>0%</b>	<b>6,994,767</b>	<b>11,492</b>	<b>0%</b>			





CLACKAMAS COUNTY	Industry		Industry Change	Percent Change	Employment	Employment Change	Percent Change	Earnings		Percent Change
	Output	Change						Earnings	Change	
No Action Alternative	\$ Thousands							\$ Thousands		
Agriculture & Ag Services	530,051	9,055		2%	10,077	74	1%	122,776	1,949	2%
Mining / Sand & Gravel	27,213	5		0%	227	0	0%	9,180	2	0%
Construction	1,420,862	(31)		0%	14,674	0	0%	624,540	(14)	0%
Food & Wood Processing	950,361	26,409		3%	3,783	68	2%	156,017	2,660	2%
Other Manufacturing	2,944,827	181		0%	15,846	1	0%	850,013	41	0%
Transportation	548,299	289		0%	4,616	2	0%	227,735	110	0%
Public Utilities	433,789	279		0%	1,514	1	0%	64,121	40	0%
Publishing & Communications	378,604	(9)		0%	2,507	0	0%	111,366	(2)	0%
Trade	2,908,966	442		0%	35,071	4	0%	1,232,581	176	0%
Finance / Insurance / Real Estate	3,116,068	52		0%	20,685	0	0%	726,906	17	0%
Hospitality Services	708,442	14		0%	15,317	0	0%	250,743	6	0%
Consumer Services	796,201	245		0%	12,101	3	0%	323,578	105	0%
Business Services	1,340,854	555		0%	19,805	6	0%	711,098	259	0%
Medical / Educational / Social Services	1,723,814	(53)		0%	29,949	(1)	0%	951,936	(30)	0%
Federal Government	381,062	(1)		0%	3,175	0	0%	184,580	0	0%
State & Local Government	837,412	(11,174)		(1%)	8,057	(108)	(1%)	447,597	(5,972)	(1%)
<b>TOTAL</b>	<b>19,046,826</b>	<b>26,256</b>		<b>0%</b>	<b>197,405</b>	<b>51</b>	<b>0%</b>	<b>6,994,767</b>	<b>(636)</b>	<b>0%</b>



CLACKAMAS COUNTY Alternative 1	Industry Output	Industry Change	Percent Change	Employment	Employment Change	Percent Change	Earnings	Earnings Change	Percent Change
	\$ Thousands	\$ Thousands					\$ Thousands	\$ Thousands	
Agriculture & Ag Services	530,051	17,566	3%	10,077	145	1%	122,776	3,786	3%
Mining / Sand & Gravel	27,213	10	0%	227	0	0%	9,180	4	0%
Construction	1,420,862	156	0%	14,674	2	0%	624,540	69	0%
Food & Wood Processing	950,361	48,536	5%	3,783	126	3%	156,017	4,916	3%
Other Manufacturing	2,944,827	533	0%	15,846	3	0%	850,013	163	0%
Transportation	548,299	581	0%	4,616	4	0%	227,735	222	0%
Public Utilities	433,789	758	0%	1,514	3	0%	64,121	111	0%
Publishing & Communications	378,604	36	0%	2,507	0	0%	111,366	12	0%
Trade	2,908,966	1,159	0%	35,071	12	0%	1,232,581	476	0%
Finance / Insurance / Real Estate	3,116,068	318	0%	20,685	2	0%	726,906	77	0%
Hospitality Services	708,442	368	0%	15,317	8	0%	250,743	130	0%
Consumer Services	796,201	761	0%	12,101	11	0%	323,578	333	0%
Business Services	1,340,854	1,469	0%	19,805	19	0%	711,098	721	0%
Medical / Educational / Social Services	1,723,814	498	0%	29,949	8	0%	951,936	280	0%
Federal Government	381,062	1	0%	3,175	0	0%	184,580	1	0%
State & Local Government	837,412	(9,644)	(1%)	8,057	(93)	(1%)	447,597	(5,155)	(1%)
<b>TOTAL</b>	<b>19,046,826</b>	<b>63,106</b>	<b>0%</b>	<b>197,405</b>	<b>250</b>	<b>0%</b>	<b>6,994,767</b>	<b>6,146</b>	<b>0%</b>



CLACKAMAS COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Change		Change		Change		Change		\$ Thousands		Change	
Agriculture & Ag Services	530,051	25,480	5%	10,077	212	2%	122,776	5,493	4%					
Mining / Sand & Gravel	27,213	16	0%	227	0	0%	9,180	7	0%					
Construction	1,420,862	364	0%	14,674	4	0%	624,540	160	0%					
Food & Wood Processing	950,361	72,337	8%	3,783	187	5%	156,017	7,323	5%					
Other Manufacturing	2,944,827	920	0%	15,846	6	0%	850,013	277	0%					
Transportation	548,299	895	0%	4,616	6	0%	227,735	343	0%					
Public Utilities	433,789	1,299	0%	1,514	4	0%	64,121	190	0%					
Publishing & Communications	378,604	85	0%	2,507	1	0%	111,366	26	0%					
Trade	2,908,966	1,932	0%	35,071	20	0%	1,232,581	800	0%					
Finance / Insurance / Real Estate	3,116,068	609	0%	20,685	4	0%	726,906	142	0%					
Hospitality Services	708,442	752	0%	15,317	16	0%	250,743	265	0%					
Consumer Services	796,201	1,328	0%	12,101	20	0%	323,578	581	0%					
Business Services	1,340,854	2,480	0%	19,805	33	0%	711,098	1,232	0%					
Medical / Educational / Social Services	1,723,814	1,097	0%	29,949	18	0%	951,936	616	0%					
Federal Government	381,062	3	0%	3,175	0	0%	184,580	3	0%					
State & Local Government	837,412	(7,413)	(1%)	8,057	(71)	(1%)	447,597	(3,962)	(1%)					
<b>TOTAL</b>	<b>19,046,826</b>	<b>102,183</b>	<b>1%</b>	<b>197,405</b>	<b>460</b>	<b>0%</b>	<b>6,994,767</b>	<b>13,495</b>	<b>0%</b>					



CLACKAMAS COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Employment		%		\$ Thousands		%	
Agriculture & Ag Services	530,051	17,038	17,038	3%	10,077	140	122,776	1%	140	1%	122,776	3,677	3%	
Mining / Sand & Gravel	27,213	9	9	0%	227	0	9,180	0%	0	0%	9,180	4	0%	
Construction	1,420,862	110	110	0%	14,674	1	624,540	0%	1	0%	624,540	48	0%	
Food & Wood Processing	950,361	44,302	44,302	5%	3,783	115	156,017	3%	115	3%	156,017	4,489	3%	
Other Manufacturing	2,944,8927	457	457	0%	15,846	3	850,013	0%	3	0%	850,013	140	0%	
Transportation	548,299	523	523	0%	4,616	4	227,735	0%	4	0%	227,735	200	0%	
Public Utilities	433,789	648	648	0%	1,514	2	64,121	0%	2	0%	64,121	94	0%	
Publishing & Communications	378,604	25	25	0%	2,507	0	111,366	0%	0	0%	111,366	8	0%	
Trade	2,908,966	1,015	1,015	0%	35,071	10	1,232,581	0%	10	0%	1,232,581	416	0%	
Finance / Insurance / Real Estate	3,116,068	260	260	0%	20,685	2	726,906	0%	2	0%	726,906	64	0%	
Hospitality Services	708,442	287	287	0%	15,317	6	250,743	0%	6	0%	250,743	102	0%	
Consumer Services	796,201	650	650	0%	12,101	10	323,578	0%	10	0%	323,578	284	0%	
Business Services	1,340,854	1,273	1,273	0%	19,805	16	711,098	0%	16	0%	711,098	621	0%	
Medical / Educational / Social Services	1,723,814	371	371	0%	29,949	6	951,936	0%	6	0%	951,936	209	0%	
Federal Government	381,062	1	1	0%	3,175	0	184,580	0%	0	0%	184,580	1	0%	
State & Local Government	837,412	(10,776)	(10,776)	(1%)	8,057	(104)	447,597	(1%)	(104)	(1%)	447,597	(5,760)	(1%)	
<b>TOTAL</b>	<b>19,046,826</b>	<b>56,192</b>	<b>56,192</b>	<b>0%</b>	<b>197,405</b>	<b>211</b>	<b>6,994,767</b>	<b>0%</b>	<b>211</b>	<b>0%</b>	<b>6,994,767</b>	<b>4,597</b>	<b>0%</b>	

CLACKAMAS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	530,051	21,173	530,051	21,173	4%	10,077	174	2%	122,776	4,584	4%	4%		
Mining / Sand & Gravel	27,213	15	27,213	15	0%	227	0	0%	9,180	7	0%	0%		
Construction	1,420,862	256	1,420,862	256	0%	14,674	3	0%	624,540	113	0%	0%		
Food & Wood Processing	950,361	56,767	950,361	56,767	6%	3,783	143	4%	156,017	5,673	4%	4%		
Other Manufacturing	2,944,827	765	2,944,827	765	0%	15,846	4	0%	354,326	130	0%	0%		
Electronics	944,556	91	944,556	91	0%	3,594	0	0%	231,264	25	0%	0%		
Misc. Manufacturing	876,116	254	876,116	254	0%	4,929	1	0%	264,423	74	0%	0%		
Transportation	548,299	2,881	548,299	2,881	1%	4,616	19	0%	227,735	1,080	0%	0%		
Public Utilities	433,789	1,033	433,789	1,033	0%	1,514	4	0%	64,121	151	0%	0%		
Publishing & Communications	378,604	59	378,604	59	0%	2,507	0	0%	111,366	18	0%	0%		
Trade	2,908,966	1,539	2,908,966	1,539	0%	35,071	16	0%	1,232,581	637	0%	0%		
Finance / Insurance / Real Estate	3,116,068	478	3,116,068	478	0%	20,685	3	0%	726,906	113	0%	0%		
Hospitality Services	708,442	545	708,442	545	0%	15,317	12	0%	250,743	192	0%	0%		
Consumer Services	796,201	1,055	796,201	1,055	0%	12,101	16	0%	323,578	450	0%	0%		
Business Services	1,340,854	2,015	1,340,854	2,015	0%	19,805	26	0%	711,098	989	0%	0%		
Medical / Educational / Social Services	1,723,814	790	1,723,814	790	0%	29,949	13	0%	951,936	444	0%	0%		
Federal Government	381,062	2	381,062	2	0%	3,175	0	0%	184,580	2	0%	0%		
State & Local Government	837,412	(9,259)	837,412	(9,259)	(1%)	8,057	(89)	(1%)	447,597	(4,949)	(1%)	(1%)		
<b>TOTAL</b>	<b>19,046,826</b>	<b>80,112</b>	<b>19,046,826</b>	<b>80,112</b>	<b>0%</b>	<b>197,405</b>	<b>344</b>	<b>0%</b>	<b>6,994,767</b>	<b>9,732</b>	<b>0%</b>	<b>0%</b>		





COLUMBIA COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
Current Conditions	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	154,770	320	0%	0%	1,756	1	0%	32,141	57	0%				
Mining / Sand & Gravel	9,820	3	0%	0%	95	0	0%	4,362	1	0%				
Construction	56,301	131	0%	0%	825	2	0%	24,747	57	0%				
Food & Wood Processing	701,439	1,277	0%	0%	872	1	0%	38,423	43	0%				
Other Manufacturing	147,850	7	0%	0%	873	0	0%	33,244	2	0%				
Transportation	38,679	112	0%	0%	448	1	0%	14,122	41	0%				
Public Utilities	20,197	40	0%	0%	70	0	0%	2,940	6	0%				
Publishing & Communications	18,817	10	0%	0%	164	0	0%	4,653	2	0%				
Trade	106,750	115	0%	0%	2,250	2	0%	48,244	51	0%				
Finance/ Insurance/ Real Estate	125,503	181	0%	0%	751	1	0%	28,312	41	0%				
Hospitality Services	45,279	53	0%	0%	1,157	1	0%	15,921	18	0%				
Consumer Services	36,790	51	0%	0%	631	1	0%	13,582	20	0%				
Business Services	37,401	61	0%	0%	658	1	0%	16,515	29	0%				
Medical / Educational / Social Services	53,435	65	0%	0%	1,393	2	0%	30,719	37	0%				
Federal Government	29,719	15	0%	0%	330	0	0%	15,488	12	0%				
State & Local Government	125,351	2,554	2%	2%	1,908	38	2%	67,000	1,365	2%				
<b>TOTAL</b>	<b>1,708,099</b>	<b>4,997</b>	<b>0%</b>	<b>0%</b>	<b>14,182</b>	<b>52</b>	<b>0%</b>	<b>390,413</b>	<b>1,786</b>	<b>0%</b>				



COLUMBIA COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	154,770	5,697	154,770	5,697	4%	1,756	22	1%	32,141	1,010	3%			
Mining / Sand & Gravel	9,820	5	9,820	5	0%	95	0	0%	4,362	2	0%			
Construction	56,301	215	56,301	215	0%	825	3	0%	24,747	94	0%			
Food & Wood Processing	701,439	19,251	701,439	19,251	3%	872	35	4%	38,423	1,684	4%			
Other Manufacturing	147,850	26	147,850	26	0%	873	0	0%	33,244	10	0%			
Transportation	38,679	651	38,679	651	2%	448	8	2%	14,122	239	2%			
Public Utilities	20,197	127	20,197	127	1%	70	0	1%	2,940	18	1%			
Publishing & Communications	18,817	18	18,817	18	0%	164	0	0%	4,653	4	0%			
Trade	106,750	396	106,750	396	0%	2,250	6	0%	48,244	169	0%			
Finance / Insurance / Real Estate	125,503	439	125,503	439	0%	751	3	0%	28,312	109	0%			
Hospitality Services	45,279	112	45,279	112	0%	1,157	3	0%	15,921	39	0%			
Consumer Services	36,790	153	36,790	153	0%	631	3	0%	13,582	64	0%			
Business Services	37,401	182	37,401	182	0%	658	3	1%	16,515	85	1%			
Medical / Educational / Social Services	53,435	106	53,435	106	0%	1,393	3	0%	30,719	61	0%			
Federal Government	29,719	21	29,719	21	0%	330	0	0%	15,488	17	0%			
State & Local Government	125,351	(887)	125,351	(887)	(1%)	1,908	(13)	(1%)	67,000	(474)	(1%)			
<b>TOTAL</b>	<b>1,708,099</b>	<b>26,511</b>	<b>1,708,099</b>	<b>26,511</b>	<b>2%</b>	<b>14,182</b>	<b>77</b>	<b>1%</b>	<b>390,413</b>	<b>3,133</b>	<b>1%</b>			



COLUMBIA COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	154,770	7,416	5%	1,756	28	2%	32,141	1,315	4%					
Mining / Sand & Gravel	9,820	9	0%	95	0	0%	4,362	4	0%					
Construction	56,301	331	1%	825	5	1%	24,747	146	1%					
Food & Wood Processing	701,439	25,202	4%	872	45	5%	38,423	2,131	6%					
Other Manufacturing	147,850	39	0%	873	0	0%	33,244	15	0%					
Transportation	38,679	917	2%	448	11	2%	14,122	337	2%					
Public Utilities	20,197	183	1%	70	1	1%	2,940	27	1%					
Publishing & Communications	18,817	27	0%	164	0	0%	4,653	6	0%					
Trade	106,750	556	1%	2,250	8	0%	48,244	238	0%					
Finance / Insurance / Real Estate	125,503	640	1%	751	5	1%	28,312	158	1%					
Hospitality Services	45,279	165	0%	1,157	4	0%	15,921	57	0%					
Consumer Services	36,790	221	1%	631	4	1%	13,582	91	1%					
Business Services	37,401	262	1%	658	5	1%	16,515	122	1%					
Medical / Educational / Social Services	53,435	162	0%	1,393	4	0%	30,719	93	0%					
Federal Government	29,719	34	0%	330	0	0%	15,488	27	0%					
State & Local Government	125,351	(84)	0%	1,908	(1)	0%	67,000	(45)	0%					
<b>TOTAL</b>	<b>1,708,099</b>	<b>36,079</b>	<b>2%</b>	<b>14,182</b>	<b>120</b>	<b>1%</b>	<b>390,413</b>	<b>4,723</b>	<b>1%</b>					





COLUMBIA COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Count		%		\$ Thousands		%	
Agriculture & Ag Services	154,770	11,035	7%	1,756	42	2%	32,141	1,958	6%					
Mining / Sand & Gravel	9,820	14	0%	95	0	0%	4,362	6	0%					
Construction	56,301	557	1%	825	8	1%	24,747	245	1%					
Food & Wood Processing	701,439	38,250	5%	872	68	8%	38,423	3,229	8%					
Other Manufacturing	147,850	61	0%	873	1	0%	33,244	23	0%					
Electronics	758	0	0%	4	0	0%	192	0	0%					
Misc. Manufacturing	36,175	13	0%	284	0	0%	10,785	5	0%					
Transportation	38,679	1,286	3%	448	15	3%	14,122	473	3%					
Public Utilities	20,197	291	1%	70	1	1%	2,940	42	1%					
Publishing & Communications	18,817	45	0%	164	0	0%	4,653	11	0%					
Trade	106,750	882	1%	2,250	14	1%	48,244	378	1%					
Finance / Insurance / Real Estate	125,503	1,038	1%	751	7	1%	28,312	254	1%					
Hospitality Services	45,279	272	1%	1,157	7	1%	15,921	95	1%					
Consumer Services	36,790	351	1%	631	7	1%	13,582	146	1%					
Business Services	37,401	417	1%	658	8	1%	16,515	195	1%					
Medical / Educational / Social Services	53,435	273	1%	1,393	7	1%	30,719	156	1%					
Federal Government	29,719	57	0%	330	1	0%	15,488	46	0%					
State & Local Government	125,351	1,239	1%	1,908	18	1%	67,000	662	1%					
<b>TOTAL</b>	<b>1,708,099</b>	<b>56,070</b>	<b>3%</b>	<b>14,182</b>	<b>204</b>	<b>1%</b>	<b>390,413</b>	<b>7,919</b>	<b>2%</b>					



COLUMBIA COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	154,770	6,053	4%	1,756	23	1%	32,141	1,074	3%					
Mining / Sand & Gravel	9,820	8	0%	95	0	0%	4,362	3	0%					
Construction	56,301	256	0%	825	4	0%	24,747	112	0%					
Food & Wood Processing	701,439	22,493	3%	872	40	5%	38,423	1,900	5%					
Other Manufacturing	147,850	33	0%	873	0	0%	33,244	12	0%					
Transportation	38,679	485	1%	448	6	1%	14,122	178	1%					
Public Utilities	20,197	155	1%	70	1	1%	2,940	23	1%					
Publishing & Communications	18,817	21	0%	164	0	0%	4,653	5	0%					
Trade	106,750	456	0%	2,250	7	0%	48,244	194	0%					
Finance / Insurance / Real Estate	125,503	505	0%	751	4	1%	28,312	126	0%					
Hospitality Services	45,279	129	0%	1,157	3	0%	15,921	45	0%					
Consumer Services	36,790	181	0%	631	3	1%	13,582	75	1%					
Business Services	37,401	215	1%	658	4	1%	16,515	100	1%					
Medical / Educational / Social Services	53,435	122	0%	1,393	3	0%	30,719	70	0%					
Federal Government	29,719	26	0%	330	0	0%	15,488	21	0%					
State & Local Government	125,351	(670)	(1%)	1,908	(10)	(1%)	67,000	(358)	(1%)					
<b>TOTAL</b>	<b>1,708,099</b>	<b>30,468</b>	<b>2%</b>	<b>14,182</b>	<b>88</b>	<b>1%</b>	<b>390,413</b>	<b>3,580</b>	<b>1%</b>					



COLUMBIA COUNTY PRMP	Industry Output		Industry Change		Percent Change		Employment		Employment Change		Percent Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands										\$ Thousands		\$ Thousands			
Agriculture & Ag Services	154,770	8,874	8,874	6%	1,756	34	2%	32,141	1,574	5%								
Mining / Sand & Gravel	9,820	14	14	0%	95	0	0%	4,362	6	0%								
Construction	56,301	426	426	1%	825	6	1%	24,747	187	1%								
Food & Wood Processing	701,439	30,710	30,710	4%	872	50	6%	38,423	2,398	6%								
Other Manufacturing	147,850	56	56	0%	873	0	0%	33,244	20	0%								
Transportation	38,679	1,226	1,226	3%	448	14	3%	14,122	451	3%								
Public Utilities	20,197	242	242	1%	70	1	1%	2,940	35	1%								
Publishing & Communications	18,817	34	34	0%	164	0	0%	4,653	8	0%								
Trade	106,750	694	694	1%	2,250	10	0%	48,244	297	1%								
Finance / Insurance / Real Estate	125,503	806	806	1%	751	6	1%	28,312	199	1%								
Hospitality Services	45,279	203	203	0%	1,157	5	0%	15,921	71	0%								
Consumer Services	36,790	286	286	1%	631	5	1%	13,582	116	1%								
Business Services	37,401	339	339	1%	658	6	1%	16,515	155	1%								
Medical / Education / Social Services	53,435	200	200	0%	1,393	5	0%	30,719	114	0%								
Federal Government	29,719	43	43	0%	330	1	0%	15,488	34	0%								
State & Local Government	125,351	252	252	0%	1,908	4	0%	67,000	134	0%								
<b>TOTAL</b>	<b>1,708,099</b>	<b>44,406</b>	<b>44,406</b>	<b>3%</b>	<b>14,182</b>	<b>149</b>	<b>1%</b>	<b>390,413</b>	<b>5,801</b>	<b>1%</b>								



COOS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
Current Conditions	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	277,570	3,885	1%	2,063	23	1%	69,679	858	1%	1%	69,679	858	1%	1%
Mining / Sand & Gravel	7,765	3	0%	70	0	0%	3,367	1	0%	0%	3,367	1	0%	0%
Construction	65,618	145	0%	897	2	0%	28,843	64	0%	0%	28,843	64	0%	0%
Food & Wood Processing	326,648	4,445	1%	1,333	17	1%	49,298	673	1%	1%	49,298	673	1%	1%
Other Manufacturing	84,592	153	0%	692	2	0%	24,585	43	0%	0%	24,585	43	0%	0%
Transportation	158,956	959	1%	1,005	9	1%	38,293	346	1%	1%	38,293	346	1%	1%
Public Utilities	39,026	442	1%	151	2	1%	5,996	67	1%	1%	5,996	67	1%	1%
Publishing & Communications	43,257	90	0%	332	1	0%	11,941	27	0%	0%	11,941	27	0%	0%
Trade	225,922	450	0%	4,211	9	0%	102,277	209	0%	0%	102,277	209	0%	0%
Finance / Insurance / Real Estate	103,067	36	0%	1,338	0	0%	27,984	8	0%	0%	27,984	8	0%	0%
Hospitality Services	125,304	976	1%	3,153	26	1%	42,421	334	1%	1%	42,421	334	1%	1%
Consumer Services	46,384	387	1%	725	6	1%	18,378	161	1%	1%	18,378	161	1%	1%
Business Services	93,694	535	1%	2,819	13	0%	55,302	290	0%	0%	55,302	290	1%	1%
Medical / Educational / Social Services	387,018	1,590	0%	6,768	28	0%	219,897	914	0%	0%	219,897	914	0%	0%
Federal Government	56,294	12,838	23%	534	113	21%	29,043	5,848	20%	21%	29,043	5,848	20%	20%
State & Local Government	130,679	8,415	6%	2,701	161	6%	69,848	4,498	6%	6%	69,848	4,498	6%	6%
<b>TOTAL</b>	<b>2,171,795</b>	<b>35,349</b>	<b>2%</b>	<b>28,792</b>	<b>410</b>	<b>1%</b>	<b>797,151</b>	<b>14,339</b>	<b>2%</b>	<b>1%</b>	<b>797,151</b>	<b>14,339</b>	<b>2%</b>	<b>2%</b>



COOS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	277,570	1,907	1,907	1%	2,063	11	1%	69,679	418	1%	69,679	418	1%	1%
Mining / Sand & Gravel	7,765	(1)	(1)	0%	70	0	0%	3,367	0	0%	3,367	0	0%	0%
Construction	65,618	(9)	(9)	0%	897	0	0%	28,843	(4)	0%	28,843	(4)	0%	0%
Food & Wood Processing	326,648	(6,354)	(6,354)	(2%)	1,333	(17)	(1%)	49,298	(716)	(1%)	49,298	(716)	(1%)	(1%)
Other Manufacturing	84,592	(2)	(2)	0%	692	0	0%	24,585	(4)	0%	24,585	(4)	0%	0%
Transportation	158,956	1,766	1,766	1%	1,005	16	2%	38,293	655	2%	38,293	655	2%	2%
Public Utilities	39,026	(118)	(118)	0%	151	0	0%	5,996	(17)	0%	5,996	(17)	0%	0%
Publishing & Communications	43,257	4	4	0%	332	0	0%	11,941	1	0%	11,941	1	0%	0%
Trade	225,922	16	16	0%	4,211	0	0%	102,277	8	0%	102,277	8	0%	0%
Finance / Insurance / Real Estate	103,067	1	1	0%	1,338	0	0%	27,984	0	0%	27,984	0	0%	0%
Hospitality Services	125,304	(10)	(10)	0%	3,153	0	0%	42,421	(3)	0%	42,421	(3)	0%	0%
Consumer Services	46,384	(6)	(6)	0%	725	0	0%	18,378	(4)	0%	18,378	(4)	0%	0%
Business Services	93,694	(5)	(5)	0%	2,819	0	0%	55,302	(5)	0%	55,302	(5)	0%	0%
Medical / Educational / Social Services	387,018	53	53	0%	6,768	1	0%	219,897	31	0%	219,897	31	0%	0%
Federal Government	56,294	5,443	5,443	10%	534	48	9%	29,043	2,477	9%	29,043	2,477	9%	9%
State & Local Government	130,679	(5,052)	(5,052)	(4%)	2,701	(96)	(4%)	69,848	(2,700)	(4%)	69,848	(2,700)	(4%)	(4%)
<b>TOTAL</b>	<b>2,171,795</b>	<b>(2,366)</b>	<b>(2,366)</b>	<b>0%</b>	<b>28,792</b>	<b>(39)</b>	<b>0%</b>	<b>797,151</b>	<b>141</b>	<b>0%</b>	<b>797,151</b>	<b>141</b>	<b>0%</b>	<b>0%</b>



COOS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
Alternative 1	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	277,570	5,797	5,797	2%	2,063	34	2%	69,679	1,265	2%	2%	69,679	1,265	2%
Mining / Sand & Gravel	7,765	0	0	0%	70	0	0%	3,367	0	0%	0%	3,367	0	0%
Construction	65,618	36	36	0%	897	0	0%	28,843	16	0%	0%	28,843	16	0%
Food & Wood Processing	326,648	(621)	(621)	0%	1,333	6	0%	49,298	199	0%	0%	49,298	199	0%
Other Manufacturing	84,592	58	58	0%	692	0	0%	24,585	19	0%	0%	24,585	19	0%
Electronics	10,137	8	8	0%	26	0	0%	1,614	2	0%	0%	1,614	2	0%
Misc. Manufacturing	39,688	33	33	0%	326	0	0%	13,975	12	0%	0%	13,975	12	0%
Transportation	158,956	2,275	2,275	1%	1,005	20	2%	38,293	841	2%	2%	38,293	841	2%
Public Utilities	39,026	62	62	0%	151	0	0%	5,996	10	0%	0%	5,996	10	0%
Publishing & Communications	43,257	33	33	0%	332	0	0%	11,941	10	0%	0%	11,941	10	0%
Trade	225,922	192	192	0%	4,211	4	0%	102,277	90	0%	0%	102,277	90	0%
Finance / Insurance / Real Estate	103,067	15	15	0%	1,338	0	0%	27,984	3	0%	0%	27,984	3	0%
Hospitality Services	125,304	351	351	0%	3,153	9	0%	42,421	120	0%	0%	42,421	120	0%
Consumer Services	46,384	141	141	0%	725	2	0%	18,378	57	0%	0%	18,378	57	0%
Business Services	93,694	188	188	0%	2,819	4	0%	55,302	98	0%	0%	55,302	98	0%
Medical / Educational / Social Services	387,018	636	636	0%	6,768	11	0%	219,897	366	0%	0%	219,897	366	0%
Federal Government	56,294	7,747	7,747	14%	534	68	13%	29,043	3,528	13%	13%	29,043	3,528	12%
State & Local Government	130,679	(3,146)	(3,146)	(2%)	2,701	(60)	(2%)	69,848	(1,681)	(2%)	(2%)	69,848	(1,681)	(2%)
<b>TOTAL</b>	<b>2,171,795</b>	<b>13,767</b>	<b>13,767</b>	<b>1%</b>	<b>28,792</b>	<b>100</b>	<b>0%</b>	<b>797,151</b>	<b>4,938</b>	<b>0%</b>	<b>0%</b>	<b>797,151</b>	<b>4,938</b>	<b>1%</b>



COOS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
Alternative 2	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	277,570	10,144			4%		2,063	60	3%		69,679	2,218	3%	
Mining / Sand & Gravel	7,765	1			0%		70	0	0%		3,367	1	0%	
Construction	65,618	128			0%		897	2	0%		28,843	56	0%	
Food & Wood Processing	326,648	4,532			1%		1,333	26	2%		49,298	1,022	2%	
Other Manufacturing	84,592	169			0%		692	2	0%		24,585	50	0%	
Transportation	158,956	3,175			2%		1,005	28	3%		38,293	1,168	3%	
Public Utilities	39,026	358			1%		151	1	1%		5,996	54	1%	
Publishing & Communications	43,257	94			0%		332	1	0%		11,941	28	0%	
Trade	225,922	511			0%		4,211	10	0%		102,277	237	0%	
Finance / Insurance / Real Estate	103,067	40			0%		1,338	0	0%		27,984	9	0%	
Hospitality Services	125,304	1,021			1%		3,153	27	1%		42,421	349	1%	
Consumer Services	46,384	407			1%		725	6	1%		18,378	167	1%	
Business Services	93,694	559			1%		2,819	13	0%		55,302	298	1%	
Medical / Educational / Social Services	387,018	1,738			0%		6,768	30	0%		219,897	999	0%	
Federal Government	56,294	17,675			31%		534	155	29%		29,043	8,050	28%	
State & Local Government	130,679	(209)			0%		2,701	(4)	0%		69,848	(111)	0%	
<b>TOTAL</b>	<b>2,171,795</b>	<b>40,345</b>			<b>2%</b>		<b>28,792</b>	<b>358</b>	<b>1%</b>		<b>797,151</b>	<b>14,594</b>	<b>2%</b>	



COOS COUNTY	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands		%		%		%		\$ Thousands		%	
<b>Alternative 3</b>														
<b>Agriculture &amp; Ag Services</b>	277,570		6,452		2%	2,063	38	2%	69,679	1,411	2%			
<b>Mining / Sand &amp; Gravel</b>	7,765		0		0%	70	0	0%	3,367	0	0%			
<b>Construction</b>	65,618		28		0%	897	0	0%	28,843	12	0%			
<b>Food &amp; Wood Processing</b>	326,648		(1,335)		0%	1,333	3	0%	49,298	85	0%			
<b>Other Manufacturing</b>	84,592		51		0%	692	0	0%	24,585	16	0%			
<b>Transportation</b>	158,956		2,763		2%	1,005	25	2%	38,293	1,022	2%			
<b>Public Utilities</b>	39,026		31		0%	151	0	0%	5,996	5	0%			
<b>Publishing &amp; Communications</b>	43,257		29		0%	332	0	0%	11,941	9	0%			
<b>Trade</b>	225,922		176		0%	4,211	4	0%	102,277	82	0%			
<b>Finance / Insurance / Real Estate</b>	103,067		13		0%	1,338	0	0%	27,984	3	0%			
<b>Hospitality Services</b>	125,304		303		0%	3,153	8	0%	42,421	103	0%			
<b>Consumer Services</b>	46,384		124		0%	725	2	0%	18,378	49	0%			
<b>Business Services</b>	93,694		164		0%	2,819	3	0%	55,302	84	0%			
<b>Medical / Educational / Social Services</b>	387,018		567		0%	6,768	10	0%	219,897	326	0%			
<b>Federal Government</b>	56,294		7,459		13%	534	65	12%	29,043	3,396	12%			
<b>State &amp; Local Government</b>	130,679		(4,373)		(3%)	2,701	(83)	(3%)	69,848	(2,337)	(3%)			
<b>TOTAL</b>	<b>2,171,795</b>		<b>12,451</b>		<b>1%</b>	<b>28,792</b>	<b>75</b>	<b>0%</b>	<b>797,151</b>	<b>4,267</b>	<b>1%</b>			





COOS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	277,570	8,626			3%	2,063	51		2%	69,679	1,894			3%
Mining / Sand & Gravel	7,765	1			0%	70	0		0%	3,367	0			0%
Construction	65,618	68			0%	897	1		0%	28,843	30			0%
Food & Wood Processing	326,648	2,037			1%	1,333	12		1%	49,298	484			1%
Other Manufacturing	84,592	35			0%	692	1		0%	24,585	30			0%
Electronics	10,137	13			0%	26	0		0%	1,614	2			0%
Misc. Manufacturing	39,688	50			0%	326	1		0%	13,975	18			0%
Transportation	158,956	3,298			2%	1,005	29		3%	38,293	1,218			3%
Public Utilities	39,026	183			0%	151	1		0%	5,996	28			0%
Publishing & Communications	43,257	54			0%	332	0		0%	11,941	16			0%
Trade	225,922	308			0%	4,211	6		0%	102,277	143			0%
Finance / Insurance / Real Estate	103,067	24			0%	1,338	0		0%	27,984	5			0%
Hospitality Services	125,304	582			0%	3,153	16		0%	42,421	199			0%
Consumer Services	46,384	239			1%	725	4		1%	18,378	97			1%
Business Services	93,694	325			0%	2,819	7		0%	55,302	170			0%
Medical / Educational / Social Services	387,018	1,013			0%	6,768	18		0%	219,897	583			0%
Federal Government	56,294	10,501			19%	534	92		17%	29,043	4,782			16%
State & Local Government	130,679	(2,524)			(2%)	2,701	(48)		(2%)	69,848	(1,349)			(2%)
<b>TOTAL</b>	<b>2,171,795</b>	<b>24,833</b>			<b>1%</b>	<b>28,792</b>	<b>190</b>		<b>1%</b>	<b>797,151</b>	<b>8,330</b>			<b>1%</b>



CURRY COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Earnings	Change
Current Conditions	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	90,258	1,058	1%	1%	1,219	9	1%	33,808	302	1%	1%			
Mining / Sand & Gravel	393	3	1%	1%	6	0	1%	139	1	1%	1%			
Construction	48,907	561	1%	1%	824	9	1%	21,497	246	1%	1%			
Food & Wood Processing	111,841	251	0%	0%	560	1	0%	24,016	59	0%	0%			
Other Manufacturing	27,407	90	1%	1%	218	0	1%	8,091	22	1%	1%			
Transportation	10,063	175	2%	2%	142	2	1%	4,210	66	2%	2%			
Public Utilities	20,003	226	1%	1%	124	1	1%	2,912	33	1%	1%			
Publishing & Communications	12,622	32	0%	0%	125	0	0%	3,813	11	0%	0%			
Trade	75,589	417	1%	1%	1,525	8	1%	35,000	192	1%	1%			
Finance/ Insurance / Real Estate	109,321	143	0%	0%	620	1	0%	24,263	28	0%	0%			
Hospitality Services	51,624	355	1%	1%	1,372	9	1%	18,051	124	1%	1%			
Consumer Services	30,651	210	1%	1%	605	5	1%	12,412	91	1%	1%			
Business Services	31,539	261	1%	1%	570	5	1%	16,151	136	1%	1%			
Medical / Educational / Social Services	60,856	273	0%	0%	1,513	7	0%	34,701	157	0%	0%			
Federal Government	20,852	9	0%	0%	227	0	0%	10,573	7	0%	0%			
State & Local Government	60,430	9,865	16%	16%	1,076	176	16%	32,300	5,273	16%	16%			
<b>TOTAL</b>	<b>762,355</b>	<b>13,929</b>	<b>2%</b>	<b>2%</b>	<b>10,726</b>	<b>235</b>	<b>2%</b>	<b>281,937</b>	<b>6,748</b>	<b>2%</b>	<b>2%</b>			



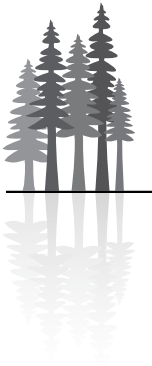
CURRY COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Employment	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands										\$ Thousands			
Agriculture & Ag Services	90,258	4,601		1,219	5%		37	3%			33,808	1,300	4%	
Mining / Sand & Gravel	393	(3)		6	(1%)		0	(1%)			139	(1)	(1%)	
Construction	48,907	(462)		824	(1%)		(8)	(1%)			21,497	(203)	(1%)	
Food & Wood Processing	111,841	(6,757)		560	(6%)		(45)	(8%)			24,016	(2,086)	(9%)	
Other Manufacturing	27,407	(83)		218	(1%)		0	(1%)			8,091	(21)	(1%)	
Transportation	10,063	777		142	8%		9	6%			4,210	288	7%	
Public Utilities	20,003	(267)		124	(1%)		(2)	(1%)			2,912	(39)	(1%)	
Publishing & Communications	12,622	(26)		125	0%		0	0%			3,813	(9)	0%	
Trade	75,589	(372)		1,525	0%		(7)	0%			35,000	(170)	0%	
Finance / Insurance / Real Estate	109,321	(115)		620	0%		0	0%			24,263	(22)	0%	
Hospitality Services	51,624	(326)		1,372	(1%)		(9)	(1%)			18,051	(114)	(1%)	
Consumer Services	30,651	(187)		605	(1%)		(4)	(1%)			12,412	(89)	(1%)	
Business Services	31,539	(253)		570	(1%)		(5)	(1%)			16,151	(140)	(1%)	
Medical / Educational / Social Services	60,856	(238)		1,513	0%		(6)	0%			34,701	(137)	0%	
Federal Government	20,852	(8)		227	0%		0	0%			10,573	(6)	0%	
State & Local Government	60,430	(8,307)		1,076	(14%)		(148)	(14%)			32,300	(4,440)	(14%)	
<b>TOTAL</b>	<b>762,355</b>	<b>(12,026)</b>		<b>10,726</b>	<b>(2%)</b>		<b>(190)</b>	<b>(2%)</b>			<b>281,937</b>	<b>(5,888)</b>	<b>(2%)</b>	



CURRY COUNTY Alternative 1	Industry	Industry	Percent	Employment	Percent	Earnings	Earnings	Percent
	Output	Change	Change	Employment	Change	Change	Change	Change
	\$ Thousands					\$ Thousands		
<b>Agriculture &amp; Ag Services</b>	90,258	1,644	2%	1,219	13	33,808	463	1%
<b>Mining / Sand &amp; Gravel</b>	393	(3)	(1%)	6	0	139	(1)	(1%)
<b>Construction</b>	48,907	(455)	(1%)	824	(8)	21,497	(200)	(1%)
<b>Food &amp; Wood Processing</b>	111,841	(5,305)	(5%)	560	(38)	24,016	(1,765)	(7%)
<b>Other Manufacturing</b>	27,407	(80)	(1%)	218	0	8,091	(20)	(1%)
<b>Transportation</b>	10,063	274	3%	142	3	4,210	101	2%
<b>Public Utilities</b>	20,003	(246)	(1%)	124	(2)	2,912	(36)	(1%)
<b>Publishing &amp; Communications</b>	12,622	(27)	0%	125	0	3,813	(9)	0%
<b>Trade</b>	75,589	(389)	(1%)	1,525	(8)	35,000	(178)	(1%)
<b>Finance / Insurance / Real Estate</b>	109,321	(122)	0%	620	(1)	24,263	(24)	0%
<b>Hospitality Services</b>	51,624	(325)	(1%)	1,372	(9)	18,051	(113)	(1%)
<b>Consumer Services</b>	30,651	(192)	(1%)	605	(4)	12,412	(88)	(1%)
<b>Business Services</b>	31,539	(257)	(1%)	570	(5)	16,151	(141)	(1%)
<b>Medical / Educational / Social Services</b>	60,856	(244)	0%	1,513	(6)	34,701	(141)	0%
<b>Federal Government</b>	20,852	(7)	0%	227	0	10,573	(6)	0%
<b>State &amp; Local Government</b>	60,430	(7,342)	(12%)	1,076	(131)	32,300	(3,924)	(12%)
<b>TOTAL</b>	<b>762,355</b>	<b>(13,076)</b>	<b>(2%)</b>	<b>10,726</b>	<b>(196)</b>	<b>281,937</b>	<b>(6,082)</b>	<b>(2%)</b>



CURRY COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		FTE		%		\$ Thousands		%	
Agriculture & Ag Services	90,258	12,997	14%	1,219	106	9%	33,808	3,679	11%					
Mining / Sand & Gravel	393	(1)	0%	6	0	0%	139	0	0%					
Construction	48,907	(139)	0%	824	(2)	0%	21,497	(61)	0%					
Food & Wood Processing	111,841	(5,060)	(5%)	560	(38)	(7%)	24,016	(1,734)	(7%)					
Other Manufacturing	27,407	(26)	0%	218	0	0%	8,091	(6)	0%					
Electronics	10,132	0	0%	100	0	0%	3,600	0	0%					
Misc. Manufacturing	3,104	(1)	0%	32	0	0%	1,208	0	0%					
Transportation	10,063	1,311	13%	142	15	10%	4,210	487	12%					
Public Utilities	20,003	(131)	(1%)	124	(1)	(1%)	2,912	(19)	(1%)					
Publishing & Communications	12,622	(6)	0%	125	0	0%	3,813	(2)	0%					
Trade	75,589	(35)	0%	1,525	(1)	0%	35,000	(16)	0%					
Finance / Insurance / Real Estate	109,321	(5)	0%	620	0	0%	24,263	1	0%					
Hospitality Services	51,624	(87)	0%	1,372	(2)	0%	18,051	(31)	0%					
Consumer Services	30,651	(20)	0%	605	(1)	0%	12,412	(18)	0%					
Business Services	31,539	(43)	0%	570	(1)	0%	16,151	(32)	0%					
Medical / Educational / Social Services	60,856	(41)	0%	1,513	(1)	0%	34,701	(23)	0%					
Federal Government	20,852	(4)	0%	227	0	0%	10,573	(3)	0%					
State & Local Government	60,430	(5,802)	(10%)	1,076	(103)	(10%)	32,300	(3,101)	(10%)					
<b>TOTAL</b>	<b>762,355</b>	<b>2,910</b>	<b>0%</b>	<b>10,726</b>	<b>(30)</b>	<b>0%</b>	<b>281,937</b>	<b>(879)</b>	<b>0%</b>					



CURRY COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Count		%		\$ Thousands		%	
Agriculture & Ag Services	90,258	515	1%	1,219	4	0%	33,808	143	0%	33,808	143	0%	0%	
Mining / Sand & Gravel	393	(3)	(1%)	6	0	(1%)	139	(1)	(1%)	139	(1)	(1%)	(1%)	
Construction	48,907	(526)	(1%)	824	(9)	(1%)	21,497	(231)	(1%)	21,497	(231)	(1%)	(1%)	
Food & Wood Processing	111,841	(5,725)	(5%)	560	(43)	(8%)	24,016	(1,958)	(8%)	24,016	(1,958)	(8%)	(8%)	
Other Manufacturing	27,407	(92)	0%	218	(1)	(1%)	8,091	(24)	(1%)	8,091	(24)	(1%)	(1%)	
Electronics	10,132	(2)	0%	100	0	0%	3,600	(1)	0%	3,600	(1)	0%	0%	
Misc. Manufacturing	3,104	(8)	0%	32	0	0%	1,208	(3)	0%	1,208	(3)	0%	0%	
Transportation	10,063	242	2%	142	3	2%	4,210	89	2%	4,210	89	2%	2%	
Public Utilities	20,003	(279)	(1%)	124	(2)	(1%)	2,912	(41)	(1%)	2,912	(41)	(1%)	(1%)	
Publishing & Communications	12,622	(31)	0%	125	0	0%	3,813	(11)	0%	3,813	(11)	0%	0%	
Trade	75,589	(460)	(1%)	1,525	(9)	(1%)	35,000	(210)	(1%)	35,000	(210)	(1%)	(1%)	
Finance / Insurance / Real Estate	109,321	(144)	0%	620	(1)	0%	24,263	(28)	0%	24,263	(28)	0%	0%	
Hospitality Services	51,624	(379)	(1%)	1,372	(10)	(1%)	18,051	(132)	(1%)	18,051	(132)	(1%)	(1%)	
Consumer Services	30,651	(225)	(1%)	605	(5)	(1%)	12,412	(103)	(1%)	12,412	(103)	(1%)	(1%)	
Business Services	31,539	(301)	(1%)	570	(6)	(1%)	16,151	(163)	(1%)	16,151	(163)	(1%)	(1%)	
Medical / Educational / Social Services	60,856	(287)	0%	1,513	(7)	0%	34,701	(165)	0%	34,701	(165)	0%	0%	
Federal Government	20,852	(8)	0%	227	0	0%	10,573	(7)	0%	10,573	(7)	0%	0%	
State & Local Government	60,430	(8,099)	(13%)	1,076	(144)	(13%)	32,300	(4,329)	(13%)	32,300	(4,329)	(13%)	(13%)	
<b>TOTAL</b>	<b>762,355</b>	<b>(15,802)</b>	<b>(2%)</b>	<b>10,726</b>	<b>(230)</b>	<b>(2%)</b>	<b>281,937</b>	<b>(7,170)</b>	<b>(2%)</b>	<b>281,937</b>	<b>(7,170)</b>	<b>(3%)</b>	<b>(3%)</b>	



CURRY COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	90,258	630	630	1%	1,219	5	0%	33,808	176	0%	33,808	1%		
Mining / Sand & Gravel	393	(2)	(2)	(1%)	6	-	(1%)	139	(1)	(1%)	139	(1%)		
Construction	48,907	(399)	(399)	(1%)	824	(7)	(1%)	21,497	(175)	(1%)	21,497	(1%)		
Food & Wood Processing	111,841	(1,520)	(1,520)	(1%)	560	(19)	(3%)	24,016	(869)	(3%)	24,016	(4%)		
Other Manufacturing	27,407	(64)	(64)	0%	218	-	0%	8,091	(16)	0%	8,091	0%		
Transportation	10,063	490	490	5%	142	5	4%	4,210	182	4%	4,210	4%		
Public Utilities	20,003	(185)	(185)	(1%)	124	(1)	(1%)	2,912	(27)	(1%)	2,912	(1%)		
Publishing & Communications	12,622	(22)	(22)	0%	125	-	0%	3,813	(8)	0%	3,813	0%		
Trade	75,589	(306)	(306)	0%	1,525	(6)	0%	35,000	(141)	0%	35,000	0%		
Finance / Insurance / Real Estate	109,321	(100)	(100)	0%	620	-	0%	24,263	(19)	0%	24,263	0%		
Hospitality Services	51,624	(267)	(267)	(1%)	1,372	(7)	(1%)	18,051	(93)	(1%)	18,051	(1%)		
Consumer Services	30,651	(146)	(146)	0%	605	(3)	(1%)	12,412	(65)	(1%)	12,412	(1%)		
Business Services	31,539	(187)	(187)	(1%)	570	(4)	(1%)	16,151	(100)	(1%)	16,151	(1%)		
Medical / Educational / Social	60,856	(203)	(203)	0%	1,513	(5)	0%	34,701	(117)	0%	34,701	0%		
Federal Government	20,852	(6)	(6)	0%	227	-	0%	10,573	(5)	0%	10,573	0%		
State & Local Government	60,430	(7,087)	(7,087)	(12%)	1,076	(126)	(12%)	32,300	(3,788)	(12%)	32,300	(12%)		
<b>TOTAL</b>	<b>762,355</b>	<b>(9,374)</b>	<b>(9,374)</b>	<b>(1%)</b>	<b>10,726</b>	<b>(169)</b>	<b>(2%)</b>	<b>281,937</b>	<b>(5,065)</b>	<b>(2%)</b>	<b>281,937</b>	<b>(2%)</b>		



DOUGLAS COUNTY	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands		%		Change		%		\$ Thousands		%	
<b>Agriculture &amp; Ag Services</b>	477,472	20,852	4%	5,285	130	2%	112,086	4,885	4%					
<b>Mining / Sand &amp; Gravel</b>	12,065	205	2%	131	2	2%	4,476	84	2%					
<b>Construction</b>	184,093	5,317	3%	2,721	79	3%	80,918	2,337	3%					
<b>Food &amp; Wood Processing</b>	1,377,889	60,441	4%	4,141	151	4%	166,764	6,149	4%					
<b>Other Manufacturing</b>	262,533	1,232	0%	2,105	11	1%	72,691	342	0%					
<b>Transportation</b>	150,942	6,877	5%	2,187	94	4%	64,316	2,819	4%					
<b>Public Utilities</b>	91,804	3,136	3%	205	7	3%	13,854	475	3%					
<b>Publishing &amp; Communications</b>	56,751	623	1%	526	7	1%	15,770	210	1%					
<b>Trade</b>	325,126	8,251	3%	6,827	169	2%	147,037	3,699	3%					
<b>Finance / Insurance / Real Estate</b>	281,881	7,023	2%	2,867	74	3%	62,267	1,674	3%					
<b>Hospitality Services</b>	245,198	2,857	1%	5,143	71	1%	82,830	981	1%					
<b>Consumer Services</b>	142,277	4,593	3%	2,442	81	3%	55,033	1,850	3%					
<b>Business Services</b>	221,957	7,129	3%	3,457	114	3%	110,520	3,583	3%					
<b>Medical / Educational / Social</b>	323,683	8,396	3%	6,077	148	2%	182,788	4,762	3%					
<b>Federal Government</b>	199,934	15,194	8%	1,644	122	7%	95,160	7,085	7%					
<b>State &amp; Local Government</b>	378,859	52,607	14%	7,013	943	13%	202,500	28,118	14%					
<b>TOTAL</b>	<b>4,732,462</b>	<b>204,734</b>	<b>4%</b>	<b>52,770</b>	<b>2,204</b>	<b>4%</b>	<b>1,469,009</b>	<b>69,053</b>	<b>5%</b>					





DOUGLAS COUNTY	Industry		Industry		Percent		Employment		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands						\$ Thousands			
Agriculture & Ag Services	477,472	(28,893)	(6%)	5,285	(179)	(3%)	112,086	(6,737)	(6%)			
Mining / Sand & Gravel	12,065	(186)	(2%)	131	(2)	(2%)	4,476	(77)	(2%)			
Construction	184,093	(4,981)	(3%)	2,721	(74)	(3%)	80,918	(2,189)	(3%)			
Food / Wood Processing	1,377,889	(138,761)	(10%)	4,141	(286)	(7%)	166,764	(11,656)	(7%)			
Other Manufacturing	262,533	(1,207)	0%	2105	(11)	(1%)	72,691	(337)	0%			
Transportation	150,942	(2,419)	(2%)	2,187	(45)	(2%)	64,316	(1,224)	(2%)			
Public Utilities	91,804	(3,755)	(4%)	205	(8)	(4%)	13,854	(564)	(4%)			
Publishing & Communications	56,751	(586)	(1%)	526	(7)	(1%)	15,770	(201)	(1%)			
Trade	325,126	(9,097)	(3%)	6,827	(176)	(3%)	147,037	(4,002)	(3%)			
Finance / Insurance / Real Estate	281,881	(6,800)	(2%)	2,867	(72)	(3%)	62,267	(1,628)	(3%)			
Hospitality Services	245,198	(2,759)	(1%)	5,143	(69)	(1%)	82,830	(948)	(1%)			
Consumer Services	142,277	(4,817)	(3%)	2,442	(82)	(3%)	55,033	(1,935)	(4%)			
Business Services	221,957	(8,811)	(4%)	3,457	(131)	(4%)	110,520	(4,508)	(4%)			
Medical / Educational / Social Services	323,683	(7,646)	(2%)	6,077	(135)	(2%)	182,788	(4,338)	(2%)			
Federal Government	199,934	2,825	1%	1,644	20	1%	95,160	1,137	1%			
State & Local Government	378,859	(42,132)	(11%)	7,013	(755)	(11%)	202,500	(22,519)	(11%)			
<b>TOTAL</b>	<b>4,732,462</b>	<b>(260,025)</b>	<b>(5%)</b>	<b>52,770</b>	<b>(2,012)</b>	<b>(4%)</b>	<b>1,469,009</b>	<b>(61,727)</b>	<b>(4%)</b>			



DOUGLAS COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	477,472	(16,822)	(4%)	5,285	(105)	(2%)	112,086	(3,958)	(4%)					
Mining / Sand & Gravel	12,065	(137)	(1%)	131	(2)	(1%)	4,476	(56)	(1%)					
Construction	184,093	(3,636)	(2%)	2,721	(54)	(2%)	80,918	(1,598)	(2%)					
Food & Wood Processing	1,377,889	(102,241)	(7%)	4,141	(185)	(4%)	166,764	(7,530)	(5%)					
Other Manufacturing	262,533	(829)	0%	2,105	(8)	0%	72,691	(229)	0%					
Transportation	150,942	292	0%	2,187	(9)	0%	64,316	(123)	0%					
Public Utilities	91,804	(2,630)	(3%)	205	(6)	(3%)	13,854	(395)	(3%)					
Publishing & Communications	56,751	(409)	(1%)	526	(5)	(1%)	15,770	(141)	(1%)					
Trade	325,126	(6,385)	(2%)	6,827	(122)	(2%)	147,037	(2,798)	(2%)					
Finance / Insurance / Real Estate	281,881	(4,710)	(2%)	2,867	(50)	(2%)	62,267	(1,125)	(2%)					
Hospitality Services	245,198	(1,902)	(1%)	5,143	(48)	(1%)	82,830	(654)	(1%)					
Consumer Services	142,277	(3,373)	(2%)	2,442	(57)	(2%)	55,033	(1,357)	(2%)					
Business Services	221,957	(6,406)	(3%)	3,457	(95)	(3%)	110,520	(3,303)	(3%)					
Medical / Educational / Social Services	323,683	(5,196)	(2%)	6,077	(92)	(2%)	182,788	(2,948)	(2%)					
Federal Government	199,934	3,686	2%	1,644	27	2%	95,160	1,572	2%					
State & Local Government	378,859	(35,015)	(9%)	7,013	(628)	(9%)	202,500	(18,715)	(9%)					
<b>TOTAL</b>	<b>4,732,462</b>	<b>(185,714)</b>	<b>(4%)</b>	<b>52,770</b>	<b>(1,436)</b>	<b>(3%)</b>	<b>1,469,009</b>	<b>(43,359)</b>	<b>(3%)</b>					



DOUGLAS COUNTY	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
Alternative 2	477,472	2,082	5,285	12	0%	112,086	436	0%	112,086	436	0%	112,086	436	0%
Agriculture & Ag Services	12,065	(56)	131	(1)	0%	4,476	(23)	(1%)	4,476	(23)	(1%)	4,476	(23)	(1%)
Mining / Sand & Gravel	184,093	(1,394)	2,721	(21)	(1%)	80,918	(613)	(1%)	80,918	(613)	(1%)	80,918	(613)	(1%)
Construction	1,377,889	(52,295)	4,141	(50)	(4%)	166,764	(2,045)	(1%)	166,764	(2,045)	(1%)	166,764	(2,045)	(1%)
Food & Wood Processing	262,533	(212)	2,105	(2)	0%	72,691	(51)	0%	72,691	(51)	0%	72,691	(51)	0%
Other Manufacturing	150,942	5,819	2,187	62	4%	64,316	2,072	3%	64,316	2,072	3%	64,316	2,072	3%
Transportation	91,804	(927)	205	(2)	(1%)	13,854	(139)	(1%)	13,854	(139)	(1%)	13,854	(139)	(1%)
Public Utilities	56,751	(115)	526	(1)	0%	15,770	(41)	0%	15,770	(41)	0%	15,770	(41)	0%
Publishing & Communications	325,126	(2,027)	6,827	(34)	(1%)	147,037	(857)	(1%)	147,037	(857)	(1%)	147,037	(857)	(1%)
Trade	281,881	(1,273)	2,867	(13)	0%	62,267	(297)	0%	62,267	(297)	0%	62,267	(297)	0%
Finance / Insurance / Real Estate	245,198	(503)	5,143	(13)	0%	82,830	(173)	0%	82,830	(173)	0%	82,830	(173)	0%
Hospitality Services	142,277	(1,056)	2,442	(18)	(1%)	55,033	(433)	(1%)	55,033	(433)	(1%)	55,033	(433)	(1%)
Consumer Services	221,957	(2,537)	3,457	(36)	(1%)	110,520	(1,360)	(1%)	110,520	(1,360)	(1%)	110,520	(1,360)	(1%)
Business Services	323,683	(1,140)	6,077	(21)	0%	182,788	(647)	0%	182,788	(647)	0%	182,788	(647)	0%
Medical / Educational / Social Services	199,934	10,546	1,644	82	5%	95,160	4,767	5%	95,160	4,767	5%	95,160	4,767	5%
Federal Government	378,859	(24,478)	7,013	(439)	(6%)	202,500	(13,084)	(6%)	202,500	(13,084)	(6%)	202,500	(13,084)	(6%)
State & Local Government	4,732,462	(69,566)	52,770	(494)	(1%)	1,469,009	(12,485)	(1%)	1,469,009	(12,485)	(1%)	1,469,009	(12,485)	(1%)
<b>TOTAL</b>														



DOUGLAS COUNTY Alternative 3	Industry Output \$ Thousands	Industry Change \$ Thousands	Percent Change	Employment	Employment Change	Percent Change	Earnings \$ Thousands	Earnings Change \$ Thousands	Percent Change
Agriculture & Ag Services	477,472	(8,782)	(2%)	5,285	(54)	(1%)	112,086	(2,003)	(2%)
Mining / Sand & Gravel	12,065	(136)	(1%)	131	(2)	(1%)	4,476	(56)	(1%)
Construction	184,093	(3,507)	(2%)	2,721	(52)	(2%)	80,918	(1,541)	(2%)
Food & Wood Processing	1,377,889	(110,213)	(8%)	4,141	(205)	(5%)	166,764	(8,369)	(5%)
Other Manufacturing	262,533	(771)	0%	2,105	(7)	0%	72,691	(210)	0%
Transportation	150,942	5,944	4%	2,187	56	3%	64,316	1,983	3%
Public Utilities	91,804	(2,688)	(3%)	205	(6)	(3%)	13,854	(403)	(3%)
Publishing & Communications	56,751	(366)	(1%)	526	(4)	(1%)	15,770	(126)	(1%)
Trade	325,126	(5,810)	(2%)	6,827	(109)	(2%)	147,037	(2,534)	(2%)
Finance / Insurance / Real Estate	281,881	(4,197)	(1%)	2,867	(44)	(2%)	62,267	(997)	(2%)
Hospitality Services	245,198	(1,718)	(1%)	5,143	(43)	(1%)	82,830	(590)	(1%)
Consumer Services	142,277	(3,114)	(2%)	2,442	(53)	(2%)	55,033	(1,269)	(2%)
Business Services	221,957	(5,996)	(3%)	3,457	(90)	(3%)	110,520	(3,106)	(3%)
Medical / Educational / Social Services	323,683	(4,550)	(1%)	6,077	(81)	(1%)	182,788	(2,582)	(1%)
Federal Government	199,934	7,837	4%	1,644	60	4%	95,160	3,466	4%
State & Local Government	378,859	(40,001)	(11%)	7,013	(717)	(10%)	202,500	(21,380)	(11%)
<b>TOTAL</b>	<b>4,732,462</b>	<b>(178,067)</b>	<b>(4%)</b>	<b>52,770</b>	<b>(1,351)</b>	<b>(3%)</b>	<b>1,469,009</b>	<b>(39,716)</b>	<b>(3%)</b>



DOUGLAS COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	477,472	4,754			1%		5,285	30	1%		112,086	1,141		1%
Mining / Sand & Gravel	12,065	(73)			(1%)		131	(1)	(1%)		4,476	(29)		(1%)
Construction	184,093	(1,741)			(1%)		2,721	(26)	(1%)		80,918	(765)		(1%)
Food & Wood Processing	1,377,889	(35,227)			(3%)		4,141	(41)	(1%)		166,764	(1,682)		(1%)
Other Manufacturing	262,533	(271)			0%		2,105	(2)	0%		72,691	(66)		0%
Transportation	150,942	6,505			4%		2,187	70	3%		64,316	2,330		4%
Public Utilities	91,804	(901)			(1%)		205	(2)	(1%)		13,854	(136)		(1%)
Publishing & Communications	56,751	(150)			0%		526	(2)	0%		15,770	(51)		0%
Trade	325,126	(2,110)			(1%)		6,827	(39)	(1%)		147,037	(919)		(1%)
Finance / Insurance / Real Estate	281,881	(1,632)			(1%)		2,867	(17)	(1%)		62,267	(377)		(1%)
Hospitality Services	245,198	(674)			0%		5,143	(17)	0%		82,830	(231)		0%
Consumer Services	142,277	(1,201)			(1%)		2,442	(21)	(1%)		55,033	(503)		(1%)
Business Services	221,957	(2,193)			(1%)		3,457	(35)	(1%)		110,520	(1,151)		(1%)
Medical / Educational / Social Services	323,683	(1,762)			(1%)		6,077	(32)	(1%)		182,788	(1,000)		(1%)
Federal Government	199,934	6,969			3%		1,644	54	3%		95,160	3,123		3%
State & Local Government	378,859	(32,747)			(9%)		7,013	(587)	(8%)		202,500	(17,504)		(9%)
<b>TOTAL</b>	<b>4,732,462</b>	<b>(62,454)</b>			<b>(1%)</b>		<b>52,770</b>	<b>(669)</b>	<b>(1%)</b>		<b>1,469,009</b>	<b>(17,820)</b>		<b>(1%)</b>



JACKSON COUNTY	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
<b>Current Conditions</b>														
<b>Agriculture &amp; Ag Services</b>	322,764	13,526	4%	5,142	196	4%	111,201	7,633	7%					
<b>Mining / Sand &amp; Gravel</b>	27,021	18	0%	270	0	0%	9,839	7	0%					
<b>Construction</b>	694,897	1,414	0%	6,898	14	0%	305,442	621	0%					
<b>Food &amp; Wood Processing</b>	1,033,962	36,630	4%	3,878	113	3%	144,583	4,614	3%					
<b>Other Manufacturing</b>	544,010	1,471	0%	3,102	10	0%	142,127	368	0%					
<b>Transportation</b>	289,705	2,093	1%	2,864	19	1%	116,751	791	1%					
<b>Public Utilities</b>	134,964	1,966	1%	263	4	1%	20,558	300	1%					
<b>Publishing &amp; Communications</b>	261,760	744	0%	1,988	6	0%	71,832	204	0%					
<b>Trade</b>	1,222,373	3,448	0%	19,071	56	0%	548,179	1,564	0%					
<b>Finance / Insurance / Real Estate</b>	701,854	960	0%	4,526	5	0%	178,471	207	0%					
<b>Hospitality Services</b>	431,123	3,606	1%	9,637	82	1%	155,225	1,262	1%					
<b>Consumer Services</b>	351,788	2,756	1%	6,331	54	1%	147,875	1,222	1%					
<b>Business Services</b>	475,690	4,001	1%	8,689	76	1%	253,729	2,173	1%					
<b>Medical / Educational / Social Services</b>	1,025,032	6,824	1%	18,147	119	1%	589,556	3,905	1%					
<b>Federal Government</b>	164,795	33,955	21%	1,935	399	21%	86,656	15,478	18%					
<b>State &amp; Local Government</b>	682,881	27,769	4%	10,570	460	4%	365,000	14,842	4%					
<b>TOTAL</b>	<b>8,364,619</b>	<b>141,181</b>	<b>2%</b>	<b>103,612</b>	<b>1,612</b>	<b>2%</b>	<b>3,247,024</b>	<b>55,194</b>	<b>2%</b>					

JACKSON COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	322,764	2,599	1%	5,142	39	1%	111,201	1,675	2%					
Mining / Sand & Gravel	27,021	(6)	0%	270	0	0%	9,839	(2)	0%					
Construction	694,897	(353)	0%	6,898	(4)	0%	305,442	(155)	0%					
Food & Wood Processing	1,033,962	(274)	0%	3,878	(2)	0%	144,583	(55)	0%					
Other Manufacturing	544,010	(237)	0%	3,402	(2)	0%	142,127	(61)	0%					
Transportation	289,705	(86)	0%	2,864	(1)	0%	116,751	(34)	0%					
Public Utilities	134,964	(389)	0%	263	(1)	0%	20,558	(59)	0%					
Publishing & Communications	261,760	(161)	0%	1,988	(1)	0%	71,832	(44)	0%					
Trade	1,222,373	(602)	0%	19,071	(10)	0%	548,179	(276)	0%					
Finance / Insurance / Real Estate	701,854	(202)	0%	4,526	(1)	0%	178,471	(45)	0%					
Hospitality Services	431,123	(721)	0%	9,637	(16)	0%	155,225	(252)	0%					
Consumer Services	351,788	(569)	0%	6,331	(11)	0%	147,875	(251)	0%					
Business Services	475,690	(707)	0%	8,689	(14)	0%	253,729	(380)	0%					
Medical / Educational / Social Services	1,025,032	(1,320)	0%	18,147	(23)	0%	589,556	(754)	0%					
Federal Government	164,795	(17)	0%	1,935	0	0%	86,656	(14)	0%					
State & Local Government	682,881	(18,343)	(3%)	10,570	(304)	(3%)	365,000	(9,804)	(3%)					
<b>TOTAL</b>	<b>8,364,619</b>	<b>(21,386)</b>	<b>0%</b>	<b>103,612</b>	<b>(351)</b>	<b>0%</b>	<b>3,247,024</b>	<b>(10,510)</b>	<b>0%</b>					





JACKSON COUNTY Alternative 1	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Industry	Change	Change	Employment	Change	Change	Change	Earnings	Change	Earnings	Change	Change
	\$ Thousands		\$ Thousands								\$ Thousands			
<b>Agriculture &amp; Ag Services</b>	322,764	10,104			3%	5,142	161	3%	111,201	6,845	6%			
<b>Mining / Sand &amp; Gravel</b>	27,021	(1)			0%	270	0	0%	9,839	0	0%			
<b>Construction</b>	694,897	33			0%	6,898	0	0%	305,442	15	0%			
<b>Food &amp; Wood Processing</b>	1,033,962	(20,931)			(2%)	3,878	63	2%	144,583	2,883	2%			
<b>Other Manufacturing</b>	544,010	941			0%	3,402	5	0%	142,127	171	0%			
<b>Transportation</b>	289,705	1,526			1%	2,864	13	0%	116,751	567	0%			
<b>Public Utilities</b>	134,964	255			0%	263	1	0%	20,558	40	0%			
<b>Publishing &amp; Communications</b>	261,760	73			0%	1,988	1	0%	71,832	20	0%			
<b>Trade</b>	1,222,373	347			0%	19,071	7	0%	548,179	172	0%			
<b>Finance / Insurance / Real Estate</b>	701,854	93			0%	4,526	0	0%	178,471	16	0%			
<b>Hospitality Services</b>	431,123	435			0%	9,637	10	0%	155,225	152	0%			
<b>Consumer Services</b>	351,788	134			0%	6,331	2	0%	147,875	28	0%			
<b>Business Services</b>	475,690	(24)			0%	8,689	(1)	0%	253,729	(44)	0%			
<b>Medical / Educational / Social Services</b>	1,025,032	1,188			0%	18,147	20	0%	589,556	683	0%			
<b>Federal Government</b>	164,795	12,498			8%	1,935	147	8%	86,656	5,689	7%			
<b>State &amp; Local Government</b>	682,881	(13,127)			(2%)	10,570	(218)	(2%)	365,000	(7,016)	(2%)			
<b>TOTAL</b>	<b>8,364,619</b>	<b>(6,455)</b>			<b>0%</b>	<b>103,612</b>	<b>211</b>	<b>0%</b>	<b>3,247,024</b>	<b>10,220</b>	<b>0%</b>			





JACKSON COUNTY	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Count		%		\$ Thousands		%	
Alternative 2														
Agriculture & Ag Services	322,764	15,671		5,142	5%	244		5%	111,201		10,157		9%	
Mining / Sand & Gravel	27,021	4		270	0%	0		0%	9,839		2		0%	
Construction	694,897	417		6,898	0%	4		0%	305,442		183		0%	
Food & Wood Processing	1,033,962	(5,025)		3,878	0%	138		4%	144,583		6,053		4%	
Other Manufacturing	544,010	1,803		3,402	0%	10		0%	142,127		357		0%	
Transportation	289,705	1,956		2,864	1%	17		1%	116,751		731		1%	
Public Utilities	134,964	1,074		263	1%	2		1%	20,558		165		1%	
Publishing & Communications	261,760	275		1,988	0%	2		0%	71,832		77		0%	
Trade	1,222,373	1,378		19,071	0%	24		0%	548,179		639		0%	
Finance / Insurance / Real Estate	701,854	371		4,526	0%	2		0%	178,471		76		0%	
Hospitality Services	431,123	1,495		9,637	0%	34		0%	155,225		522		0%	
Consumer Services	351,788	966		6,331	0%	18		0%	147,875		399		0%	
Business Services	475,690	1,144		8,689	0%	21		0%	253,729		584		0%	
Medical / Educational / Social Services	1,025,032	3,179		18,147	0%	55		0%	589,556		1,823		0%	
Federal Government	164,795	17,027		1,935	10%	200		10%	86,656		7,757		9%	
State & Local Government	682,881	(5,938)		10,570	(1%)	(98)		(1%)	365,000		(3,174)		(1%)	
<b>TOTAL</b>	<b>8,364,619</b>	<b>35,797</b>		<b>103,612</b>	<b>0%</b>	<b>672</b>		<b>1%</b>	<b>3,247,024</b>		<b>26,351</b>		<b>1%</b>	



JACKSON COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Employment	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
Alternative 3	\$ Thousands										\$ Thousands			
Agriculture & Ag Services	322,764	6,219		5,142	2%	102	2%	111,201	4,446	2%	102	4,446	4%	
Mining / Sand & Gravel	27,021	(3)		270	0%	0	0%	9,839	(1)	0%	0	(1)	0%	
Construction	694,897	(123)		6,898	0%	(1)	0%	305,442	(54)	0%	(1)	(54)	0%	
Food & Wood Processing	1,033,962	(22,754)		3,878	(2%)	59	(2%)	144,583	2,694	2%	59	2,694	2%	
Other Manufacturing	544,010	717		3,402	0%	3	0%	142,127	120	0%	3	120	0%	
Transportation	289,705	1,517		2,864	1%	13	1%	116,751	563	0%	13	563	0%	
Public Utilities	134,964	16		263	0%	0	0%	20,558	3	0%	0	3	0%	
Publishing & Communications	261,760	(10)		1,988	0%	0	0%	71,832	(2)	0%	0	(2)	0%	
Trade	1,222,373	(53)		19,071	0%	1	0%	548,179	(11)	0%	1	(11)	0%	
Finance / Insurance / Real Estate	701,854	(20)		4,526	0%	0	0%	178,471	(9)	0%	0	(9)	0%	
Hospitality Services	431,123	11		9,637	0%	0	0%	155,225	3	0%	0	3	0%	
Consumer Services	351,788	(179)		6,331	0%	(4)	0%	147,875	(108)	0%	(4)	(108)	0%	
Business Services	475,690	(429)		8,689	0%	(9)	0%	253,729	(260)	0%	(9)	(260)	0%	
Medical / Educational / Social Services	1,025,032	355		18,147	0%	6	0%	589,556	207	0%	6	207	0%	
Federal Government	164,795	10,568		1,935	6%	124	6%	86,656	4,808	6%	124	4,808	6%	
State & Local Government	682,881	(16,709)		10,570	(2%)	(277)	(2%)	365,000	(8,931)	(3%)	(277)	(8,931)	(2%)	
<b>TOTAL</b>	<b>8,364,619</b>	<b>(20,877)</b>		<b>103,612</b>	<b>0%</b>	<b>16</b>	<b>0%</b>	<b>3,247,024</b>	<b>3,469</b>	<b>0%</b>	<b>16</b>	<b>3,469</b>	<b>0%</b>	



JACKSON COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Employment	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
PRMP	\$ Thousands										\$ Thousands			
Agriculture & Ag Services	322,764	2,023		5,142	1%	33	1%	111,201	1,390	1%				1%
Mining / Sand & Gravel	27,021	(1)		270	0%	(0)	0%	9,839	(0)	0%				0%
Construction	694,897	52		6,898	0%	1	0%	305,442	23	0%				0%
Food & Wood Processing	1,033,962	7,162		3,878	1%	172	4%	144,583	7,434	4%				5%
Other Manufacturing	544,010	1,229		3,402	0%	6	0%	142,127	235	0%				0%
Transportation	289,705	2,015		2,864	1%	17	1%	116,751	751	1%				1%
Public Utilities	134,964	635		263	0%	1	0%	20,558	97	0%				0%
Publishing & Communications	261,760	70		1,988	0%	1	0%	71,832	20	0%				0%
Trade	1,222,373	464		19,071	0%	8	0%	548,179	215	0%				0%
Finance / Insurance / Real Estate	701,854	97		4,526	0%	0	0%	178,471	19	0%				0%
Hospitality Services	431,123	459		9,637	0%	10	0%	155,225	161	0%				0%
Consumer Services	351,788	299		6,331	0%	6	0%	147,875	126	0%				0%
Business Services	475,690	400		8,689	0%	7	0%	253,729	204	0%				0%
Medical / Educational / Social Services	1,025,032	995		18,147	0%	17	0%	589,556	572	0%				0%
Federal Government	164,795	8,021		1,935	5%	94	5%	86,656	3,652	5%				4%
State & Local Government	682,881	(12,074)		10,570	(2%)	(200)	(2%)	365,000	(6,454)	(2%)				(2%)
<b>TOTAL</b>	<b>8,364,619</b>	<b>11,844</b>		<b>103,612</b>	<b>0%</b>	<b>173</b>	<b>0%</b>	<b>3,247,024</b>	<b>8,446</b>	<b>0%</b>				<b>0%</b>



JOSEPHINE COUNTY	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Change		Change		Change		Change		\$ Thousands		Change	
<b>Agriculture &amp; Ag Services</b>	138,991	2,526	2%	1,849	16	1%	39,315	632	2%					
<b>Mining / Sand &amp; Gravel</b>	3,310	6	0%	77	0	0%	1,144	2	0%					
<b>Construction</b>	150,888	1,200	1%	2,488	20	1%	66,323	527	1%					
<b>Food / Wood Processing</b>	181,718	4,587	3%	1,138	25	2%	40,149	1,044	3%					
<b>Other Manufacturing</b>	370,088	147	0%	2,706	1	0%	102,174	46	0%					
<b>Transportation</b>	93,512	432	0%	915	4	0%	35,312	160	0%					
<b>Public Utilities</b>	30,344	398	1%	65	1	1%	4,704	62	1%					
<b>Publishing &amp; Communications</b>	65,935	425	1%	541	3	1%	18,119	110	1%					
<b>Trade</b>	307,410	2,042	1%	5,665	38	1%	139,496	929	1%					
<b>Finance / Insurance / Real Estate</b>	307,929	2,209	1%	2,684	18	1%	73,721	468	1%					
<b>Hospitality Services</b>	109,774	909	1%	3,125	25	1%	38,318	315	1%					
<b>Consumer Services</b>	110,997	890	1%	2,356	19	1%	44,051	356	1%					
<b>Business Services</b>	141,076	870	1%	2,799	17	1%	65,648	391	1%					
<b>Medical / Educational / Social Services</b>	315,197	2,283	1%	6,574	47	1%	178,438	1,298	1%					
<b>Federal Government</b>	42,247	12	0%	450	0	0%	22,511	10	0%					
<b>State &amp; Local Government</b>	306,873	18,462	6%	3,820	235	6%	164,023	9,868	6%					
<b>TOTAL</b>	<b>2,676,289</b>	<b>37,398</b>	<b>1%</b>	<b>37,253</b>	<b>470</b>	<b>1%</b>	<b>1,033,446</b>	<b>16,218</b>	<b>2%</b>					



JOSEPHINE COUNTY	Industry	Industry Output	Industry Change	Percent Change	Employment	Employment Change	Percent Change	Earnings	Earnings Change	Percent Change
No Action Alternative										
Agriculture & Ag Services	138,991	(634)	0%	1,849	(4)	0%	39,315	(152)	0%	0%
Mining / Sand & Gravel	3,310	(4)	0%	77	0	0%	1,144	(2)	0%	0%
Construction	150,888	(825)	(1%)	2,488	(14)	(1%)	66,323	(363)	(1%)	(1%)
Food/ Wood Processing	181,718	(8,846)	(5%)	1,138	(21)	(2%)	40,149	(902)	(2%)	(2%)
Other Manufacturing	370,088	(102)	0%	2,706	1	0%	102,174	(32)	0%	0%
Transportation	93,512	1,178	1%	915	10	1%	35,312	438	1%	1%
Public Utilities	30,344	(314)	(1%)	65	(1)	(1%)	4,704	(48)	(1%)	(1%)
Publishing & Communications	65,935	(275)	0%	541	(2)	0%	18,119	(71)	0%	0%
Trade	307,410	(1,376)	0%	5,665	(25)	0%	139,496	(621)	0%	0%
Finance / Insurance / Real Estate	307,929	(1,434)	0%	2,684	(12)	0%	73,721	(302)	0%	0%
Hospitality Services	109,774	(607)	(1%)	3,125	(17)	(1%)	38,318	(210)	(1%)	(1%)
Consumer Services	110,997	(595)	(1%)	2,356	(13)	(1%)	44,051	(247)	(1%)	(1%)
Business Services	141,076	(616)	0%	2,799	(12)	0%	65,648	(286)	0%	0%
Medical / Educational / Social Services	315,197	(1,464)	0%	6,574	(30)	0%	178,438	(832)	0%	0%
Federal Government	42,247	(8)	0%	450	0	0%	22,511	(7)	0%	0%
State & Local Government	306,873	(12,865)	(4%)	3,820	(164)	(4%)	164,023	(6,876)	(4%)	(4%)
<b>TOTAL</b>	<b>2,676,289</b>	<b>(28,788)</b>	<b>(1%)</b>	<b>37,253</b>	<b>(306)</b>	<b>(1%)</b>	<b>1,033,446</b>	<b>(10,512)</b>	<b>(1%)</b>	<b>(1%)</b>



JOSEPHINE COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		Thousands		%		%		%		\$ Thousands		%	
Agriculture & Ag Services	138,991	1,598	1%	1,849	10	1%	39,315	410	1%	1%	39,315	410	1%	1%
Mining / Sand & Gravel	3,310	(3)	0%	77	0	0%	1,144	(1)	0%	0%	1,144	(1)	0%	0%
Construction	150,888	(504)	0%	2,488	(8)	0%	66,323	(222)	0%	0%	66,323	(222)	0%	0%
Food & Wood Processing	181,718	(7,257)	(4%)	1,138	(6)	(1%)	40,149	(291)	(1%)	(1%)	40,149	(291)	(1%)	(1%)
Other Manufacturing	370,088	(59)	0%	2,706	0	0%	102,174	(18)	0%	0%	102,174	(18)	0%	0%
Transportation	93,512	1,939	2%	915	17	2%	35,312	721	2%	2%	35,312	721	2%	2%
Public Utilities	30,344	(205)	(1%)	65	0	(1%)	4,704	(31)	(1%)	(1%)	4,704	(31)	(1%)	(1%)
Publishing & Communications	65,935	(148)	0%	541	(1)	0%	18,119	(38)	0%	0%	18,119	(38)	0%	0%
Trade	307,410	(718)	0%	5,665	(13)	0%	139,496	(322)	0%	0%	139,496	(322)	0%	0%
Finance / Insurance / Real Estate	307,929	(749)	0%	2,684	(6)	0%	73,721	(155)	0%	0%	73,721	(155)	0%	0%
Hospitality Services	109,774	(333)	0%	3,125	(9)	0%	38,318	(115)	0%	0%	38,318	(115)	0%	0%
Consumer Services	110,997	(315)	0%	2,356	(7)	0%	44,051	(137)	0%	0%	44,051	(137)	0%	0%
Business Services	141,076	(340)	0%	2,799	(7)	0%	65,648	(165)	0%	0%	65,648	(165)	0%	0%
Medical / Educational / Social Services	315,197	(757)	0%	6,574	(16)	0%	178,438	(429)	0%	0%	178,438	(429)	0%	0%
Federal Government	42,247	(5)	0%	450	0	0%	22,511	(4)	0%	0%	22,511	(4)	0%	0%
State & Local Government	306,873	(9,139)	(3%)	3,820	(116)	(3%)	164,023	(4,885)	(3%)	(3%)	164,023	(4,885)	(3%)	(3%)
<b>TOTAL</b>	<b>2,676,289</b>	<b>(16,994)</b>	<b>(1%)</b>	<b>37,253</b>	<b>(165)</b>	<b>0%</b>	<b>1,033,446</b>	<b>(5,684)</b>	<b>0%</b>	<b>0%</b>	<b>1,033,446</b>	<b>(5,684)</b>	<b>(1%)</b>	<b>(1%)</b>



JOSEPHINE COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	138,991	3,048	2%	1,849	19	1%	39,315	771	2%					
Mining / Sand & Gravel	3,310	(1)	0%	77	0	0%	1,144	0	0%					
Construction	150,888	(114)	0%	2,488	(2)	0%	66,323	(50)	0%					
Food & Wood Processing	181,718	(4,674)	(3%)	1,138	11	1%	40,149	421	1%					
Other Manufacturing	370,088	(8)	0%	2,706	0	0%	102,174	(2)	0%					
Transportation	93,512	2,139	2%	915	19	2%	35,312	795	2%					
Public Utilities	30,344	(69)	0%	65	0	0%	4,704	(10)	0%					
Publishing & Communications	65,935	(5)	0%	541	0	0%	18,119	(1)	0%					
Trade	307,410	9	0%	5,665	0	0%	139,496	8	0%					
Finance / Insurance / Real Estate	307,929	13	0%	2,684	0	0%	73,721	7	0%					
Hospitality Services	109,774	(19)	0%	3,125	0	0%	38,318	(7)	0%					
Consumer Services	110,997	(4)	0%	2,356	(1)	0%	44,051	(13)	0%					
Business Services	141,076	(31)	0%	2,799	(1)	0%	65,648	(27)	0%					
Medical / Educational / Social Services	315,197	35	0%	6,574	1	0%	178,438	21	0%					
Federal Government	42,247	(1)	0%	450	0	0%	22,511	(1)	0%					
State & Local Government	306,873	(3,830)	(1%)	3,820	(49)	(1%)	164,023	(2,047)	(1%)					
<b>TOTAL</b>	<b>2,676,289</b>	<b>(3,514)</b>	<b>0%</b>	<b>37,253</b>	<b>(4)</b>	<b>0%</b>	<b>1,033,446</b>	<b>(135)</b>	<b>0%</b>					



JOSEPHINE COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	138,991	2,332	1,849	14	2%	1,849	14	1%	39,315	597	1%	39,315	597	2%
Mining / Sand & Gravel	3,310	(3)	77	0	0%	77	0	0%	1,144	(1)	0%	1,144	(1)	0%
Construction	150,888	(627)	2,488	(10)	0%	2,488	(10)	0%	66,323	(276)	0%	66,323	(276)	0%
Food & Wood Processing	181,718	(7,514)	1,138	(9)	(4%)	1,138	(9)	(1%)	40,149	(389)	(1%)	40,149	(389)	(1%)
Other Manufacturing	370,088	(72)	2,706	0	0%	2,706	0	0%	102,174	(23)	0%	102,174	(23)	0%
Transportation	93,512	2,353	915	20	3%	915	20	2%	35,312	875	2%	35,312	875	2%
Public Utilities	30,344	(245)	65	(1)	(1%)	65	(1)	(1%)	4,704	(37)	(1%)	4,704	(37)	(1%)
Publishing & Communications	65,935	(185)	541	(1)	0%	541	(1)	0%	18,119	(48)	0%	18,119	(48)	0%
Trade	307,410	(869)	5,665	(16)	0%	5,665	(16)	0%	139,496	(391)	0%	139,496	(391)	0%
Finance / Insurance / Real Estate	307,929	(928)	2,684	(8)	0%	2,684	(8)	0%	73,721	(192)	0%	73,721	(192)	0%
Hospitality Services	109,774	(413)	3,125	(11)	0%	3,125	(11)	0%	38,318	(143)	0%	38,318	(143)	0%
Consumer Services	110,997	(383)	2,356	(9)	0%	2,356	(9)	0%	44,051	(166)	0%	44,051	(166)	0%
Business Services	141,076	(402)	2,799	(8)	0%	2,799	(8)	0%	65,648	(195)	0%	65,648	(195)	0%
Medical / Educational / Social Services	315,197	(950)	6,574	(20)	0%	6,574	(20)	0%	178,438	(539)	0%	178,438	(539)	0%
Federal Government	42,247	(6)	450	0	0%	450	0	0%	22,511	(5)	0%	22,511	(5)	0%
State & Local Government	306,873	(11,718)	3,820	(149)	(4%)	3,820	(149)	(4%)	164,023	(6,263)	(4%)	164,023	(6,263)	(4%)
<b>TOTAL</b>	<b>2,676,289</b>	<b>(19,631)</b>	<b>37,253</b>	<b>(208)</b>	<b>(1%)</b>	<b>37,253</b>	<b>(208)</b>	<b>(1%)</b>	<b>1,033,446</b>	<b>(7,195)</b>	<b>(1%)</b>	<b>1,033,446</b>	<b>(7,195)</b>	<b>(1%)</b>





JOSEPHINE COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	138,991	2,526			2%		1,849	15	1%		39,315	646	2%	
Mining / Sand & Gravel	3,310	(2)			0%		77	(0)	0%		1,144	(1)	0%	
Construction	150,888	(405)			0%		2,488	(7)	0%		66,323	(178)	0%	
Food/ Wood Processing	181,718	(4,524)			(2%)		1,138	(9)	(1%)		40,149	(378)	(1%)	
Other Manufacturing	370,088	(44)			0%		2,706	(0)	0%		102,174	(14)	0%	
Transportation	93,512	1,973			2%		915	17	2%		35,312	734	2%	
Public Utilities	30,344	(155)			(1%)		65	(0)	(1%)		4,704	(24)	(1%)	
Publishing & Communications	65,935	(115)			0%		541	(1)	0%		18,119	(30)	0%	
Trade	307,410	(510)			0%		5,665	(9)	0%		139,496	(230)	0%	
Finance / Insurance / Real Estate	307,929	(559)			0%		2,684	(5)	0%		73,721	(114)	0%	
Hospitality Services	109,774	(257)			0%		3,125	(7)	0%		38,318	(89)	0%	
Consumer Services	110,997	(226)			0%		2,356	(5)	0%		44,051	(100)	0%	
Business Services	141,076	(233)			0%		2,799	(5)	0%		65,648	(115)	0%	
Medical/ Educational / Social Services	315,197	(586)			0%		6,574	(12)	0%		178,438	(332)	0%	
Federal Government	42,247	(4)			0%		450	(0)	0%		22,511	(3)	0%	
State & Local Government	306,873	(8,195)			(3%)		3,820	(104)	(3%)		164,023	(4,380)	(3%)	
<b>TOTAL</b>	<b>2,676,289</b>	<b>(11,318)</b>			<b>0%</b>		<b>37,253</b>	<b>(132)</b>	<b>0%</b>		<b>1,033,446</b>	<b>(4,609)</b>	<b>0%</b>	



KLAMATH COUNTY	Industry		Industry		Change	Employment	Employment		Earnings	Earnings	
	Output	Change	Change	Change			Change	Change		\$ Thousands	Change
<b>Current Conditions</b>	<b>\$ Thousands</b>		<b>\$ Thousands</b>								
<b>Agriculture &amp; Ag Services</b>	175,521	3,071	2%	2,773	23	1%	49,958	885	2%		
<b>Mining / Sand &amp; Gravel</b>	1,430	10	1%	17	0	1%	554	3	1%		
<b>Construction</b>	110,042	1,078	1%	1,645	16	1%	48,369	474	1%		
<b>Food &amp; Wood Processing</b>	424,423	19,839	5%	1,873	86	5%	75,788	3,838	5%		
<b>Other Manufacturing</b>	164,351	420	0%	1,096	4	1%	42,981	115	0%		
<b>Transportation</b>	128,107	2,086	2%	920	15	2%	48,385	790	2%		
<b>Public Utilities</b>	58,103	1,190	2%	113	2	2%	8,641	176	2%		
<b>Communications</b>	36,508	112	0%	354	1	0%	10,243	37	0%		
<b>Trade</b>	242,877	1,269	1%	4,561	22	0%	108,414	555	1%		
<b>Finance / Insurance / Real Estate</b>	214,503	386	0%	1,981	3	0%	50,365	78	0%		
<b>Hospitality Services</b>	131,463	1,237	1%	2,943	28	1%	45,609	428	1%		
<b>Consumer Services</b>	93,973	864	1%	1,617	17	1%	34,810	370	1%		
<b>Business Services</b>	177,362	1,330	1%	3,205	25	1%	93,532	704	1%		
<b>Other Services</b>	275,595	1,779	1%	5,655	37	1%	153,706	991	1%		
<b>Federal Government</b>	129,695	777	1%	1,086	7	1%	62,739	399	1%		
<b>State &amp; Local Government</b>	355,861	22,327	6%	4,340	284	7%	190,208	11,934	6%		
<b>TOTAL</b>	<b>2,719,816</b>	<b>57,775</b>	<b>2%</b>	<b>34,179</b>	<b>571</b>	<b>2%</b>	<b>1,024,239</b>	<b>21,777</b>	<b>2%</b>		



KLAMATH COUNTY	Industry		Industry Change	Percent Change	Employment	Employment Change	Percent Change	Earnings		Percent Change
	Output	\$ Thousands						Earnings	\$ Thousands	
No Action Alternative										
Agriculture & Ag Services	175,521	1,720	1%	2,773	12	0%	49,958	493	1%	
Mining / Sand & Gravel	1,430	(6)	0%	17	0	0%	554	(2)	0%	
Construction	110,042	(563)	(1%)	1,645	(8)	(1%)	48,369	(247)	(1%)	
Food & Wood Processing	424,423	8,557	2%	1,873	34	2%	75,788	1,527	2%	
Other Manufacturing	164,351	(124)	0%	1,096	0	0%	42,918	(32)	0%	
Transportation	128,107	403	0%	920	3	0%	48,385	151	0%	
Public Utilities	58,103	(219)	0%	113	0	0%	8,641	(33)	0%	
Communications	36,508	(50)	0%	354	(1)	0%	10,243	(16)	0%	
Trade	242,877	(349)	0%	4,561	(7)	0%	108,414	(160)	0%	
Finance/ Insurance/ Real Estate	214,503	(162)	0%	1,981	(1)	0%	50,365	(32)	0%	
Hospitality Services	131,463	(530)	0%	2,943	(12)	0%	45,609	(183)	0%	
Consumer Services	93,973	(291)	0%	1,617	(6)	0%	34,810	(118)	0%	
Business Services	177,362	(217)	0%	3,205	.	0%	93,532	(103)	0%	
Other Services	275,595	(784)	0%	5,655	(16)	0%	153,706	(437)	0%	
Federal Government	129,695	620	0%	1,086	5	0%	62,739	258	0%	
State & Local Government	355,861	(19,787)	(6%)	4,340	(252)	(6%)	190,208	(10,576)	(6%)	
<b>TOTAL</b>	<b>2,719,816</b>	<b>(11,783)</b>	<b>0%</b>	<b>34,179</b>	<b>(251)</b>	<b>(1%)</b>	<b>1,024,239</b>	<b>(9,510)</b>	<b>(1%)</b>	



KLAMATH COUNTY Alternative 1	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Earnings	Change	Change
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	175,521	1,313	1%	2,773	9	0%	49,958	374	1%					
Mining / Sand & Gravel	1,430	(6)	0%	17	0	0%	554	(2)	0%					
Construction	110,042	(601)	(1%)	1,645	(9)	(1%)	48,369	(264)	(1%)					
Food & Wood Processing	424,423	3,026	1%	1,873	9	1%	75,788	416	1%					
Other Manufacturing	164,351	(162)	0%	1,096	2	0%	42,918	(43)	0%					
Transportation	128,107	250	0%	920	2	0%	48,385	91	0%					
Public Utilities	58,103	(376)	(1%)	113	(1)	(1%)	8,641	(56)	(1%)					
Communications	36,508	(56)	0%	354	(1)	0%	10,243	(18)	0%					
Trade	242,877	(457)	0%	4,561	(9)	0%	108,414	(206)	0%					
Finance/ Insurance/ Real Estate	214,503	(183)	0%	1,981	(2)	0%	50,365	(36)	0%					
Hospitality Services	131,463	(599)	0%	2,943	(13)	0%	45,609	(207)	0%					
Consumer Services	93,973	(358)	0%	1,617	(7)	0%	34,810	(149)	0%					
Business Services	177,362	(357)	0%	3,205	.	0%	93,532	(178)	0%					
Other Services	275,595	(874)	0%	5,655	(18)	0%	153,706	(487)	0%					
Federal Government	129,695	1,095	1%	1,086	8	1%	62,739	472	1%					
State & Local Government	355,861	(19,323)	(5%)	4,340	(246)	(6%)	190,208	(10,328)	(5%)					
<b>TOTAL</b>	<b>2,719,816</b>	<b>(17,669)</b>	<b>(1%)</b>	<b>34,179</b>	<b>(278)</b>	<b>(1%)</b>	<b>1,024,239</b>	<b>(10,621)</b>	<b>(1%)</b>					

KLAMATH COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands						Employment				\$ Thousands			
Agriculture & Ag Services	175,521		1,933		1%	2,773	14		1%	49,958	553		1%	
Mining / Sand & Gravel	1,430		(6)		0%	17	0		0%	554	(2)		0%	
Construction	110,042		(523)		0%	1,645	(8)		0%	48,369	(230)		0%	
Food & Wood Processing	424,423		6,408		2%	1,873	20		1%	75,788	879		1%	
Other Manufacturing	164,351		(130)		0%	1,096	0		0%	42,918	(33)		0%	
Transportation	128,107		407		0%	920	3		0%	48,385	152		0%	
Public Utilities	58,103		(287)		0%	113	(1)		(1%)	8,641	(43)		0%	
Communications	36,508		(47)		0%	354	(1)		0%	10,243	(15)		0%	
Trade	242,877		(328)		0%	4,561	(7)		0%	108,414	(150)		0%	
Finance/ Insurance/ Real Estate	214,503		(152)		0%	1,981	(1)		0%	50,365	(30)		0%	
Hospitality Services	131,463		(501)		0%	2,943	(11)		0%	45,609	(173)		0%	
Consumer Services	93,973		(283)		0%	1,617	(6)		0%	34,810	(116)		0%	
Business Services	177,362		(209)		0%	3,205	.		0%	93,532	(97)		0%	
Other Services	275,595		(737)		0%	5,655	(15)		0%	153,706	(411)		0%	
Federal Government	129,695		1,129		1%	1,086	9		1%	62,739	491		1%	
State & Local Government	355,861		(18,199)		(5%)	4,340	(232)		(5%)	190,208	(9,727)		(5%)	
<b>TOTAL</b>	<b>2,719,816</b>		<b>(11,524)</b>		<b>0%</b>	<b>34,179</b>	<b>(237)</b>		<b>(1%)</b>	<b>1,024,239</b>	<b>(8,953)</b>		<b>(1%)</b>	





KLAMATH COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	175,521		2,260		1%	16		1%	49,958		646		1%	
Mining / Sand & Gravel	1,430		(6)		0%	0		0%	554		(2)		0%	
Construction	110,042		(570)		(1%)	(9)		(1%)	48,369		(250)		(1%)	
Food & Wood Processing	424,423		6,314		2%	20		1%	75,788		871		1%	
Other Manufacturing	164,351		(141)		0%	(1)		0%	42,918		(37)		0%	
Transportation	128,107		577		0%	5		0%	48,385		215		0%	
Public Utilities	58,103		(320)		(1%)	(1)		(1%)	8,641		(48)		(1%)	
Publishing & Communications	36,508		(51)		0%	(1)		0%	10,243		(17)		0%	
Trade	242,877		(363)		0%	(7)		0%	108,414		(166)		0%	
Finance/ Insurance/ Real Estate	214,503		(166)		0%	(1)		0%	50,365		(32)		0%	
Hospitality Services	131,463		(547)		0%	(12)		0%	45,609		(189)		0%	
Consumer Services	93,973		(309)		0%	(6)		0%	34,810		(127)		0%	
Business Services	177,362		(238)		0%	.		0%	93,532		(2)		0%	
Medical / Educational / Social Services	275,595		(803)		0%	(17)		0%	153,706		(447)		0%	
Federal Government	129,695		1,064		1%	8		1%	62,739		459		1%	
State & Local Government	355,861		(19,670)		(6%)	(250)		(6%)	190,208		(10,514)		(6%)	
<b>TOTAL</b>	<b>2,719,816</b>		<b>(12,969)</b>		<b>0%</b>	<b>(257)</b>		<b>(1%)</b>	<b>1,024,239</b>		<b>(9,750)</b>		<b>(1%)</b>	

KLAMATH COUNTY PRMP	Industry Output		Industry Change		Percent Change		Employment		Employment Change		Percent Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands										\$ Thousands					
Agriculture & Ag Services	175,521		10,240		6%	2,773		75		3%	49,958		2,929		6%			
Mining / Sand & Gravel	1,430		(8)		(1%)	17		0		0%	554		(3)		0%			
Construction	110,042		(705)		(1%)	1,645		(11)		(1%)	48,369		(310)		(1%)			
Food & Wood Processing	424,423		23,172		5%	1,874		71		4%	75,789		3,220		4%			
Other Manufacturing	164,351		(75)		0%	1,096		0		0%	42,918		(14)		0%			
Transportation	128,107		5,290		4%	920		42		5%	48,385		1,977		4%			
Public Utilities	58,103		(174)		0%	113		0		0%	8,641		(26)		0%			
Communications	36,508		(54)		0%	354		(1)		0%	10,243		(17)		0%			
Trade	242,877		(90)		0%	4,561		(4)		0%	108,414		(59)		0%			
Finance/Insurance/ Real Estate	214,503		(160)		0%	1,981		(1)		0%	50,365		(30)		0%			
Hospitality Services	131,463		(596)		0%	2,943		(13)		0%	45,609		(207)		0%			
Consumer Services	93,973		(176)		0%	1,617		(4)		0%	34,810		(66)		0%			
Business Services	177,362		122		0%	3,205		1		0%	93,532		85		0%			
Medical / Educational / Social Services	275,595		(922)		0%	5,655		(19)		0%	153,706		(514)		0%			
Federal Government	129,695		(18,158)		(14%)	1,086		(145)		(13%)	62,739		(8,298)		(13%)			
State & Local Government	355,861		(18,936)		(5%)	4,340		(241)		(6%)	190,208		(10,121)		(5%)			
<b>TOTAL</b>	<b>2,719,816</b>		<b>(1,231)</b>		<b>0%</b>	<b>34,179</b>		<b>(251)</b>		<b>(1%)</b>	<b>1,024,239</b>		<b>(11,453)</b>		<b>(1%)</b>			





LANE COUNTY	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Change		%		\$ Thousands		%	
<b>Agriculture &amp; Ag Services</b>	834,424	14,768	2%	6,941	82	1%	195,965	3,592	2%					2%
Mining / Sand & Gravel	0	0	0%	0	0	0%	0	0	0%			0	0	0%
Construction	941,497	1,517	0%	10,468	17	0%	413,835	667	0%					0%
Food & Wood Processing	2,007,826	33,389	2%	8,759	129	1%	367,743	5,624	2%					2%
Other Manufacturing	622,597	982	0%	10,128	12	0%	456,752	516	0%					0%
Transportation	325,204	2,130	1%	3,472	22	1%	130,441	806	1%					1%
Public Utilities	66,639	607	1%	153	1	1%	10,669	97	1%					1%
Communications	649,423	1,028	0%	4,602	7	0%	199,537	297	0%					0%
Trade	1,795,971	3,964	0%	28,784	68	0%	790,195	1,772	0%					0%
Finance/ Insurance/ Real Estate	1,564,405	1,872	0%	12,682	14	0%	360,423	374	0%					0%
Hospitality Services	646,967	1,464	0%	16,882	47	0%	228,229	594	0%					0%
Consumer Services	587,412	4,538	1%	11,014	102	1%	250,526	2,135	1%					1%
Business Services	982,972	6,360	1%	17,937	135	1%	531,420	3,468	1%					1%
Medical / Educational / Social Services	2,215,558	8,957	0%	35,067	194	1%	1,232,364	4,266	1%					0%
Federal Government	287,803	3,929	1%	2,836	37	1%	154,688	1,830	1%					1%
State & Local Government	761,833	96,307	13%	9,200	1,120	12%	407,200	51,476	13%					13%
<b>TOTAL</b>	<b>15,445,518</b>	<b>182,729</b>	<b>1%</b>	<b>178,924</b>	<b>1,987</b>	<b>1%</b>	<b>5,729,986</b>	<b>77,513</b>	<b>1%</b>					<b>1%</b>





LANE COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Employment	Change	Change	Change	Earnings	Change	Earnings	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	834,424	10,179	834,424	10,179	1%	6,941	46	1%	195,965	2,439	1%	195,965	2,439	1%
Mining / Sand & Gravel	0	0	0	0	0%	0	0	0%	0	0	0%	0	0	0%
Construction	941,497	(658)	941,497	(658)	0%	10,468	(7)	0%	413,835	(289)	0%	413,835	(289)	0%
Food & Wood Processing	2,007,826	10,330	2,007,826	10,330	1%	8,759	30	0%	367,743	1,941	0%	367,743	1,941	1%
Other Manufacturing	1,777,584	80	1,777,584	80	0%	10,128	(1)	0%	456,752	(13)	0%	456,752	(13)	0%
Transportation	325,204	3,177	325,204	3,177	1%	3,472	31	1%	130,441	1,178	1%	130,441	1,178	1%
Public Utilities	66,639	(110)	66,639	(110)	0%	153	0	0%	10,669	(17)	0%	10,669	(17)	0%
Communications	649,423	(396)	649,423	(396)	0%	4,602	(3)	0%	199,537	(110)	0%	199,537	(110)	0%
Trade	1,795,971	(1,050)	1,795,971	(1,050)	0%	28,784	(19)	0%	790,195	(479)	0%	790,195	(479)	0%
Finance / Insurance / Real Estate	1,564,405	(629)	1,564,405	(629)	0%	12,682	(5)	0%	360,423	(125)	0%	360,423	(125)	0%
Hospitality Services	646,967	(543)	646,967	(543)	0%	16,882	(18)	0%	228,229	(219)	0%	228,229	(219)	0%
Consumer Services	587,412	(1,230)	587,412	(1,230)	0%	11,014	(29)	0%	250,526	(602)	0%	250,526	(602)	0%
Business Services	982,972	(1,622)	982,972	(1,622)	0%	17,937	(40)	0%	531,420	(893)	0%	531,420	(893)	0%
Medical / Educational / Social Services	2,215,558	(2,869)	2,215,558	(2,869)	0%	35,067	(59)	0%	1,232,364	(1,385)	0%	1,232,364	(1,385)	0%
Federal Government	287,803	(1,180)	287,803	(1,180)	0%	2,836	(11)	0%	154,688	(555)	0%	154,688	(555)	0%
State & Local Government	761,833	(60,750)	761,833	(60,750)	(8%)	9,200	(681)	(7%)	407,200	(32,471)	(8%)	407,200	(32,471)	(8%)
<b>TOTAL</b>	<b>15,445,518</b>	<b>(47,430)</b>	<b>15,445,518</b>	<b>(47,430)</b>	<b>0%</b>	<b>178,924</b>	<b>(766)</b>	<b>0%</b>	<b>5,729,986</b>	<b>(31,601)</b>	<b>0%</b>	<b>5,729,986</b>	<b>(31,601)</b>	<b>(1%)</b>



LANE COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands		%		Change		%		\$ Thousands		%	
Agriculture & Ag Services	834,424	31,503	4%	6,941	155	2%	195,965	7,607	4%					
Mining / Sand & Gravel	0	0	0%	0	0	0%	0	0	0%					
Construction	941,497	(29)	0%	10,468	0	0%	413,835	(13)	0%					
Food & Wood Processing	2,007,826	53,687	3%	8,759	192	2%	367,743	9,156	2%					
Other Manufacturing	1,777,584	1,250	0%	10,128	8	0%	456,752	354	0%					
Transportation	325,204	6,391	2%	3,472	62	2%	130,441	2,382	2%					
Public Utilities	66,639	260	0%	153	1	0%	10,669	44	0%					
Communications	649,423	65	0%	4,602	1	0%	199,537	26	0%					
Trade	1,795,971	1,262	0%	28,784	18	0%	790,195	539	0%					
Finance / Insurance / Real Estate	1,564,405	296	0%	12,682	2	0%	360,423	62	0%					
Hospitality Services	646,967	148	0%	16,882	4	0%	228,229	61	0%					
Consumer Services	587,412	1,287	0%	11,014	28	0%	250,526	576	0%					
Business Services	982,972	1,929	0%	17,937	31	0%	531,420	1,048	0%					
Medical / Educational / Social Services	2,215,558	1,492	0%	35,067	36	0%	1,232,364	684	0%					
Federal Government	287,803	920	0%	2,836	8	0%	154,688	417	0%					
State & Local Government	761,833	(35,003)	(5%)	9,200	(362)	(4%)	407,200	(18,709)	(5%)					
<b>TOTAL</b>	<b>15,445,518</b>	<b>65,456</b>	<b>0%</b>	<b>178,924</b>	<b>184</b>	<b>0%</b>	<b>5,729,986</b>	<b>4,234</b>	<b>0%</b>					

LANE COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	834,424	54,125	6%	6,941	271	4%	195,965	13,057	7%					
Mining / Sand & Gravel	0	0	0%	0	0	0%	0	0	0%					
Construction	941,497	670	0%	10,468	7	0%	413,835	295	0%					
Food & Wood Processing	2,007,826	110,589	6%	8,759	406	5%	367,743	18,640	5%					
Other Manufacturing	1,777,584	2,757	0%	10,128	17	0%	456,752	767	0%					
Transportation	325,204	8,020	2%	3,472	79	2%	130,441	2,997	2%					
Public Utilities	66,639	708	1%	153	2	1%	10,669	116	1%					
Communications	649,423	571	0%	4,602	4	0%	199,537	176	0%					
Trade	1,795,971	3,886	0%	28,784	59	0%	790,195	1,691	0%					
Finance / Insurance/ Real Estate	1,564,405	1,311	0%	12,682	10	0%	360,423	268	0%					
Hospitality Services	646,967	920	0%	16,882	29	0%	228,229	375	0%					
Consumer Services	587,412	4,154	1%	11,014	93	1%	250,526	1,925	1%					
Business Services	982,972	5,873	1%	17,937	112	1%	531,420	3,208	1%					
Medical / Educational / Social Services	2,215,558	6,178	0%	35,067	137	0%	1,232,364	2,915	0%					
Federal Government	287,803	3,257	1%	2,836	30	1%	154,688	1,500	1%					
State & Local Government	761,833	(5,114)	(1%)	9,200	6	0%	407,200	(2,733)	(1%)					
<b>TOTAL</b>	<b>15,445,518</b>	<b>197,906</b>	<b>1%</b>	<b>178,924</b>	<b>1,261</b>	<b>1%</b>	<b>5,729,986</b>	<b>45,197</b>	<b>1%</b>					





LANE COUNTY Alternative 3	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands		%		Change		%		\$ Thousands		%	
<b>Agriculture &amp; Ag Services</b>	834,424		28,047		3%	6,941	136	2%	195,965	6,757	3%			
<b>Mining / Sand &amp; Gravel</b>	-		-		0%	-	-	0%	-	-	0%			
<b>Construction</b>	941,497		(264)		0%	10,468	(3)	0%	413,835	(116)	0%			
<b>Food &amp; Wood Processing</b>	2,007,826		47,740		2%	8,759	167	2%	367,743	8,076	2%			
<b>Other Manufacturing</b>	622,597		556		0%	10,128	5	0%	456,752	241	0%			
<b>Transportation</b>	325,204		5,406		2%	3,472	53	2%	130,441	2,013	2%			
<b>Public Utilities</b>	66,639		159		0%	153	0	0%	10,669	27	0%			
<b>Communications</b>	649,423		(103)		0%	4,602	(1)	0%	199,537	(23)	0%			
<b>Trade</b>	1,795,971		580		0%	28,784	6	0%	790,195	234	0%			
<b>Finance/ Insurance/ Real Estate</b>	1,564,405		(24)		0%	12,682	(0)	0%	360,423	(1)	0%			
<b>Hospitality Services</b>	646,967		(91)		0%	16,882	(3)	0%	228,229	(36)	0%			
<b>Consumer Services</b>	587,412		532		0%	11,014	11	0%	250,526	224	0%			
<b>Business Services</b>	982,972		712		0%	17,937	7	0%	531,420	381	0%			
<b>Medical / Educational / Social Services</b>	2,215,558		(197)		0%	35,067	(2)	0%	1,232,364	(110)	0%			
<b>Federal Government</b>	287,803		250		0%	2,836	2	0%	154,688	106	0%			
<b>State &amp; Local Government</b>	761,833		(45,676)		(6%)	9,200	(491)	(5%)	407,200	(24,414)	(6%)			
<b>TOTAL</b>	<b>15,445,518</b>		<b>37,918</b>		<b>0%</b>	<b>178,924</b>	<b>(113)</b>	<b>0%</b>	<b>5,729,986</b>	<b>(6,641)</b>	<b>0%</b>			



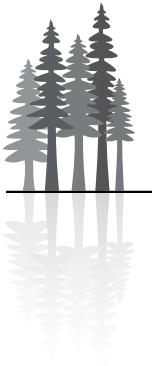
LANE COUNTY PRMP	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Change		%		\$ Thousands		%	
Agriculture & Ag Services	834,424	44,432	4.60%	6,941	219	2.70%	195,965	10,435	4.80%					
Mining / Sand & Gravel	0	0	0.00%	-	-	0.00%	0	0	0.00%					
Construction	941,497	299	0.00%	10,468	3	0.00%	413,835	131	0.00%					
Food & Wood Processing	2,007,826	71,913	2.80%	8,759	273	2.40%	367,743	13,171	2.70%					
Other Manufacturing	622,597	1,953	0.20%	10,128	117	0.20%	456,752	1,433	0.20%					
Electronics	274,965	349	0.10%	1,189	1	0.10%	66,610	85	0.10%					
Manufacturing: Other	880,022	448	0.00%	5,358	3	0.10%	227,748	116	0.10%					
Transportation	325,204	10,606	3.20%	3,472	103	2.90%	130,441	4,254	3.00%					
Public Utilities	66,639	450	0.50%	153	1	0.60%	10,669	72	0.60%					
Communications	649,423	310	0.00%	4,602	3	0.00%	199,537	95	0.00%					
Trade	1,795,971	2,517	0.10%	28,784	38	0.10%	790,195	1,107	0.10%					
Finance / Insurance / Real Estate	1,564,405	797	0.00%	12,682	6	0.00%	360,423	184	0.00%					
Hospitality Services	646,967	1,383	0.20%	16,882	36	0.20%	228,229	488	0.20%					
Consumer Services	587,412	1,668	0.20%	11,014	32	0.20%	250,526	711	0.20%					
Business Services	982,972	3,829	0.30%	17,937	60	0.30%	531,420	2,070	0.30%					
Other Services	2,215,558	3,991	0.10%	41,067	70	0.10%	1,232,364	2,220	0.10%					
Federal Government	287,803	20,169	7.00%	2,836	186	6.60%	154,688	10,840	5.90%					
State & Local Government	761,833	(39,845)	(5.20%)	9,200	(507)	(5.50%)	407,200	(21,297)	(5.20%)					
<b>TOTAL</b>	<b>15,445,518</b>	<b>124,471</b>	<b>0.60%</b>	<b>178,924</b>	<b>535</b>	<b>0.20%</b>	<b>5,729,986</b>	<b>46,176</b>	<b>0.30%</b>					



LINCOLN COUNTY Current Conditions	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Change		%		\$ Thousands		%	
Agriculture & Ag Services	168,707		137		0%	1,244	1	0%	52,589	34	0%			
Mining / Sand & Gravel	3,436		8		0%	71	0	0%	1,434	3	0%			
Construction	130,527		534		0%	1,440	6	0%	57,373	235	0%			
Food & Wood Processing	412,045		630		0%	845	1	0%	32,291	41	0%			
Other Manufacturing	42,744		94		0%	338	0	0%	12,825	26	0%			
Transportation	21,285		41		0%	314	1	0%	8,282	16	0%			
Public Utilities	18,353		67		0%	34	0	0%	2,979	11	0%			
Communications	36,153		38		0%	305	0	0%	9,277	10	0%			
Trade	182,462		212		0%	4,001	5	0%	84,033	97	0%			
Financial / Insurance / Real Estate	92,560		112		0%	728	1	0%	23,306	27	0%			
Hospitality Services	229,983		194		0%	4,798	4	0%	81,631	65	0%			
Consumer Services	44,043		134		0%	603	2	0%	17,750	59	0%			
Business Services	54,671		178		0%	910	3	0%	27,374	92	0%			
Other Services	137,255		336		0%	2,230	6	0%	75,843	185	0%			
Federal Government	26,815		23		0%	319	0	0%	14,072	18	0%			
State & Local Government	196,557		6,181		3%	3,380	112	3%	105,060	3,304	3%			
<b>TOTAL</b>	<b>1,797,597</b>		<b>8,919</b>		<b>0%</b>	<b>21,560</b>	<b>143</b>	<b>1%</b>	<b>606,118</b>	<b>4,223</b>	<b>1%</b>			



LINCOLN COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
No Action Alternative	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	168,707	1,348	1,348	1%	1,244	4	1,244	0%	52,589	277	52,589	277	1%	
Mining / Sand & Gravel	3,436	(3)	(3)	0%	71	(0)	71	0%	1,434	(1)	1,434	(1)	0%	
Construction	130,527	(413)	(413)	0%	1,440	(5)	1,440	0%	57,373	(181)	57,373	(181)	0%	
Food & Wood Processing	412,045	2,021	2,021	1%	845	6	845	1%	32,291	210	32,291	210	1%	
Other Manufacturing	42,744	(54)	(54)	0%	338	(0)	338	0%	6,932	(9)	6,932	(9)	0%	
Transportation	21,285	(8)	(8)	0%	314	(0)	314	0%	8,282	(4)	8,282	(4)	0%	
Public Utilities	18,353	(31)	(31)	0%	34	(0)	34	0%	2,979	(5)	2,979	(5)	0%	
Communications	36,153	(27)	(27)	0%	305	(0)	305	0%	9,277	(7)	9,277	(7)	0%	
Trade	182,462	(122)	(122)	0%	4,001	(3)	4,001	0%	84,033	(57)	84,033	(57)	0%	
Finance / Insurance / Real Estate	92,560	(70)	(70)	0%	728	(1)	728	0%	23,306	(17)	23,306	(17)	0%	
Hospitality Services	229,983	(130)	(130)	0%	4,798	(3)	4,798	0%	81,631	(43)	81,631	(43)	0%	
Consumer Services	44,043	(82)	(82)	0%	603	(1)	603	0%	17,750	(36)	17,750	(36)	0%	
Business Services	54,671	(111)	(111)	0%	910	(2)	910	0%	27,374	(59)	27,374	(59)	0%	
Other Services	137,255	(230)	(230)	0%	2,230	(4)	2,230	0%	75,843	(127)	75,843	(127)	0%	
Federal Government	26,815	(18)	(18)	0%	319	(0)	319	0%	14,072	(15)	14,072	(15)	0%	
State & Local Government	196,557	(5,865)	(5,865)	(3%)	3,380	(106)	3,380	(3%)	105,060	(3,135)	105,060	(3,135)	(3%)	
<b>TOTAL</b>	<b>1,797,597</b>	<b>(3,794)</b>	<b>(3,794)</b>	<b>0%</b>	<b>21,560</b>	<b>(115)</b>	<b>21,560</b>	<b>(1%)</b>	<b>606,118</b>	<b>(3,212)</b>	<b>606,118</b>	<b>(3,212)</b>	<b>(1%)</b>	



LINCOLN COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands								\$ Thousands			
<b>Agriculture &amp; Ag Services</b>	168,707		1,948		1%	1,244	6	1%	52,589	402	1%			
<b>Mining / Sand &amp; Gravel</b>	3,436	(0)			0%	71	0	0%	1,434	0	0%			
<b>Construction</b>	130,527	(353)			0%	1,440	(4)	0%	57,373	(155)	0%			
<b>Food &amp; Wood Processing</b>	412,045	3,422			1%	845	10	1%	32,291	345	1%			
<b>Other Manufacturing</b>	42,744	(34)			0%	338	(0)	0%	12,825	(7)	0%			
<b>Transportation</b>	21,285	9			0%	314	0	0%	8,282	3	0%			
<b>Public Utilities</b>	18,353	(13)			0%	34	(0)	0%	2,979	(2)	0%			
<b>Communications</b>	36,153	(21)			0%	305	(0)	0%	9,277	(5)	0%			
<b>Trade</b>	182,462	(79)			0%	4,001	(2)	0%	84,033	(37)	0%			
<b>Finance / Insurance / Real Estate</b>	92,560	(50)			0%	728	(0)	0%	23,306	(12)	0%			
<b>Hospitality Services</b>	229,983	(99)			0%	4,798	(2)	0%	81,631	(33)	0%			
<b>Consumer Services</b>	44,043	(57)			0%	603	(1)	0%	17,750	(25)	0%			
<b>Business Services</b>	54,671	(77)			0%	910	(2)	0%	27,374	(42)	0%			
<b>Other Services</b>	137,255	(180)			0%	2,230	(3)	0%	75,843	(99)	0%			
<b>Federal Government</b>	26,815	(16)			0%	319	(0)	0%	14,072	(13)	0%			
<b>State &amp; Local Government</b>	196,557	(5,689)			(3%)	3,380	(103)	(3%)	105,060	(3,041)	(3%)			
<b>TOTAL</b>	<b>1,797,597</b>	<b>(1,289)</b>			<b>0%</b>	<b>21,560</b>	<b>(102)</b>	<b>0%</b>	<b>606,118</b>	<b>(2,722)</b>	<b>0%</b>			



LINCOLN COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
<b>Agriculture &amp; Ag Services</b>	168,707	2,438	1%	1,244	8	1%	52,589	505	1%					1%
<b>Mining / Sand &amp; Gravel</b>	3,436	3	0%	71	0	0%	1,434	1	0%					0%
<b>Construction</b>	130,527	(301)	0%	1,440	(3)	0%	57,373	(132)	0%					0%
<b>Food &amp; Wood Processing</b>	412,045	4,359	1%	845	11	1%	32,291	410	1%					2%
<b>Other Manufacturing</b>	42,744	(17)	0%	338	0	0%	12,825	(1)	0%					0%
<b>Transportation</b>	21,285	21	0%	314	0	0%	8,282	7	0%					0%
<b>Public Utilities</b>	18,353	4	0%	34	0	0%	2,979	1	0%					0%
<b>Communications</b>	36,153	(17)	0%	305	(0)	0%	9,277	(4)	0%					0%
<b>Trade</b>	182,462	(45)	0%	4,001	(1)	0%	84,033	(23)	0%					0%
<b>Finance / Insurance / Real Estate</b>	92,560	(34)	0%	728	(0)	0%	23,306	(8)	0%					0%
<b>Hospitality Services</b>	229,983	(76)	0%	4,798	(2)	0%	81,631	(25)	0%					0%
<b>Consumer Services</b>	44,043	(35)	0%	603	(1)	0%	17,750	(16)	0%					0%
<b>Business Services</b>	54,671	(48)	0%	910	(1)	0%	27,374	(28)	0%					0%
<b>Other Services</b>	137,255	(141)	0%	2,230	(2)	0%	75,843	(78)	0%					0%
<b>Federal Government</b>	26,815	(14)	0%	319	(0)	0%	14,072	(11)	0%					0%
<b>State &amp; Local Government</b>	196,557	(5,484)	(3%)	3,380	(99)	(3%)	105,060	(2,931)	(3%)					(3%)
<b>TOTAL</b>	<b>1,797,597</b>	<b>612</b>	<b>0%</b>	<b>21,560</b>	<b>(91)</b>	<b>0%</b>	<b>606,118</b>	<b>(2,334)</b>	<b>0%</b>					<b>0%</b>





LINCOLN COUNTY Alternative 3	Industry Output		Industry Change		Employment		Earnings		Percent Change	
	\$ Thousands		Thousands		Change		Change		Change	
Agriculture & Ag Services	168,707	2,309	1%	1,244	7	52,589	478	1%	1%	
Mining / Sand & Gravel	3,436	(1)	0%	71	(0)	1,434	(0)	0%	0%	
Construction	130,527	(363)	0%	1,440	(4)	57,373	(159)	0%	0%	
Food & Wood Processing	412,045	2,753	1%	845	8	32,291	270	1%	1%	
Other Manufacturing	42,744	(39)	0%	338	(0)	12,825	(8)	0%	0%	
Transportation	21,285	2	0%	314	(0)	8,282	0	0%	0%	
Public Utilities	18,353	(17)	0%	34	(0)	2,979	(3)	0%	0%	
Communications	36,153	(22)	0%	305	(0)	9,277	(6)	0%	0%	
Trade	182,462	(84)	0%	4,001	(2)	84,033	(40)	0%	0%	
Finance / Insurance / Real Estates	92,560	(52)	0%	728	(0)	23,306	(12)	0%	0%	
Hospitality Services	229,983	(102)	0%	4,798	(2)	81,631	(34)	0%	0%	
Consumer Services	44,043	(62)	0%	603	(1)	17,750	(28)	0%	0%	
Business Services	54,671	(85)	0%	910	(2)	27,374	(46)	0%	0%	
Other Services	137,255	(182)	0%	2,230	(3)	75,843	(100)	0%	0%	
Federal Government	26,815	(16)	0%	319	(0)	14,072	(13)	0%	0%	
State & Local Government	196,557	(5,769)	(3%)	3,380	(105)	105,060	(3,083)	(3%)	(3%)	
<b>TOTAL</b>	<b>1,797,597</b>	<b>(1,728)</b>	<b>0%</b>	<b>21,560</b>	<b>(105)</b>	<b>606,118</b>	<b>(2,784)</b>	<b>0%</b>	<b>0%</b>	



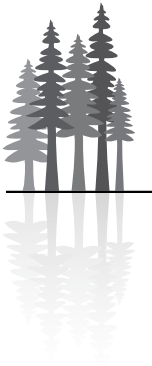
LINCOLN COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Employment	Change	Change	Change	Earnings	Change	Earnings	Change	
PRMP	\$ Thousands										\$ Thousands			
Agriculture & Ag Services	168,707	2,198			1%	1,244	7	1%	52,589	456	1%	52,589	456	1%
Mining / Sand & Gravel	3,436	4			0%	71	0	0%	1,434	2	0%	1,434	2	0%
Construction	130,527	(345)			0%	1,440	(4)	0%	57,373	(152)	0%	57,373	(152)	0%
Food/ Wood Processing	412,045	2,907			1%	845	5	1%	32,291	191	1%	32,291	191	1%
Other Manufacturing	42,744	(29)			0%	338	0	0%	12,825	(6)	0%	12,825	(6)	0%
Transportation	21,285	5			0%	314	0	0%	8,282	1	0%	8,282	1	0%
Public Utilities	18,353	(2)			0%	34	0	0%	2,979	0	0%	2,979	0	0%
Communications	36,153	(22)			0%	305	0	0%	9,277	(6)	0%	9,277	(6)	0%
Trade	182,462	(83)			0%	4,001	(2)	0%	84,033	(39)	0%	84,033	(39)	0%
Finance / Insurance / Real Estate	92,560	(52)			0%	728	0	0%	23,306	(12)	0%	23,306	(12)	0%
Hospitality Services	229,983	(105)			0%	4,798	(2)	0%	81,631	(35)	0%	81,631	(35)	0%
Consumer Services	44,043	(51)			0%	603	(1)	0%	17,750	(25)	0%	17,750	(25)	0%
Business Services	54,671	(70)			0%	910	(2)	0%	27,374	(40)	0%	27,374	(40)	0%
Other Services	137,255	(189)			0%	2,230	(3)	0%	75,843	(104)	0%	75,843	(104)	0%
Federal Government	26,815	(16)			0%	319	0	0%	14,072	(13)	0%	14,072	(13)	0%
State & Local Government	196,557	(5,660)			(3%)	3,380	(103)	(3%)	105,060	(3,026)	(3%)	105,060	(3,026)	(3%)
<b>TOTAL</b>	<b>1,797,597</b>	<b>(1,512)</b>			<b>0%</b>	<b>21,560</b>	<b>(106)</b>	<b>0%</b>	<b>606,118</b>	<b>(2,808)</b>	<b>0%</b>	<b>606,118</b>	<b>(2,808)</b>	<b>0%</b>



LINN COUNTY	Industry Output		Industry Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		Change		Change		\$ Thousands		Change	
<b>Agriculture &amp; Ag Services</b>	466,674	5,661	4,750	30	1%	115,685	1,350	1%	1%	1%		
<b>Mining / Sand &amp; Gravel</b>	5,517	30	69	0	1%	2,239	13	1%	1%	1%		
<b>Construction</b>	237,168	1,544	2,948	19	1%	104,247	679	1%	1%	1%		
<b>Food &amp; Wood Processing</b>	1,193,300	9,100	4,747	29	1%	207,043	1,668	1%	1%	1%		
<b>Other Manufacturing</b>	843,050	220	4,404	1	0%	202,866	64	0%	0%	0%		
<b>Transportation</b>	245,454	2,194	2,611	22	1%	98,778	859	1%	1%	1%		
<b>Public Utilities</b>	87,374	673	168	1	1%	14,064	108	1%	1%	1%		
<b>Communications</b>	92,685	139	630	1	0%	26,234	42	0%	0%	0%		
<b>Trade</b>	444,877	1,987	7,582	34	0%	195,969	873	0%	0%	0%		
<b>Finance / Insurance / Real Estate</b>	254,730	1,360	2,330	13	1%	61,073	335	1%	1%	1%		
<b>Hospitality Services</b>	102,517	443	2,943	13	0%	35,235	151	0%	0%	0%		
<b>Consumer Services</b>	113,411	774	2,178	14	1%	45,709	305	1%	1%	1%		
<b>Business Services</b>	199,576	1,292	3,665	24	1%	108,144	675	1%	1%	1%		
<b>Other Services</b>	366,176	1,815	7,636	38	0%	210,416	1,041	0%	0%	0%		
<b>Federal Government</b>	46,957	118	615	2	0%	26,140	95	0%	0%	0%		
<b>State &amp; Local Government</b>	310,015	14,543	3,294	155	5%	165,703	7,773	5%	5%	5%		
<b>TOTAL</b>	<b>5,010,081</b>	<b>41,896</b>	<b>50,568</b>	<b>396</b>	<b>1%</b>	<b>1,619,544</b>	<b>16,032</b>	<b>1%</b>	<b>1%</b>	<b>1%</b>		

LINN COUNTY	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands		%		%		%		\$ Thousands		%	
<b>No Action Alternative</b>														
<b>Agriculture &amp; Ag Services</b>	466,674	4,907	1%	4,750	26	1%	115,685	1,173	1%					
<b>Mining / Sand &amp; Gravel</b>	5,517	31	1%	69	0	1%	2,239	15	1%					
<b>Construction</b>	237,168	(463)	0%	2,948	(6)	0%	104,247	(203)	0%					
<b>Food &amp; Wood Processing</b>	1,193,300	9,810	1%	4,747	44	1%	207,043	2,875	1%					
<b>Other Manufacturing</b>	641,821	83	0%	2,861	0	0%	141,534	23	0%					
<b>Transportation</b>	245,454	1,004	0%	2,611	9	0%	98,778	377	0%					
<b>Public Utilities</b>	87,374	256	0%	168	1	0%	14,064	43	0%					
<b>Communications</b>	92,685	(31)	0%	630	(0)	0%	26,234	(9)	0%					
<b>Trade</b>	444,877	35	0%	7,582	(1)	0%	195,969	4	0%					
<b>Finance / Insurance / Real Estate</b>	254,730	(190)	0%	2,330	(2)	0%	61,073	(41)	0%					
<b>Hospitality Services</b>	102,517	(84)	0%	2,943	(2)	0%	35,235	(28)	0%					
<b>Consumer Services</b>	113,411	98	0%	2,178	(0)	0%	45,709	13	0%					
<b>Business Services</b>	199,576	299	0%	3,665	(0)	0%	108,144	100	0%					
<b>Other Services</b>	366,176	(360)	0%	7,636	(8)	0%	210,416	(206)	0%					
<b>Federal Government</b>	46,957	(43)	0%	615	(1)	0%	26,140	(35)	0%					
<b>State &amp; Local Government</b>	310,015	(13,308)	(4%)	3,294	(141)	(4%)	165,703	(7,113)	(4%)					
<b>TOTAL</b>	<b>5,010,081</b>	<b>2,037</b>	<b>0%</b>	<b>50,568</b>	<b>(82)</b>	<b>0%</b>	<b>1,619,544</b>	<b>(3,016)</b>	<b>0%</b>					





LINN COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Change	Employment	Change	Change	Change	Change	Change	Change	Earnings	Change	Change	Change
	\$ Thousands										\$ Thousands			
<b>Agriculture &amp; Ag Services</b>	466,674	21,586	5%	4,750	113	2%	115,685	5,156	4%					
<b>Mining / Sand &amp; Gravel</b>	5,517	65	1%	69	1	1%	2,239	30	1%					
<b>Construction</b>	237,168	484	0%	2,948	6	0%	104,247	213	0%					
<b>Food &amp; Wood Processing</b>	1,193,900	22,234	2%	4,747	82	2%	207,043	5,224	3%					
<b>Other Manufacturing</b>	843,050	292	0%	4,404	1	0%	202,866	83	0%					
<b>Transportation</b>	245,454	4,327	2%	2,611	41	2%	98,778	1,654	2%					
<b>Public Utilities</b>	87,374	873	1%	168	2	1%	14,064	143	1%					
<b>Communications</b>	92,685	63	0%	630	1	0%	26,234	20	0%					
<b>Trade</b>	444,877	1,800	0%	7,582	27	0%	195,969	768	0%					
<b>Finance / Insurance / Real Estate</b>	254,730	860	0%	2,330	8	0%	61,073	222	0%					
<b>Hospitality Services</b>	102,517	227	0%	2,943	6	0%	35,235	77	0%					
<b>Consumer Services</b>	113,411	773	1%	2,178	11	0%	45,709	263	1%					
<b>Business Services</b>	199,576	1,515	1%	3,665	18	1%	108,144	701	1%					
<b>Other Services</b>	366,176	913	0%	7,636	19	0%	210,416	525	0%					
<b>Federal Government</b>	46,957	18	0%	615	0	0%	26,140	15	0%					
<b>State &amp; Local Government</b>	310,015	(12,482)	(4%)	3,294	(133)	(4%)	165,703	(6,671)	(4%)					
<b>TOTAL</b>	<b>5,010,081</b>	<b>43,550</b>	<b>1%</b>	<b>50,568</b>	<b>205</b>	<b>0%</b>	<b>1,619,544</b>	<b>8,423</b>	<b>1%</b>					

LINN COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Change		%		\$ Thousands		%	
Agriculture & Ag Services	466,674	30,190	6%	4,750	158	3%	115,685	7,208	6%					
Mining / Sand & Gravel	5,517	104	2%	69	1	2%	2,239	47	2%					
Construction	237,168	1,290	1%	2,948	16	1%	104,247	567	1%					
Food & Wood Processing	1,193,300	38,242	3%	4,747	132	3%	207,043	8,223	4%					
Other Manufacturing	843,050	515	0%	4,404	3	0%	202,866	148	0%					
Transportation	245,454	6,051	2%	2,611	58	2%	98,778	2,328	2%					
Public Utilities	87,374	1,537	2%	168	3	2%	14,064	251	2%					
Communications	92,685	141	0%	630	1	0%	26,234	44	0%					
Trade	444,877	3,322	1%	7,582	51	1%	195,969	1,425	1%					
Finance / Insurance / Real Estate	254,730	1,706	1%	2,330	16	1%	61,073	434	1%					
Hospitality Services	102,517	488	0%	2,943	14	0%	35,235	167	0%					
Consumer Services	113,411	1,388	1%	2,178	21	1%	45,709	489	1%					
Business Services	199,576	2,668	1%	3,665	36	1%	108,144	1,270	1%					
Other Services	366,176	1,954	1%	7,636	41	1%	210,416	1,123	1%					
Federal Government	46,957	73	0%	615	1	0%	26,140	59	0%					
State & Local Government	310,015	(11,349)	(4%)	3,294	(121)	(4%)	165,703	(6,066)	(4%)					
<b>TOTAL</b>	<b>5,010,081</b>	<b>78,321</b>	<b>2%</b>	<b>50,568</b>	<b>432</b>	<b>1%</b>	<b>1,619,544</b>	<b>17,717</b>	<b>1%</b>					





LINN COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
Alternative 3	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	466,674	14,502	466,674	14,502	3%	3%	4,750	76	2%	2%	115,685	3,461	3%	3%
Mining / Sand & Gravel	5,517	56	5,517	56	1%	1%	69	1	1%	1%	2,239	26	1%	1%
Construction	237,168	181	237,168	181	0%	0%	2,948	2	0%	0%	104,247	80	0%	0%
Food & Wood Processing	1,193,900	20,256	1,193,900	20,256	2%	2%	4,747	79	2%	2%	207,043	4,888	2%	2%
Other Manufacturing	843,050	235	843,050	235	0%	0%	4,404	1	0%	0%	202,866	67	0%	0%
Transportation	245,454	3,734	245,454	3,734	2%	2%	2,611	35	1%	1%	98,778	1,424	1%	1%
Public Utilities	87,374	709	87,374	709	1%	1%	168	1	1%	1%	14,064	116	1%	1%
Communications	92,685	35	92,685	35	0%	0%	630	0	0%	0%	26,234	12	0%	0%
Trade	444,877	1,289	444,877	1,289	0%	0%	7,582	19	0%	0%	195,969	546	0%	0%
Finance / Insurance / Real Estate	254,730	542	254,730	542	0%	0%	2,330	5	0%	0%	61,073	143	0%	0%
Hospitality Services	102,517	132	102,517	132	0%	0%	2,943	4	0%	0%	35,235	45	0%	0%
Consumer Services	113,411	578	113,411	578	1%	1%	2,178	8	0%	0%	45,709	191	0%	0%
Business Services	199,576	1,178	199,576	1,178	1%	1%	3,665	13	0%	0%	108,144	536	0%	0%
Other Services	366,176	516	366,176	516	0%	0%	7,636	11	0%	0%	210,416	297	0%	0%
Federal Government	46,957	(0)	46,957	(0)	0%	0%	615	(0)	0%	0%	26,140	(0)	0%	0%
State & Local Government	310,015	(13,055)	310,015	(13,055)	(4%)	(4%)	3,294	(139)	(4%)	(4%)	165,703	(6,978)	(4%)	(4%)
<b>TOTAL</b>	<b>5,010,081</b>	<b>30,888</b>	<b>5,010,081</b>	<b>30,888</b>	<b>1%</b>	<b>1%</b>	<b>50,568</b>	<b>117</b>	<b>0%</b>	<b>0%</b>	<b>1,619,544</b>	<b>4,853</b>	<b>0%</b>	<b>0%</b>





LINN COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Industry	Change	Change	Change	Employment	Change	Change	Change	Earnings	Change	Change	Change
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	466,674	11,927	11,927	3%	4,750	62	1%	115,685	2,802	2%				
Mining/ Sand & Gravel	5,517	84	84	2%	69	1	1%	2,239	38	2%				
Construction	237,168	1,298	1,298	1%	2,948	16	1%	104,247	570	1%				
Food & Wood Processing	1,193,900	43,454	43,454	4%	4,747	185	4%	207,043	9,298	4%				
Other Manufacturing	843,050	463	463	0%	4,404	3	0%	202,866	136	0%				
Transportation	245,454	5,704	5,704	2%	2,611	55	2%	98,778	2,200	2%				
Public Utilities	87,374	1,371	1,371	2%	168	3	2%	14,064	222	2%				
Communications	92,685	142	142	0%	630	1	0%	26,234	44	0%				
Trade	444,877	3,143	3,143	1%	7,582	48	1%	195,969	1,348	1%				
Finance / Insurance / Real Estate	254,730	1,615	1,615	1%	2,330	15	1%	61,073	410	1%				
Hospitality Services	102,517	492	492	0%	2,943	14	0%	35,235	168	0%				
Consumer Services	113,411	1,236	1,236	1%	2,178	19	1%	45,709	453	1%				
Business Services	199,576	2,395	2,395	1%	3,665	35	1%	108,144	1,176	1%				
Other Services	366,176	1,918	1,918	1%	7,636	40	1%	210,416	1,101	1%				
Federal Government	46,957	89	89	0%	615	1	0%	26,140	72	0%				
State & Local Government	310,015	(5,258)	(5,258)	(2%)	3,294	(56)	(2%)	165,703	(2,810)	(2%)				
<b>TOTAL</b>	<b>5,010,081</b>	<b>70,071</b>	<b>70,071</b>	<b>1%</b>	<b>50,568</b>	<b>444</b>	<b>1%</b>	<b>1,619,544</b>	<b>17,228</b>	<b>1%</b>				



MARION COUNTY	Industry Output		Industry Change		Employment		Earnings		Percent Change	
	\$ Thousands		Change		Change		Change		Change	
Current Conditions										
Agriculture & Ag Services	629,346		381	0%	9,465	4	151,199	95	0%	0%
Mining / Sand & Gravel	26,977		11	0%	316	0	11,947	4	0%	0%
Construction	786,568		1,008	0%	9,092	12	345,736	443	0%	0%
Food & Wood Processing	1,641,023		211	0%	9,362	1	312,522	41	0%	0%
Other Manufacturing	757,977		164	0%	4,807	2	191,809	43	0%	0%
Transportation	268,492		153	0%	2,926	1	116,708	60	0%	0%
Public Utilities	154,924		207	0%	745	1	25,092	33	0%	0%
Communications	290,656		99	0%	2,069	1	75,038	27	0%	0%
Trade	1,316,238		412	0%	21,770	8	584,852	190	0%	0%
Finance / Insurance / Real Estate	1,175,781		167	0%	7,538	1	294,469	35	0%	0%
Hospitality Services	517,199		653	0%	12,741	16	182,280	227	0%	0%
Consumer Services	500,156		509	0%	8,158	9	195,215	222	0%	0%
Business Services	734,601		898	0%	12,364	16	358,106	482	0%	0%
Other Services	1,537,052		1,360	0%	22,290	19	856,420	769	0%	0%
Federal Government	366,829		16,081	4%	3,009	121	186,161	7,323	4%	4%
State & Local Government	3,546,005		6,242	0%	30,548	60	1,895,340	3,337	0%	0%
<b>TOTAL</b>	<b>14,249,826</b>		<b>28,557</b>	<b>0%</b>	<b>157,199</b>	<b>272</b>	<b>5,782,895</b>	<b>13,332</b>	<b>0%</b>	<b>0%</b>



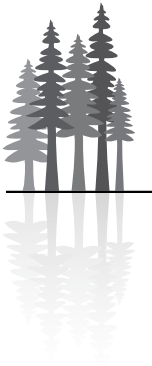
MARION COUNTY	Industry		Industry Change	Employment		Employment Change	Earnings		Earnings Change	Percent Change	
	Output	\$ Thousands		Change	Change		\$ Thousands	Change		Change	Change
No Action Alternative											
Agriculture & Ag Services	629,346		801	9,465	7	151,199	200	0%	0%	0%	
Mining / Sand & Gravel	26,977		(1)	316	(0)	11,947	(0)	0%	0%	0%	
Construction	786,568		(63)	9,092	(1)	345,736	(27)	0%	0%	0%	
Food & Wood Processing	1,641,023		485	9,362	2	312,522	86	0%	0%	0%	
Other Manufacturing	757,977		(3)	4,807	(0)	191,809	0	0%	0%	0%	
Transportation	268,492		269	2,926	2	116,708	100	0%	0%	0%	
Public Utilities	154,924		(23)	745	(0)	25,092	(4)	0%	0%	0%	
Communications	290,656		(1)	2,069	(0)	75,038	(0)	0%	0%	0%	
Trade	1,316,238		(2)	21,770	(0)	584,852	(1)	0%	0%	0%	
Finance / Insurance / Real Estate	1,175,781		(1)	7,538	0	294,469	0	0%	0%	0%	
Hospitality Services	517,199		(17)	12,741	(0)	182,280	(6)	0%	0%	0%	
Consumer Services	500,156		(23)	8,158	(1)	195,215	(12)	0%	0%	0%	
Business Services	734,601		38	12,364	0	358,106	23	0%	0%	0%	
Other Services	1,537,052		(20)	22,290	(0)	856,420	(11)	0%	0%	0%	
Federal Government	366,829		5,260	3,009	40	186,161	2,394	1%	1%	1%	
State & Local Government	3,546,005		(5,332)	30,548	(51)	1,895,340	(2,850)	0%	0%	0%	
<b>TOTAL</b>	<b>14,249,826</b>		<b>1,368</b>	<b>157,199</b>	<b>(2)</b>	<b>5,782,895</b>	<b>(108)</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	



MARION COUNTY Alternative 1	Industry Output		Industry Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands		Change		Change		\$ Thousands		Change	
Agriculture & Ag Services	629,346		1,658		9,465	14	0%	0%	151,199	416	0%	0%
Mining / Sand & Gravel	26,977		3		316	0	0%	0%	11,947	1	0%	0%
Construction	786,568		371		9,092	4	0%	0%	345,736	163	0%	0%
Food & Wood Processing	1,641,023		685		9,362	4	0%	0%	312,522	123	0%	0%
Other Manufacturing	757,977		72		4,807	0	0%	0%	191,809	20	0%	0%
Transportation	268,492		643		2,926	6	0%	0%	116,708	241	0%	0%
Public Utilities	154,924		62		745	0	0%	0%	25,092	10	0%	0%
Communications	290,656		45		2,069	0	0%	0%	75,038	12	0%	0%
Trade	1,316,238		188		21,770	4	0%	0%	584,852	86	0%	0%
Finance / Insurance / Real Estate	1,175,781		76		7,538	0	0%	0%	294,469	17	0%	0%
Hospitality Services	517,199		276		12,741	7	0%	0%	182,280	96	0%	0%
Consumer Services	500,156		203		8,158	3	0%	0%	195,215	86	0%	0%
Business Services	734,601		466		12,364	7	0%	0%	358,106	253	0%	0%
Other Services	1,537,052		598		22,290	8	0%	0%	856,420	339	0%	0%
Federal Government	366,829		14,692		3,009	111	4%	4%	186,161	6,689	4%	4%
State & Local Government	3,546,005		(4,804)		30,548	(46)	0%	0%	1,895,340	(2,568)	0%	0%
<b>TOTAL</b>	<b>14,249,826</b>		<b>15,235</b>		<b>157,199</b>	<b>124</b>	<b>0%</b>	<b>0%</b>	<b>5,782,895</b>	<b>5,984</b>	<b>0%</b>	<b>0%</b>

MARION COUNTY Alternative 2	Industry		Industry		Employment		Employment		Earnings		Earnings		Percent	
	Output		Change		Change		Change		Change		Change		Change	
	\$ Thousands		\$ Thousands		\$ Thousands		\$ Thousands		\$ Thousands		\$ Thousands		%	
Agriculture & Ag Services	629,346	1,188	0%	9,465	11	0%	151,199	296	0%					
Mining / Sand & Gravel	26,977	7	0%	316	0	0%	11,947	3	0%					
Construction	786,568	731	0%	9,092	8	0%	345,736	321	0%					
Food & Wood Processing	1,641,023	982	0%	9,362	5	0%	312,522	177	0%					
Other Manufacturing	757,977	132	0%	4,807	0	0%	191,809	36	0%					
Transportation	268,492	353	0%	2,926	3	0%	116,708	134	0%					
Public Utilities	154,924	131	0%	745	1	0%	25,092	21	0%					
Communications	290,656	81	0%	2,069	1	0%	75,038	22	0%					
Trade	1,316,238	335	0%	21,770	6	0%	584,852	154	0%					
Finance / Insurance / Real Estate	1,175,781	136	0%	7,538	1	0%	294,469	29	0%					
Hospitality Services	517,199	512	0%	12,741	12	0%	182,280	178	0%					
Consumer Services	500,156	378	0%	8,158	7	0%	195,215	163	0%					
Business Services	734,601	813	0%	12,364	14	0%	358,106	441	0%					
Other Services	1,537,052	1,093	0%	22,290	15	0%	856,420	619	0%					
Federal Government	366,829	23,016	6%	3,009	174	6%	186,161	10,479	6%					
State & Local Government	3,546,005	(4,124)	0%	30,548	(40)	0%	1,895,340	(2,204)	0%					
<b>TOTAL</b>	<b>14,249,826</b>	<b>25,764</b>	<b>0%</b>	<b>157,199</b>	<b>219</b>	<b>0%</b>	<b>5,782,895</b>	<b>10,870</b>	<b>0%</b>					





MARION COUNTY Alternative 3	Industry Output		Industry Change		Employment		Earnings		Percent Change	
	\$ Thousands		\$ Thousands		Change		\$ Thousands		Change	
Agriculture & Ag Services	629,346	1,479	0%	9,465	13	0%	151,199	371	0%	0%
Mining / Sand & Gravel	26,977	2	0%	316	0	0%	11,947	1	0%	0%
Construction	786,568	271	0%	9,092	3	0%	345,736	119	0%	0%
Food & Wood Processing	1,641,023	576	0%	9,362	3	0%	312,522	103	0%	0%
Other Manufacturing	757,977	55	0%	4,807	0	0%	191,809	16	0%	0%
Transportation	268,492	582	0%	2,926	5	0%	116,708	218	0%	0%
Public Utilities	154,924	42	0%	745	0	0%	25,092	7	0%	0%
Communications	290,656	34	0%	2,069	0	0%	75,038	9	0%	0%
Trade	1,316,238	145	0%	21,770	3	0%	584,852	66	0%	0%
Finance / Insurance / Real Estate	1,175,781	59	0%	7,538	0	0%	294,469	13	0%	0%
Hospitality Services	517,199	209	0%	12,741	5	0%	182,280	73	0%	0%
Consumer Services	500,156	150	0%	8,158	3	0%	195,215	63	0%	0%
Business Services	734,601	370	0%	12,364	6	0%	358,106	201	0%	0%
Other Services	1,537,052	457	0%	22,290	6	0%	856,420	259	0%	0%
Federal Government	366,829	12,800	3%	3,009	97	3%	186,161	5,827	3%	3%
State & Local Government	3,546,005	(5,130)	0%	30,548	(49)	0%	1,895,340	(2,742)	0%	0%
<b>TOTAL</b>	<b>14,249,826</b>	<b>12,102</b>	<b>0%</b>	<b>157,199</b>	<b>95</b>	<b>0%</b>	<b>5,782,895</b>	<b>4,605</b>	<b>0%</b>	<b>0%</b>



MARION COUNTY	Industry		Industry Change	Percent Change		Employment	Employment Change		Earnings	Earnings Change		Percent Change
	Output	\$ Thousands		Change	Change		Change	Change		Change	Change	
<b>PRMP</b>												
		\$ Thousands							\$ Thousands			
Agriculture & Ag Services	629,346		1,434	0%	9,465	12	0%	151,199	360	0%	0%	
Mining / Sand & Gravel	26,977		4	0%	316	0	0%	11,947	2	0%	0%	
Construction	786,568		471	0%	9,092	5	0%	345,736	207	0%	0%	
Food & Wood Processing	1,641,023		600	0%	9,362	3	0%	312,522	108	0%	0%	
Other Manufacturing	757,977		88	0%	4,807	0	0%	191,809	25	0%	0%	
Transportation	268,492		552	0%	2,926	5	0%	116,708	207	0%	0%	
Public Utilities	154,924		80	0%	745	0	0%	25,092	13	0%	0%	
Communications	290,656		55	0%	2,069	0	0%	75,038	15	0%	0%	
Trade	1,316,238		227	0%	21,770	4	0%	584,852	105	0%	0%	
Finance / Insurance / Real Estate	1,175,781		93	0%	7,538	0	0%	294,469	20	0%	0%	
Hospitality Services	517,199		340	0%	12,741	8	0%	182,280	119	0%	0%	
Consumer Services	500,156		249	0%	8,158	4	0%	195,215	106	0%	0%	
Business Services	734,601		562	0%	12,364	9	0%	358,106	305	0%	0%	
Other Services	1,537,052		733	0%	22,290	10	0%	856,420	415	0%	0%	
Federal Government	366,829		17,193	5%	3,009	130	4%	186,161	7,828	4%	4%	
State & Local Government	3,546,005		(4,681)	0%	30,548	(45)	0%	1,895,340	(2,502)	0%	0%	
<b>TOTAL</b>	<b>14,249,826</b>		<b>18,002</b>	<b>0%</b>	<b>157,199</b>	<b>149</b>	<b>0%</b>	<b>5,782,895</b>	<b>7,332</b>	<b>0%</b>	<b>0%</b>	



POLK COUNTY	Industry		Industry		Employment		Earnings		Percent	
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change
Current Conditions	\$ Thousands						\$ Thousands			
Agriculture & Ag Services	251,805	591	0%	3,417	6	0%	77,659	184	0%	0%
Mining / Sand & Gravel	5,265	2	0%	65	0	0%	1,970	1	0%	0%
Construction	100,708	172	0%	1,202	2	0%	44,266	76	0%	0%
Food & Wood Processing	217,797	120	0%	1,139	0	0%	35,053	21	0%	0%
Other Manufacturing	204,435	8	0%	1,519	0	0%	59,386	2	0%	0%
Transportation	26,029	76	0%	327	1	0%	10,269	29	0%	0%
Public Utilities	26,763	37	0%	79	0	0%	4,468	6	0%	0%
Communications	7,813	3	0%	121	0	0%	2,656	1	0%	0%
Trade	117,799	111	0%	2,427	2	0%	52,454	49	0%	0%
Finance / Insurance / Real Estate	108,347	108	0%	1,094	1	0%	23,586	23	0%	0%
Hospitality Services	46,549	46	0%	1,425	1	0%	15,966	15	0%	0%
Consumer Services	50,883	62	0%	1,089	1	0%	19,999	25	0%	0%
Business Services	46,952	64	0%	896	1	0%	22,166	31	0%	0%
Other Services	125,079	121	0%	3,104	3	0%	69,919	67	0%	0%
Federal Government	24,041	11	0%	295	0	0%	12,538	9	0%	0%
State & Local Government	322,494	2,513	1%	4,299	34	1%	172,373	1,343	1%	1%
<b>TOTAL</b>	<b>1,682,760</b>	<b>4,045</b>	<b>0%</b>	<b>22,499</b>	<b>54</b>	<b>0%</b>	<b>624,709</b>	<b>1,883</b>	<b>0%</b>	<b>0%</b>



POLK COUNTY	Industry		Industry Change	Employment		Employment Change	Earnings		Earnings Change	Percent Change
	Output	\$ Thousands		Employment	Percent Change		Earnings	Percent Change		
No Action Alternative	\$ Thousands		\$ Thousands		\$ Thousands		\$ Thousands		\$ Thousands	
Agriculture & Ag Services	251,805	7,347	3%	3,417	74	2%	77,659	2,291	3%	
Mining / Sand & Gravel	5,265	0	0%	65	0	0%	1,970	0	0%	
Construction	100,708	119	0%	1,202	1	0%	44,266	52	0%	
Food & Wood Processing	217,797	2,173	1%	1,139	10	1%	35,053	383	1%	
Other Manufacturing	204,435	16	0%	1,519	0	0%	59,368	6	0%	
Transportation	26,029	629	2%	327	7	2%	10,269	234	2%	
Public Utilities	26,763	32	0%	79	0	0%	4,468	5	0%	
Communications	7,813	3	0%	121	0	0%	2,656	1	0%	
Trade	117,799	223	0%	2,427	4	0%	52,454	96	0%	
Finance / Insurance / Real Estate	108,347	136	0%	1,094	1	0%	23,586	31	0%	
Hospitality Services	46,549	61	0%	1,425	2	0%	15,966	21	0%	
Consumer Services	50,883	102	0%	1,089	2	0%	19,999	41	0%	
Business Services	46,952	96	0%	896	2	0%	22,166	43	0%	
Other Services	125,079	152	0%	3,104	4	0%	69,919	85	0%	
Federal Government	24,041	4	0%	295	0	0%	12,538	3	0%	
State & Local Government	322,494	(1,485)	0%	4,299	(20)	0%	172,373	(794)	0%	
<b>TOTAL</b>	<b>1,682,760</b>	<b>9,609</b>	<b>1%</b>	<b>22,499</b>	<b>87</b>	<b>0%</b>	<b>624,709</b>	<b>2,499</b>	<b>0%</b>	





POLK COUNTY Alternative 1	Industry Output		Industry Change		Employment		Earnings		Percent Change	
	\$ Thousands				Change		\$ Thousands		Change	
Agriculture & Ag Services	251,805	11,884	5%	3,417	120	3%	77,659	3,694	5%	
Mining / Sand & Gravel	5,265	2	0%	65	0	0%	1,970	1	0%	
Construction	100,708	272	0%	1,202	3	0%	44,266	120	0%	
Food & Wood Processing	217,797	2,473	1%	1,139	11	1%	35,053	436	1%	
Other Manufacturing	204,435	27	0%	1,519	0	0%	59,368	9	0%	
Transportation	26,029	954	4%	327	10	3%	10,269	355	3%	
Public Utilities	26,763	64	0%	79	0	0%	4,468	10	0%	
Communications	7,813	7	0%	121	0	0%	2,656	3	0%	
Trade	117,799	387	0%	2,427	7	0%	52,454	167	0%	
Finance / Insurance / Real Estate	108,347	261	0%	1,094	3	0%	23,586	59	0%	
Hospitality Services	46,549	115	0%	1,425	3	0%	15,966	39	0%	
Consumer Services	50,883	184	0%	1,089	4	0%	19,999	73	0%	
Business Services	46,952	173	0%	896	3	0%	22,166	77	0%	
Other Services	125,079	293	0%	3,104	7	0%	69,919	164	0%	
Federal Government	24,041	11	0%	295	0	0%	12,538	9	0%	
State & Local Government	322,494	(845)	0%	4,299	(11)	0%	172,373	(452)	0%	
<b>TOTAL</b>	<b>1,682,760</b>	<b>16,262</b>	<b>1%</b>	<b>22,499</b>	<b>160</b>	<b>1%</b>	<b>624,709</b>	<b>4,764</b>	<b>1%</b>	

POLK COUNTY	Industry		Industry Change	Percent Change	Employment	Employment Change	Percent Change	Earnings		Percent Change
	Output	Change						Earnings	Earnings Change	
Alternative 2	\$ Thousands							\$ Thousands		
Agriculture & Ag Services	251,805	9,225	4%	3,417	93	3%	77,659	2,877	4%	
Mining / Sand & Gravel	5,265	2	0%	65	0	0%	1,970	1	0%	
Construction	100,708	260	0%	1,202	3	0%	44,266	114	0%	
Food & Wood Processing	217,797	2,769	1%	1,139	12	1%	35,053	488	1%	
Other Manufacturing	204,435	24	0%	1,519	0	0%	59,368	9	0%	
Transportation	26,029	595	2%	327	6	2%	10,269	222	2%	
Public Utilities	26,763	64	0%	79	0	0%	4,468	10	0%	
Communications	7,813	6	0%	121	0	0%	2,656	2	0%	
Trade	117,799	339	0%	2,427	6	0%	52,454	147	0%	
Finance / Insurance / Real Estate	108,347	233	0%	1,094	2	0%	23,586	52	0%	
Hospitality Services	46,549	103	0%	1,425	3	0%	15,966	35	0%	
Consumer Services	50,883	163	0%	1,089	3	0%	19,999	66	0%	
Business Services	46,952	156	0%	896	3	0%	22,166	71	0%	
Other Services	125,079	263	0%	3,104	7	0%	69,919	147	0%	
Federal Government	24,041	12	0%	295	0	0%	12,538	10	0%	
State & Local Government	322,494	(16)	0%	4,299	0	0%	172,373	(9)	0%	
<b>TOTAL</b>	<b>1,682,760</b>	<b>14,199</b>	<b>1%</b>	<b>22,499</b>	<b>139</b>	<b>1%</b>	<b>624,709</b>	<b>4,242</b>	<b>1%</b>	





POLK COUNTY Alternative 3	Industry Output		Industry Change		Employment		Employment Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	251,805	9,263	4%	3,417	93	77,659	2,892	3%	4%					
Mining / Sand & Gravel	5,265	1	0%	65	0	1,970	0	0%	0%					
Construction	100,708	194	0%	1,202	2	44,266	85	0%	0%					
Food & Wood Processing	217,797	3,060	1%	1,139	13	35,053	540	1%	2%					
Other Manufacturing	204,435	23	0%	1,519	0	59,368	9	0%	0%					
Transportation	26,029	940	4%	327	10	10,269	350	3%	3%					
Public Utilities	26,763	51	0%	79	0	4,468	8	0%	0%					
Communications	7,813	5	0%	121	0	2,656	2	0%	0%					
Trade	117,799	316	0%	2,427	6	52,454	136	0%	0%					
Finance / Insurance / Real Estate	108,347	201	0%	1,094	2	23,586	45	0%	0%					
Hospitality Services	46,549	89	0%	1,425	3	15,966	30	0%	0%					
Consumer Services	50,883	148	0%	1,089	3	19,999	60	0%	0%					
Business Services	46,952	140	0%	896	3	22,166	63	0%	0%					
Other Services	125,079	224	0%	3,104	6	69,919	125	0%	0%					
Federal Government	24,041	8	0%	295	0	12,538	6	0%	0%					
State & Local Government	322,494	(1,314)	0%	4,299	(18)	172,373	(702)	0%	0%					
<b>TOTAL</b>	<b>1,682,760</b>	<b>13,349</b>	<b>1%</b>	<b>22,499</b>	<b>123</b>	<b>624,709</b>	<b>3,650</b>	<b>1%</b>	<b>1%</b>					



POLK COUNTY	Industry	Industry	Employment	Employment	Percent	Employment	Employment	Percent	Earnings	Earnings	Percent	Earnings	Percent
	Output	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
PRMP	\$ Thousands												
Agriculture & Ag Services	251,805	9,830	3,417	98	4%	3%	77,659	3%	3,150	3%	4%	3,150	4%
Mining / Sand & Gravel	5,265	3	65	0	0%	0%	1,970	0%	1	0%	0%	1	0%
Construction	100,708	362	1,202	4	0%	0%	44,266	0%	159	0%	0%	159	0%
Food & Wood Processing	217,797	10,134	1,139	45	5%	4%	35,053	4%	1,788	4%	5%	1,788	5%
Other Manufacturing	204,435	51	1,519	0	0%	0%	59,368	0%	19	0%	0%	19	0%
Transportation	26,029	1,397	327	15	5%	4%	10,269	4%	521	4%	5%	521	5%
Public Utilities	26,763	121	79	0	0%	0%	4,468	0%	18	0%	0%	18	0%
Communications	7,813	9	121	0	0%	0%	2,656	0%	4	0%	0%	4	0%
Trade	117,799	559	2,427	10	0%	0%	52,454	0%	240	0%	0%	240	0%
Finance / Insurance / Real Estate	108,347	343	1,094	3	0%	0%	23,586	0%	77	0%	0%	77	0%
Hospitality Services	46,549	156	1,425	5	0%	0%	15,966	0%	53	0%	0%	53	0%
Consumer Services	50,883	263	1,089	6	1%	1%	19,999	1%	113	1%	1%	113	1%
Business Services	46,952	263	896	5	1%	1%	22,166	1%	126	1%	1%	126	1%
Other Services	125,079	382	3,104	9	0%	0%	69,919	0%	213	0%	0%	213	0%
Federal Government	24,041	19	295	0	0%	0%	12,538	0%	15	0%	0%	15	0%
State & Local Government	322,494	(674)	4,299	(9)	0%	0%	172,373	0%	(360)	0%	0%	(360)	0%
<b>TOTAL</b>	<b>1,682,759</b>	<b>23,217</b>	<b>22,498</b>	<b>192</b>	<b>1%</b>	<b>1%</b>	<b>624,710</b>	<b>1%</b>	<b>6,138</b>	<b>1%</b>	<b>1%</b>	<b>6,138</b>	<b>1%</b>



TILLAMOOK COUNTY	Industry		Employment	Employment		Percent Change	Earnings		Percent Change	Earnings		Percent Change
	Output	Change		Change	Change		\$ Thousands	Change		\$ Thousands		
<b>Current Conditions</b>												
	\$ Thousands											
<b>Agriculture &amp; Ag Services</b>	226,518	433	1,073	0%	1	0%	41,842	55	0%	0%	0%	
<b>Mining / Sand &amp; Gravel</b>	1,361	1	16	0%	0	0%	500	0	0%	0%	0%	
<b>Construction</b>	71,428	59	1,001	0%	1	0%	31,396	26	0%	0%	0%	
<b>Food &amp; Wood Processing</b>	428,360	854	1,170	0%	2	1%	44,053	99	1%	1%	1%	
<b>Other Manufacturing</b>	23,349	4	189	0%	0	0%	6,552	1	0%	0%	0%	
<b>Transportation</b>	8,171	53	121	1%	1	1%	3,408	20	1%	1%	1%	
<b>Public Utilities</b>	384	2	4	1%	0	1%	100	1	1%	1%	1%	
<b>Communications</b>	9,714	7	118	0%	0	0%	2,769	3	0%	0%	0%	
<b>Trade</b>	62,325	42	1,475	0%	1	0%	28,541	20	0%	0%	0%	
<b>Finance / Insurance / Real Estate</b>	54,615	14	419	0%	0	0%	11,532	2	0%	0%	0%	
<b>Hospitality Services</b>	65,752	171	1,592	0%	4	0%	22,966	59	0%	0%	0%	
<b>Consumer Services</b>	25,675	99	570	0%	2	0%	10,265	42	0%	0%	0%	
<b>Business Services</b>	22,570	83	418	0%	2	0%	9,577	37	0%	0%	0%	
<b>Other Services</b>	49,172	183	972	0%	3	0%	28,153	105	0%	0%	0%	
<b>Federal Government</b>	20,218	2	232	0%	0	0%	10,242	1	0%	0%	0%	
<b>State &amp; Local Government</b>	101,353	3,746	1,614	4%	61	4%	54,173	2,002	4%	4%	4%	
<b>TOTAL</b>	<b>1,170,965</b>	<b>5,755</b>	<b>10,985</b>	<b>0%</b>	<b>79</b>	<b>1%</b>	<b>306,070</b>	<b>2,473</b>	<b>1%</b>	<b>1%</b>	<b>1%</b>	



TILLAMOOK COUNTY	Industry Output		Industry Change		Employment		Employment Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		Thousands		FTE		FTE		\$ Thousands		\$ Thousands		%	
No Action Alternative														
Agriculture & Ag Services	226,518		5,074		1,073		15		41,842		588		1%	1%
Mining / Sand & Gravel	1,361		0		16		0		500		0		0%	0%
Construction	71,428		12		1,001		0		31,396		5		0%	0%
Food & Wood Processing	428,360		13,161		1,170		32		44,053		1,505		3%	3%
Other Manufacturing	14,471		14		116		0		3,664		6		0%	0%
Transportation	8,171		83		121		1		3,408		31		1%	1%
Public Utilities	384		0		4		0		100		0		0%	0%
Communications	9,714		1		118		0		2,769		0		0%	0%
Trade	62,325		22		1,475		1		28,541		10		0%	0%
Finance / Insurance / Real Estate	54,615		5		419		0		11,532		1		0%	0%
Hospitality Services	65,752		71		1,592		2		22,966		24		0%	0%
Consumer Services	25,675		84		570		1		10,265		34		0%	0%
Business Services	22,570		86		418		1		9,577		34		0%	0%
Other Services	49,172		47		972		1		28,153		27		0%	0%
Federal Government	20,218		0		232		0		10,242		0		0%	0%
State & Local Government	101,353		(2,964)		1,614		(48)		54,173		(1,584)		(3%)	(3%)
<b>TOTAL</b>	<b>1,170,965</b>		<b>15,697</b>		<b>10,985</b>		<b>6</b>		<b>306,070</b>		<b>682</b>		<b>0%</b>	<b>0%</b>



TILLAMOOK COUNTY	Industry Output		Industry Change		Employment		Percent Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands				%		\$ Thousands		%			
Alternative 1														
Agriculture & Ag Services	226,518		6,288		1,073		3%	18	41,842		2%	730		2%
Mining / Sand & Gravel	1,361		0		16		0%	0	500		0%	0		0%
Construction	71,428		29		1,001		0%	0	31,396		0%	13		0%
Food & Wood Processing	428,360		16,582		1,170		4%	40	44,053		4%	1,887		4%
Other Manufacturing	23,349		20		189		0%	0	6,552		0%	8		0%
Transportation	8,171		46		121		1%	1	3,408		1%	17		1%
Public Utilities	384		0		4		0%	0	100		0%	0		0%
Communications	9,714		3		118		0%	0	2,769		0%	1		0%
Trade	62,325		37		1,475		0%	1	28,541		0%	17		0%
Finance / Insurance / Real Estate	54,615		9		419		0%	0	11,532		0%	2		0%
Hospitality Services	65,752		131		1,592		0%	3	22,966		0%	45		0%
Consumer Services	25,675		128		570		0%	2	10,265		0%	52		1%
Business Services	22,570		127		418		1%	2	9,577		0%	51		1%
Other Services	49,172		103		972		0%	2	28,153		0%	59		0%
Federal Government	20,218		1		232		0%	0	10,242		0%	0		0%
State & Local Government	101,353		(2,683)		1,614		(3%)	(43)	54,173		(3%)	(1,434)		(3%)
<b>TOTAL</b>	<b>1,170,965</b>		<b>20,822</b>		<b>10,985</b>		<b>2%</b>	<b>27</b>	<b>306,070</b>		<b>0%</b>	<b>1,459</b>		<b>0%</b>





TILLAMOOK COUNTY Alternative 2	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		FTE		%		\$ Thousands		%	
Agriculture & Ag Services	226,518	10,603		1,073	5%		31	3%	41,842	1,233	3%			3%
Mining / Sand & Gravel	1,361	1		16	0%		0	0%	500	0	0%			0%
Construction	71,428	83		1,001	0%		1	0%	31,396	36	0%			0%
Food & Wood Processing	428,360	26,102		1,170	6%		63	5%	44,053	2,986	5%			7%
Other Manufacturing	23,349	35		189	0%		0	0%	6,552	13	0%			0%
Transportation	8,171	445		121	5%		6	5%	3,408	166	5%			5%
Public Utilities	384	1		4	0%		0	0%	100	0	0%			0%
Communications	9,714	9		118	0%		0	0%	2,769	3	0%			0%
Trade	62,325	87		1,475	0%		2	0%	28,541	41	0%			0%
Finance / Insurance / Real Estate	54,615	24		419	0%		0	0%	11,532	4	0%			0%
Hospitality Services	65,752	312		1,592	0%		8	0%	22,966	107	0%			0%
Consumer Services	25,675	267		570	1%		5	1%	10,265	109	1%			1%
Business Services	22,570	254		418	1%		4	1%	9,577	103	1%			1%
Other Services	49,172	280		972	1%		5	1%	28,153	161	1%			1%
Federal Government	20,218	2		232	0%		0	0%	10,242	2	0%			0%
State & Local Government	101,353	(2,048)		1,614	(2%)		(33)	(2%)	54,173	(1,095)	(2%)			(2%)
<b>TOTAL</b>	<b>1,170,965</b>	<b>36,457</b>		<b>10,985</b>	<b>3%</b>		<b>93</b>	<b>1%</b>	<b>306,070</b>	<b>3,872</b>	<b>1%</b>			<b>1%</b>



Tillamook County	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands			%			%	\$ Thousands				
<b>Alternative 3</b>														
<b>Agriculture &amp; Ag Services</b>	226,518		7,666		3%		1,073		22	2%	41,842		890	2%
<b>Mining / Sand &amp; Gravel</b>	1,361		0		0%		16		0	0%	500		0	0%
<b>Construction</b>	71,428		38		0%		1,001		1	0%	31,396		16	0%
<b>Food &amp; Wood Processing</b>	428,360		15,906		4%		1,170		38	3%	44,053		1,820	4%
<b>Other Manufacturing</b>	23,349		22		0%		189		0	0%	6,552		9	0%
<b>Transportation</b>	8,171		919		11%		121		12	10%	3,408		341	10%
<b>Public Utilities</b>	384		0		0%		4		0	0%	100		0	0%
<b>Communications</b>	9,714		4		0%		118		0	0%	2,769		2	0%
<b>Trade</b>	62,325		48		0%		1,475		1	0%	28,541		23	0%
<b>Finance / Insurance / Real Estate</b>	54,615		13		0%		419		0	0%	11,532		2	0%
<b>Hospitality Services</b>	65,752		156		0%		1,592		4	0%	22,966		54	0%
<b>Consumer Services</b>	25,675		153		1%		570		3	1%	10,265		62	1%
<b>Business Services</b>	22,570		146		1%		418		2	1%	9,577		58	1%
<b>Other Services</b>	49,172		138		0%		972		2	0%	28,153		79	0%
<b>Federal Government</b>	20,218		1		0%		232		0	0%	10,242		1	0%
<b>State &amp; Local Government</b>	101,353		(2,719)		(3%)		1,614		(44)	(3%)	54,173		(1,453)	(3%)
<b>TOTAL</b>	<b>1,170,965</b>		<b>22,491</b>		<b>2%</b>		<b>10,985</b>		<b>43</b>	<b>0%</b>	<b>306,070</b>		<b>1,902</b>	<b>1%</b>



TILLAMOOK COUNTY	Industry		Industry		Percent		Employment		Percent		Earnings		Percent	
	Output	Change	Output	Change	Change	Employment	Change	Change	Change	Change	Earnings	Change	Change	
PRMP	\$ Thousands		\$ Thousands								\$ Thousands			
Agriculture & Ag Services	226,518	7,578			3%	1,073	22	2%	41,842	880	2%			
Mining / Sand & Gravel	1,361	0			0%	16	0	0%	500	0	0%			
Construction	71,428	43			0%	1,001	1	0%	31,396	19	0%			
Food & Wood Processing	428,360	18,241			4%	1,170	44	4%	44,053	2,087	5%			
Other Manufacturing	23,349	24			0%	189	0	0%	6,552	9	0%			
Transportation	8,171	398			5%	121	5	4%	3,408	148	4%			
Public Utilities	384	0			0%	4	0	0%	100	0	0%			
Communications	9,714	5			0%	118	0	0%	2,769	2	0%			
Trade	62,325	51			0%	1,475	1	0%	28,541	24	0%			
Finance / Insurance / Real Estate	54,615	14			0%	419	0	0%	11,532	2	0%			
Hospitality Services	65,752	176			0%	1,592	4	0%	22,966	60	0%			
Consumer Services	25,675	164			1%	570	3	1%	10,265	67	1%			
Business Services	22,570	159			1%	418	3	1%	9,577	64	1%			
Other Services	49,172	150			0%	972	3	0%	28,153	86	0%			
Federal Government	20,218	1			0%	232	0	0%	10,242	1	0%			
State & Local Government	101,353	(2,537)			(3%)	1,614	(41)	(3%)	54,173	(1,356)	(3%)			
<b>TOTAL</b>	<b>1,170,965</b>	<b>24,466</b>			<b>2%</b>	<b>10,985</b>	<b>45</b>	<b>0%</b>	<b>306,070</b>	<b>2,093</b>	<b>1%</b>			



WASHINGTON COUNTY	Industry	Industry Change	Employment	Employment Change	Percent Change	Earnings	Earnings Change	Percent Change
	Output		Change		Change			
Current Conditions	\$ Thousands							
Agriculture & Ag Services	395,099	615	6,353	4	0%	96,833	111	0%
Mining / Sand & Gravel	34,190	1	313	0	0%	12,350	0	0%
Construction	1,958,303	83	16,313	1	0%	860,772	37	0%
Food & Wood Processing	1,224,731	1,232	6,300	4	0%	291,342	238	0%
Other Manufacturing	13,843,515	13	41,373	0	0%	3,252,804	4	0%
Transportation	464,604	155	3,513	1	0%	190,259	58	0%
Public Utilities	735,956	46	2,077	0	0%	107,418	7	0%
Communications	1,790,074	7	8,142	0	0%	518,837	2	0%
Trade	5,495,006	64	49,083	1	0%	2,303,791	28	0%
Finance / Insurance / Real Estate	3,399,312	81	20,692	0	0%	845,128	21	0%
Hospitality Services	921,544	24	19,647	1	0%	324,040	9	0%
Consumer Services	1,108,294	40	15,494	1	0%	450,657	18	0%
Business Services	2,701,656	89	35,065	1	0%	1,466,536	47	0%
Other Services	2,300,479	56	36,262	1	0%	1,261,982	31	0%
Federal Government	134,046	0	2,103	0	0%	78,906	0	0%
State & Local Government	1,057,105	721	9,480	6	0%	565,023	385	0%
<b>TOTAL</b>	<b>37,563,913</b>	<b>3,228</b>	<b>272,210</b>	<b>22</b>	<b>0%</b>	<b>12,626,678</b>	<b>996</b>	<b>0%</b>



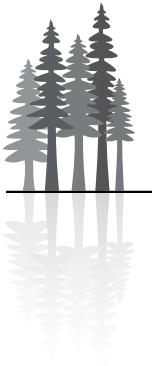
WASHINGTON COUNTY No Action Alternative	Industry Output		Industry Change		Employment		Employment Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	395,099		3,014		6,353		22		96,833		547		0%	1%
Mining / Sand & Gravel	34,190		1		313		0		12,350		0		0%	0%
Construction	1,958,303		163		16,313		1		860,772		72		0%	0%
Food & Wood Processing	1,224,731		6,968		6,300		23		291,342		1,608		0%	1%
Other Manufacturing	13,843,515		34		41,373		0		3,252,804		11		0%	0%
Transportation	464,604		324		3,513		2		190,259		120		0%	0%
Public Utilities	735,956		125		2,077		0		107,418		18		0%	0%
Communications	1,790,074		15		8,142		0		518,837		4		0%	0%
Trade	5,495,006		206		49,083		2		2,303,791		89		0%	0%
Finance / Insurance / Real Estate	3,399,312		229		20,692		1		845,128		63		0%	0%
Hospitality Services	921,544		65		19,647		1		324,040		23		0%	0%
Consumer Services	1,108,294		114		15,494		2		450,657		51		0%	0%
Business Services	2,701,656		270		35,065		3		1,466,536		142		0%	0%
Other Services	2,300,479		145		36,262		2		1,261,982		80		0%	0%
Federal Government	134,046		0		2,103		0		78,906		0		0%	0%
State & Local Government	1,057,105		(442)		9,480		(4)		565,023		(236)		0%	0%
<b>TOTAL</b>	<b>37,563,913</b>		<b>11,229</b>		<b>272,210</b>		<b>57</b>		<b>12,626,678</b>		<b>2,592</b>		<b>0%</b>	<b>0%</b>



WASHINGTON COUNTY Alternative 1	Industry Output		Industry Change		Employment		Employment Change		Earnings		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	395,099		3,610		6,353		27		96,833		657		0%	1%
Mining / Sand & Gravel	34,190		1		313		0		12,350		1		0%	0%
Construction	1,958,303		226		16,313		2		860,772		99		0%	0%
Food & Wood Processing	1,224,731		9,298		6,300		31		291,342		2,084		0%	1%
Other Manufacturing	874,063		48		41,373		0		3,252,804		16		0%	0%
Transportation	464,604		285		3,513		2		190,259		106		0%	0%
Public Utilities	735,956		178		2,077		0		107,418		26		0%	0%
Communications	1,790,074		20		8,142		0		518,837		6		0%	0%
Trade	5,495,006		269		49,083		3		2,303,791		117		0%	0%
Finance / Insurance / Real Estate	3,399,312		298		20,692		2		845,128		81		0%	0%
Hospitality Services	921,544		86		19,647		2		324,040		30		0%	0%
Consumer Services	1,108,294		152		15,494		2		450,657		68		0%	0%
Business Services	2,701,656		358		35,065		4		1,466,536		188		0%	0%
Other Services	2,300,479		193		36,262		3		1,261,982		106		0%	0%
Federal Government	134,046		0		2,103		0		78,906		0		0%	0%
State & Local Government	1,057,105		(271)		9,480		(2)		565,023		(145)		0%	0%
<b>TOTAL</b>	<b>37,563,914</b>		<b>14,751</b>		<b>272,210</b>		<b>76</b>		<b>12,626,678</b>		<b>3,440</b>		<b>0%</b>	<b>0%</b>



WASHINGTON COUNTY Alternative 2	Industry	Industry	Percent	Employment	Employment	Percent	Earnings	Earnings	Percent
	Output	Change	Change		Change	Change		Change	Change
	\$ Thousands						\$ Thousands		
<b>Agriculture &amp; Ag Services</b>	395,099	5,023	1%	6,353	37	1%	96,833	915	1%
<b>Mining / Sand &amp; Gravel</b>	34,190	2	0%	313	0	0%	12,350	1	0%
<b>Construction</b>	1,958,303	344	0%	16,313	3	0%	860,772	151	0%
<b>Food &amp; Wood Processing</b>	1,224,731	8,152	1%	6,300	27	0%	291,342	1,821	1%
<b>Other Manufacturing</b>	13,843,515	73	0%	41,373	0	0%	3,252,804	23	0%
<b>Transportation</b>	464,604	328	0%	3,513	2	0%	190,259	122	0%
<b>Public Utilities</b>	735,956	267	0%	2,077	1	0%	107,418	39	0%
<b>Communications</b>	1,790,074	31	0%	8,142	0	0%	518,837	9	0%
<b>Trade</b>	5,495,006	395	0%	49,083	4	0%	2,303,791	171	0%
<b>Finance / Insurance</b>	3,399,312	438	0%	20,692	3	0%	845,128	119	0%
<b>Hospitality Services</b>	921,544	129	0%	19,647	3	0%	324,040	45	0%
<b>Consumer Services</b>	1,108,294	225	0%	15,494	3	0%	450,657	101	0%
<b>Business Services</b>	2,701,656	526	0%	35,065	6	0%	1,466,536	277	0%
<b>Other Services</b>	2,300,479	288	0%	36,262	4	0%	1,261,982	158	0%
<b>Federal Government</b>	134,046	0	0%	2,103	0	0%	78,906	0	0%
<b>State &amp; Local Government</b>	1,057,105	(17)	0%	9,480	0	0%	565,023	(9)	0%
<b>TOTAL</b>	<b>37,563,913</b>	<b>21,539</b>	<b>0%</b>	<b>272,210</b>	<b>112</b>	<b>0%</b>	<b>12,626,678</b>	<b>5,121</b>	<b>0%</b>



WASHINGTON COUNTY	Industry		Industry		Employment		Employment		Earnings		Earnings		Percent	
	Output	Change	Output	Change	Count	Change	Count	Change	Count	Change	Change	Change	Change	Change
Alternative 3	\$ Thousands		\$ Thousands						\$ Thousands					
Agriculture & Ag Services	395,099	2,797	6,353	21	96,833	511	0%	0%	0%	1%	0%	0%	0%	1%
Mining / Sand & Gravel	34,190	1	313	0	12,350	0	0%	0%	0%	0%	0%	0%	0%	0%
Construction	1,958,303	175	16,313	1	860,772	77	0%	0%	0%	0%	0%	0%	0%	0%
Food & Wood Processing	1,224,731	8,152	6,300	27	291,342	1,821	0%	0%	0%	0%	0%	0%	0%	1%
Other Manufacturing	13,843,515	41	41,373	0	3,252,804	13	0%	0%	0%	0%	0%	0%	0%	0%
Transportation	464,604	60	3,513	0	190,259	23	0%	0%	0%	0%	0%	0%	0%	0%
Public Utilities	735,956	150	2,077	0	107,418	22	0%	0%	0%	0%	0%	0%	0%	0%
Communications	1,790,074	16	8,142	0	518,837	4	0%	0%	0%	0%	0%	0%	0%	0%
Trade	5,495,006	218	49,083	2	2,303,791	94	0%	0%	0%	0%	0%	0%	0%	0%
Finance / Insurance / Real Estate	3,399,312	235	20,692	1	845,128	64	0%	0%	0%	0%	0%	0%	0%	0%
Hospitality Services	921,544	69	19,647	1	324,040	24	0%	0%	0%	0%	0%	0%	0%	0%
Consumer Services	1,108,294	122	15,494	2	450,657	55	0%	0%	0%	0%	0%	0%	0%	0%
Business Services	2,701,656	289	35,065	3	1,466,536	152	0%	0%	0%	0%	0%	0%	0%	0%
Other Services	2,300,479	153	36,262	2	1,261,982	84	0%	0%	0%	0%	0%	0%	0%	0%
Federal Government	134,046	0	2,103	0	78,906	0	0%	0%	0%	0%	0%	0%	0%	0%
State & Local Government	1,057,105	(401)	9,480	(4)	565,023	(214)	0%	0%	0%	0%	0%	0%	0%	0%
<b>TOTAL</b>	<b>37,563,914</b>	<b>12,077</b>	<b>272,210</b>	<b>56</b>	<b>12,626,678</b>	<b>2,730</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>





WASHINGTON COUNTY	Industry		Industry Change	Employment	Employment Change	Earnings	Earnings Change	Percent Change
	Output	Change						
PRMP	\$ Thousands					\$ Thousands		
Agriculture & Ag Services	395,099	5,516	1%	6,353	40	96,833	993	1%
Mining / Sand & Gravel	34,190	2	0%	313	0	12,350	1	0%
Construction	1,958,303	308	0%	16,313	3	860,772	135	0%
Food & Wood Processing	1,224,731	10,117	1%	6,300	34	291,341	2,161	1%
Other Manufacturing	13,343,515	64	0%	41,373	0	3,252,804	21	0%
Transportation	464,604	1,252	0%	3,513	8	190,259	465	0%
Public Utilities	735,956	223	0%	2,077	1	107,418	32	0%
Communications	1,790,074	28	0%	8,142	0	518,837	8	0%
Trade	5,495,006	349	0%	49,083	4	2,303,791	152	0%
Finance / Insurance / Real Estate	3,399,312	415	0%	20,692	3	845,128	113	0%
Hospitality Services	921,544	111	0%	19,647	2	324,040	39	0%
Consumer Services	1,108,294	200	0%	15,494	3	450,657	89	0%
Business Services	2,701,656	472	0%	35,065	6	1,466,536	248	0%
Other Services	2,300,479	252	0%	36,262	4	1,261,982	138	0%
Federal Government	134,046	0	0%	2,103	0	78,906	0	0%
State & Local Government	1,057,105	(226)	0%	9,480	(2)	565,023	(121)	0%
<b>TOTAL</b>	<b>37,563,914</b>	<b>19,083</b>	<b>0%</b>	<b>272,210</b>	<b>105</b>	<b>12,626,677</b>	<b>4,474</b>	<b>0%</b>



YAMHILL COUNTY	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		%		Change		%		\$ Thousands		%	
<b>Agriculture &amp; Ag Services</b>	328,125		924		0%	5,107	9	0%	80,062		248	0%		
<b>Mining / Sand &amp; Gravel</b>	8,710		50		1%	97	1	1%	3,951		24	1%		
<b>Construction</b>	176,278		42		0%	2,179	1	0%	77,483		18	0%		
<b>Food &amp; Wood Processing</b>	772,515		3,936		1%	2,614	8	0%	108,586		566	1%		
<b>Other Manufacturing</b>	596,518		34		0%	3,417	0	0%	161,302		10	0%		
<b>Transportation</b>	88,441		118		0%	826	1	0%	31,064		41	0%		
<b>Public Utilities</b>	10,854		23		0%	42	0	0%	1,738		3	0%		
<b>Communications</b>	31,413		12		0%	368	0	0%	10,649		4	0%		
<b>Trade</b>	265,108		298		0%	4,723	5	0%	118,528		131	0%		
<b>Finance / Insurance / Real Estate</b>	265,501		242		0%	2,326	2	0%	61,017		53	0%		
<b>Hospitality Services</b>	94,927		91		0%	2,723	3	0%	32,650		31	0%		
<b>Consumer Services</b>	108,471		150		0%	1,969	3	0%	41,957		57	0%		
<b>Business Services</b>	129,978		196		0%	2,210	3	0%	63,285		92	0%		
<b>Other Services</b>	326,705		293		0%	6,487	6	0%	186,592		167	0%		
<b>Federal Government</b>	96,802		15		0%	792	0	0%	47,689		12	0%		
<b>State &amp; Local Government</b>	192,236		1,626		1%	2,047	17	1%	102,750		869	1%		
<b>TOTAL</b>	<b>3,492,580</b>		<b>8,049</b>		<b>0%</b>	<b>37,928</b>	<b>59</b>	<b>0%</b>	<b>1,129,303</b>		<b>2,327</b>	<b>0%</b>		

YAMHILL COUNTY	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		Thousands		%		%		Thousands		%		%	
No Action Alternative														
Agriculture & Ag Services	328,125	2,787	1%	5,107	25	0%	80,062	754	1%					
Mining / Sand & Gravel	8,710	103	1%	97	1	1%	3,951	48	1%					
Construction	176,278	27	0%	2,179	0	0%	77,483	12	0%					
Food & Wood Processing	772,515	6,947	1%	2,614	18	1%	108,586	1,203	1%					
Other Manufacturing	596,518	50	0%	3,417	0	0%	161,302	15	0%					
Transportation	88,441	139	0%	826	1	0%	31,064	49	0%					
Public Utilities	10,854	27	0%	42	0	0%	1,738	4	0%					
Communications	31,413	9	0%	368	0	0%	10,649	3	0%					
Trade	265,108	339	0%	4,723	5	0%	118,528	146	0%					
Finance / Insurance / Real Estate	265,501	212	0%	2,326	2	0%	61,017	48	0%					
Hospitality Services	94,927	79	0%	2,723	2	0%	32,650	27	0%					
Consumer Services	108,471	173	0%	1,969	3	0%	41,957	62	0%					
Business Services	129,978	240	0%	2,210	4	0%	63,285	106	0%					
Other Services	326,705	242	0%	6,487	5	0%	186,592	138	0%					
Federal Government	96,802	7	0%	792	0	0%	47,689	6	0%					
State & Local Government	192,236	(1,283)	(1%)	2,047	(14)	(1%)	102,750	(686)	(1%)					
<b>TOTAL</b>	<b>3,492,580</b>	<b>10,100</b>	<b>0%</b>	<b>37,928</b>	<b>54</b>	<b>0%</b>	<b>1,129,303</b>	<b>1,936</b>	<b>0%</b>					





YAMHILL COUNTY Alternative 1	Industry Output		Industry Change		Percent Change		Employment Change		Percent Change		Earnings Change		Percent Change	
	\$ Thousands		\$ Thousands		%		%		%		\$ Thousands		%	
Agriculture & Ag Services	328,125	7,200	2%	5,107	66	1%	80,062	1,948	2%					
Mining / Sand & Gravel	8,710	182	2%	97	2	2%	3,951	85	2%					
Construction	176,278	79	0%	2,179	1	0%	77,483	35	0%					
Food & Wood Processing	772,515	13,889	2%	2,614	37	2%	108,586	2,295	2%					
Other Manufacturing	596,518	102	0%	3,417	1	0%	161,302	30	0%					
Transportation	88,441	317	0%	826	3	0%	31,064	111	0%					
Public Utilities	10,854	58	1%	42	0	0%	1,738	9	1%					
Communications	31,413	25	0%	368	0	0%	10,649	9	0%					
Trade	265,108	812	0%	4,723	13	0%	118,528	352	0%					
Finance / Insurance / Real Estate	265,501	569	0%	2,326	6	0%	61,017	128	0%					
Hospitality Services	94,927	209	0%	2,723	6	0%	32,650	71	0%					
Consumer Services	108,471	411	0%	1,969	7	0%	41,957	149	0%					
Business Services	129,978	547	0%	2,210	8	0%	63,285	244	0%					
Other Services	326,705	665	0%	6,487	13	0%	186,592	380	0%					
Federal Government	96,802	24	0%	792	0	0%	47,689	20	0%					
State & Local Government	192,236	(1,058)	(1%)	2,047	(11)	(1%)	102,750	(565)	(1%)					
<b>TOTAL</b>	<b>3,492,580</b>	<b>24,034</b>	<b>1%</b>	<b>37,928</b>	<b>151</b>	<b>0%</b>	<b>1,129,303</b>	<b>5,299</b>	<b>0%</b>					



YAMHILL COUNTY Alternative 2	Industry Output		Industry Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		Thousands		Employment		%		\$ Thousands		%	
Agriculture & Ag Services	328,125	9,046	3%	5,107	82	2%	80,062	2,447	3%			
Mining / Sand & Gravel	8,710	280	3%	97	3	3%	3,951	130	3%			
Construction	176,278	120	0%	2,179	1	0%	77,483	53	0%			
Food & Wood Processing	772,515	20,023	3%	2,614	52	2%	108,586	3,370	3%			
Other Manufacturing	596,518	154	0%	3,417	1	0%	161,302	45	0%			
Transportation	88,441	465	1%	826	4	1%	31,064	162	1%			
Public Utilities	10,854	88	1%	42	0	1%	1,738	13	1%			
Communications	31,413	38	0%	368	0	0%	10,649	13	0%			
Trade	265,108	1,180	0%	4,723	19	0%	118,528	511	0%			
Finance / Insurance / Real Estate	265,501	833	0%	2,326	8	0%	61,017	186	0%			
Hospitality Services	94,927	308	0%	2,723	9	0%	32,650	105	0%			
Consumer Services	108,471	600	1%	1,969	10	0%	41,957	219	1%			
Business Services	129,978	802	1%	2,210	12	1%	63,285	360	1%			
Other Services	326,705	978	0%	6,487	19	0%	186,592	558	0%			
Federal Government	96,802	38	0%	792	1	0%	47,689	31	0%			
State & Local Government	192,236	(752)	0%	2,047	(8)	0%	102,750	(402)	0%			
<b>TOTAL</b>	<b>3,492,580</b>	<b>34,200</b>	<b>1%</b>	<b>37,928</b>	<b>216</b>	<b>1%</b>	<b>1,129,303</b>	<b>7,803</b>	<b>1%</b>			



YAMHILL COUNTY Alternative 3	Industry Output		Industry Change		Percent Change	Employment	Employment Change		Percent Change	Earnings		Percent Change
	\$ Thousands		Thousands				\$ Thousands					
Agriculture & Ag Services	328,125	4,835	1%	5,107	44	1%	80,062	1,308	2%			
Mining / Sand & Gravel	8,710	163	2%	97	2	2%	3,951	76	2%			
Construction	176,278	57	0%	2,179	1	0%	77,483	25	0%			
Food & Wood Processing	772,515	11,310	1%	2,614	30	1%	108,586	1,928	2%			
Other Manufacturing	596,518	85	0%	3,417	1	0%	161,302	25	0%			
Transportation	88,441	245	0%	826	2	0%	31,064	86	0%			
Public Utilities	10,854	47	0%	42	0	0%	1,738	7	0%			
Communications	31,413	18	0%	368	0	0%	10,649	7	0%			
Trade	265,108	612	0%	4,723	10	0%	118,528	264	0%			
Finance / Insurance / Real Estate	265,501	410	0%	2,326	4	0%	61,017	92	0%			
Hospitality Services	94,927	152	0%	2,723	4	0%	32,650	52	0%			
Consumer Services	108,471	312	0%	1,969	5	0%	41,957	113	0%			
Business Services	129,978	423	0%	2,210	6	0%	63,285	189	0%			
Other Services	326,705	476	0%	6,487	9	0%	186,592	272	0%			
Federal Government	96,802	17	0%	792	0	0%	47,689	14	0%			
State & Local Government	192,236	(1,218)	(1%)	2,047	(13)	(1%)	102,750	(651)	(1%)			
<b>TOTAL</b>	<b>3,492,580</b>	<b>17,943</b>	<b>1%</b>	<b>37,928</b>	<b>106</b>	<b>0%</b>	<b>1,129,303</b>	<b>3,806</b>	<b>0%</b>			



YAMHILL COUNTY PRMP	Industry Output		Industry Change		Percent Change		Employment		Percent Change		Earnings		Percent Change	
	\$ Thousands		\$ Thousands				Change		Change		\$ Thousands	Change		Change
Agriculture & Ag Services	328,125		2,614		1%		5,107		24		80,062	707		1%
Mining / Sand & Gravel	8,710		216		2%		97		3		3,951	101		3%
Construction	176,278		57		0%		2,179		1		77,483	25		0%
Food / Wood Processing	772,515		12,469		2%		2,614		32		108,586	2,259		2%
Other Manufacturing	596,518		101		0%		3,418		1		161,302	29		0%
Transportation	88,441		261		0%		826		2		31,064	91		0%
Public Utilities	10,854		55		1%		43		0		1,738	8		0%
Communications	31,413		18		0%		368		0		10,649	7		0%
Trade	265,108		618		0%		4,723		10		118,528	266		0%
Finance / Insurance / Real Estate	265,501		393		0%		2,326		4		61,017	88		0%
Hospitality Services	94,927		151		0%		2,723		4		32,650	52		0%
Consumer Services	108,471		320		0%		1,970		5		41,957	117		0%
Business Services	129,978		450		0%		2,210		7		63,285	204		0%
Other Services	326,705		458		0%		6,487		9		186,592	262		0%
Federal Government	96,802		17		0%		792		0		47,689	14		0%
State & Local Government	192,236		(1,028)		(1%)		2,047		(11)		102,750	(549)		(1%)
<b>TOTAL</b>	<b>3,492,582</b>		<b>17,171</b>		<b>0%</b>		<b>37,928</b>		<b>91</b>		<b>1,129,303</b>	<b>3,681</b>		<b>0%</b>





# Appendix E

## Timber



---

This appendix provides background on the analysis of timber valuation effects and the process for completing a 10-year scenario to verify the practicality of harvest scheduling the OPTIONS modeling results.

**In this appendix:**

Timber Valuation .....	144
Ten-Year Scenario Quality Check.....	147



## Timber Valuation

The estimate of the value of harvest produced by the different alternatives must take into account the volume and quality of the timber offered and the cost of harvest and transportation. The estimate of stumpage was completed for the analysis of the effects of the alternatives for the first 10 years. As the alternatives are projected forward beyond the first 10 years, changes would be expected in the receipt levels as the mix of sizes, quality, and tree species changes in response to the harvest of different stand types, growth of other stands, and the application of silvicultural practices.

Stumpage and receipts were calculated in the following manner:

Stumpage = Pond value – harvest and transportation costs.

- Pond value will be a weighted pond value inclusive of both the species mix and grade of logs anticipated from the different levels and types of harvest.
- Harvest and transportation costs will be an average by harvest type for each district. Receipts will be the sum of all stumpage prices multiplied by the corresponding log volumes.

## Analytical Assumptions

The following analytical assumptions were used in the analysis:

1. Prices and costs were calculated in constant dollars, set at 2005.
2. Costs, species composition, recovery and grade were developed using an historical reconstruction approach with a variety of base periods.
3. Costs were developed for each district by two harvest types, thinning and regeneration harvest. Sales were selected from a base period of 1996 through 2006. The first year of the forest plan (1995) was not used due to expected bias, since watershed analysis had not yet been completed on the majority of BLM-administered lands and no road construction could be undertaken in Riparian Reserves until the completion of watershed analysis for individual watersheds.
4. Sales that were actually offered were included as provided by the districts, in response to a data query. Sales where data was incomplete were excluded.
5. Sales were included regardless of whether or not they were actually awarded, implemented, or litigated. Volume-weighted averages by thinning and regeneration harvest were developed for each district to obtain a “standing tree to mill” cost including cutting, yarding, road construction, transportation, maintenance, miscellaneous and other costs used in the standard BLM appraisal methods. All costs were expressed in dollars per thousand board feet (MBF) for 16-foot short-log, Scribner scale. Costs varied considerably by district with the cost of hauling logs to the mills one of the more highly variable. Costs for thinnings were generally higher than for regeneration harvest.
6. Costs for thinning were used in the analysis for the thinning, uneven-age harvest, and partial harvest treatments described in Alternative 3.
7. A base size of approximately 1,100 million board feet was included to estimate costs, with a total cost of over \$390 million in 2005 dollars.



## Species Composition

Commercially valuable species compositions for the analysis were developed for each district, using an historical reconstruction technique. Volumes and percentages of volume by species were developed using the period 1990 through 2006 (in part) as the base period.

Analysis of the data in the species data base of TSIS (Timber Sale Information System), which is the BLM accounting and record keeping system for timber sales, indicates a high level of similarity of species between districts with the exception of the Klamath Falls Resource Area.

Douglas-fir is the dominant commercial species with all districts having a harvest percentage of Douglas-fir by volume at or near 80 percent. Stratifying the base period into pre-Northwest Forest Plan, (1990-1995), early Northwest Forest Plan (1996-2000), and current Northwest Forest Plan era (2001-2006) yields only minor changes in species composition of sales. This species percentage composition has remained generally constant despite a substantial change in the harvest types and ages harvested over these three periods.

No formal sampling method was used to select a sample of sales. Sales with missing or incomplete information were excluded. Some sales from the base period had been archived from TSIS, and were not included, as information was not available. Emphasis was placed on including large sales, as well as those from pre-Northwest Forest Plan years. Sales of less than one million board feet and those consisting of primarily fire salvage were excluded.

## Log Quality

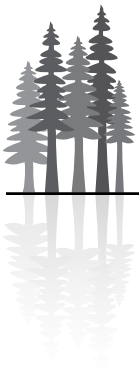
Log quality was estimated using historical reconstruction of log grades weighted by volume. Few sales were available in older forest types across the districts for the Northwest Forest Plan era, so sales from 1985-1990 were used to develop estimates for harvest of older timber, with the exception of the Coos Bay District, where no records for this time could be located. For the Coos Bay District, the base period of 1970-1975 was used.

Sales were included when the data was available, complete and legible. Sales of less than one million board feet were excluded, as were certain salvage sales where species bias was likely. With the exception of the Klamath Falls Resource Area, 150-300+ MMBF were included in the reconstruction base for each district.

District cruiser estimates were used for grade breaks in thinnings where the price differences between lower sawlog grades are low.

Four types of forest stands were used to estimate quality by percent of volume:

- 1. Thinning stands.** These were typically commercial thinning or density management treatments designed to remove/prevent suppression mortality and improve stand composition, vigor or value. Cruiser estimates of sawlog grade percentages were used for these stands, in particular the DF-4 sawlog.
- 2. Regeneration or clearcut treatment in young stands.** These are typically stands less than 80-100 years of age depending on site quality. A modest number of pre-Northwest Forest Plan stands were available for this estimation, and some Northwest Forest Plan regeneration harvests fall within this category.
- 3. Mature stands.** These are generally older than 80-100 years, typically dominated by one species, and generally of higher overall density. These stands correspond to the mature structural stage.
- 4. Structurally complex.** These stands are typically older than 150-200 years and correspond to the structurally complex structural stage.



A more complete description of these structural stages is contained in *Appendix B - Forest Structure and Spatial Pattern*.

For each district, average percentages by log grade for each of these structural classes were prepared for Douglas-fir, ponderosa pine, white fir, and sugar pine. Other species were estimated using a camp run method with no grade differentiation. Analysis of the data indicates that higher log grades in other than these four species are rare.

The sales used as a basis were classified by structural stage class (described above) using a combination of local knowledge, species composition, average log size in board feet, and average number of Douglas-fir trees per acre. Typically, stands with more than 100 trees per acre and an average log volume of less than 100 board feet would be in the “young” stand classification. The “structurally complex” class would contain stands with less than 40 trees/acre of the dominant species and average log volume generally greater than 200 board feet. The “mature” stand class would be between these figures. These levels differ by district based on differences in site productivity. Volume-weighted percentages of grades were then developed by structural classes and by district.

## Preparation of Weighted Pond Values

Species composition were assumed to be similar for both regeneration harvest and thinning harvest.

Species were consolidated into commonly used groups for which prices were available. For example, true firs and hemlocks were consolidated into “white wood.”

For Douglas-fir, sugar pine, white fir, and ponderosa pine, prices were a weighted average by grade for the stand categories of young, mature, and structurally complex.

Prices for species and grades, where applicable, were averaged levels for calendar year 2005 for commonly priced groups, using data obtained from Log Lines Log Price Reporting Service (published monthly) P.O. Box 2215, Mount Vernon, WA 98273, [loglines@fidalgo.net](mailto:loglines@fidalgo.net).”

Weighted pond values for each district were then prepared for young, mature and structurally complex stand classes using the pricing groups, grade weighted prices for Douglas-fir, sugar pine, white fir, and ponderosa pine, and consolidated percentages for grouped species such as true firs and hemlocks with their associated camp run prices. Log volumes and prices published in Log Lines are based on 32-foot long-log volumes. The BLM volumes are expressed in 16-foot short-log, Scribner scale. Conversion factors used to adjust prices to 16-foot short-log were 0.8 for sawlog grades and 0.85 for peeler grades.

The above matrix of weighted pond values were held in 2005 dollars for the 10-year estimate of stumpage, receipts, and costs.

## Preparation of Stumpage and Receipt Estimation

For each district, each harvest type and each stand structural stage matrix was prepared, which subtracted harvesting costs from weighted pond values. Thinning costs were used for the partial harvest in Alternative 3 due to the anticipated difficulties associated with this type of harvest in mature and structurally complex stands.

After a matrix of stumpage values for the various treatments and stand categories was prepared, anticipated receipts were calculated by multiplying the stumpage value per thousand board feet by the corresponding harvest level by structural stage to obtain a total expected price for the 10 years.



No correction for the “delay” in harvest after sale was made. After a sale is sold and executed, a delay in sale receipts will normally occur since receipts are not generated until harvest occurs. This may be immediately after execution, or may be delayed depending on seasonal requirements, sale specifications such as required construction, or market conditions. Similarly, no delay was assumed for litigation of individual sales.

## Ten-Year Scenario Quality Check

The ten-year scenario was used to verify the practicality of the harvest scheduling as modeled and to assist in estimating the effects of harvest on other resources through estimates of road construction and acres harvested by harvesting method.

The ten-year scenario was a simulation to serve as a single scenario for how harvest scheduling could occur in the first decade. There are a large number of possible scenarios that could occur in the first decade in terms of both harvest locations and harvest types. This single scenario was used to estimate and compare the effects of the alternatives and is only intended to be representative of the implementation of the plan for the first decade. It is not intended to be used to predict or decide locations of actual harvest units.

## Methodology

After harvest units were modeled by OPTIONS as harvested in the first 10 years, the locations and harvest types were mapped with accompanying tables of information. These maps were distributed to the districts for analysis. District planners and others familiar with harvest unit design and road systems developed road locations and harvest methods for the selected units. These designs were captured in a Geographic Information System mapping database and assembled for analysis.

The OPTIONS model selected units for harvest based on a Western Oregon Plan Revisions identification (WOPR ID) number. These WOPR ID units are polygons in the Geographic Information System database. They are typically subdivisions of the Forest Operations Inventory polygons, and are formed by the intersection and overlay of a variety of Geographic Information System layers or themes such as roads, streams, etc. (See *Appendix R - Vegetative Modeling* for further information.)

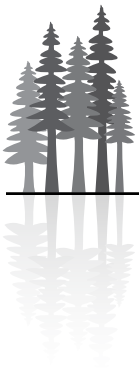
Planners examined the sampled WOPR ID units (see below) as these ID units were formed into logical larger harvest units where the WOPR ID units are contiguous. Planners then used a variety of Geographic Information System themes (such as elevation contours, streams, ownership boundaries, etc. and local knowledge) to locate and document existing roads and to estimate the new road construction needed for access, location of landings to be constructed, and the harvest method (ground-based, cable/skyline, or helicopter) to be used.

After these Geographic Information System themes were completed, the layers were assembled and overlain to perform analysis at a variety of scales.

## Sampling

Since the ten-year scenario was a simulation, these methods provided an estimate of miles of new road construction, acres of ground-based harvest, and number of new stream crossings.

In order to develop the estimates in a reasonable time and with a reasonable level of effort, a sampling method was developed to select a portion of the simulated units for analysis.



Sections where harvest occurred within the ten-year scenario were sampled at a 1 in 3 random sample. Results from this sampling were developed as ratios such as miles of new road construction per million board feet for both thinning and regeneration harvest. These ratios were then expanded to the entire population to yield estimates of the amount for the entire harvest over the next 10 years.

Sampling a particular township, range, and section was not stratified. That is, all sections where at least one WOPR ID unit was harvested had an equal chance of being sampled independent of the size of harvest within that section and independent of the acres of BLM-administered land within that section.

Although units were selected by section, examination of the results show that many metrics, such as acres sampled or volume sampled, were within a few percent of the expected values of 33 percent. Actual expansion was based on the sampled volume level.

The ratios developed were split by district, alternative, harvest type (thinning/regeneration harvest), and road type (temporary/permanent and surfaced/natural). These ratios were then expanded to estimate the total miles of road by road and harvest type, the acres disturbed from construction, etc. After these ratios were developed, they were prorated to other units for expansion.

For the PRMP, road ratios and harvesting system percentages that were developed for No Action Alternative, Alternative 1, Alternative 2, Alternative 3, and a set of potential mitigations for Alternative 2 were averaged using volume weighting. These averaged ratios were used to project the expected harvesting system and road construction levels for the PRMP. These previous alternatives provided an extensive array of sampled harvest units, and no further improvement in estimation was expected by additional sampling.

# Appendix F

## Botany



This appendix provides a list of federally listed and candidate plant species and actions and plans related to federally listed and BLM special status plant species. It also includes a list of special status plants and fungi by habitat group. The analysis of effects for special status plant and fungi species is based on using these habitat groups.

### **In this appendix:**

Federally Listed and Candidate Plant Species . . . . .	150
Digest of Actions Contained in Individual Recovery Plans and Conservation Agreements . . . . .	152
Digest of Conservation Plans for Special Status Plants . . . . .	155
Habitat Groups . . . . .	158



# Federally Listed and Candidate Plant Species

Following is a list of federally listed and candidate plant species found in the planning area.

**TABLE F-1. FEDERALLY LISTED AND CANDIDATE PLANT SPECIES.**

Federal Status	Species	Common Name	Critical Habitat Designation	Recovery Plan	Conservation Agreement
FTO	<i>Castilleja levisecta</i>	Golden paintbrush	Not Designated	August-00	
FTO	<i>Howellia aquatilis</i>	Water howellia	Not Designated	Draft 1996	
FTO	<i>Lupinus sulphureus</i> ssp. <i>kincaidii</i>	Kincaid's lupine	Designated		2006
FTO	<i>Sidalcea nelsoniana</i>	Nelson's checker-mallow	Not Designated	September-98	
FEO	<i>Arabis macdonaldiana</i>	MacDonald's rock-cress	Not Designated	1990	
FEO	<i>Astragalus applegate</i>	Applegate's milk-vetch	Not Designated	April-98	
FEO	<i>Erigeron decumbens</i> var. <i>decumbens</i>	Willamette Daisy	Designated		
FEO	<i>Fritillaria gentneri</i>	Gentner's fritillary	Not Designated	July-03	
FEO	<i>Lilium occidentale</i>	Western Lily	Not Designated	March-98	
FEO	<i>Limnanthes floccosa</i> ssp. <i>grandiflora</i>	Agate desert meadowfoam	Not Designated	Draft 2006	
FEO	<i>Lomatium bradshawii</i>	Bradshaw's desert parsley	Not Designated	August-93	
FEO	<i>Lomatium cookii</i>	Cook's lomatium	Not Designated	Draft 2006	2002
FEO	<i>Plagiobothrys hirtus</i>	Rough popcorn-flower	Not Designated	July-03	
FCO	<i>Calochortus persistens</i>	Siskiyou Mariposa lily	Not Designated		

FTO = Federally Threatened Oregon FEO = Federally Endangered Oregon FCO = Federal Candidate Oregon





M07-10-01

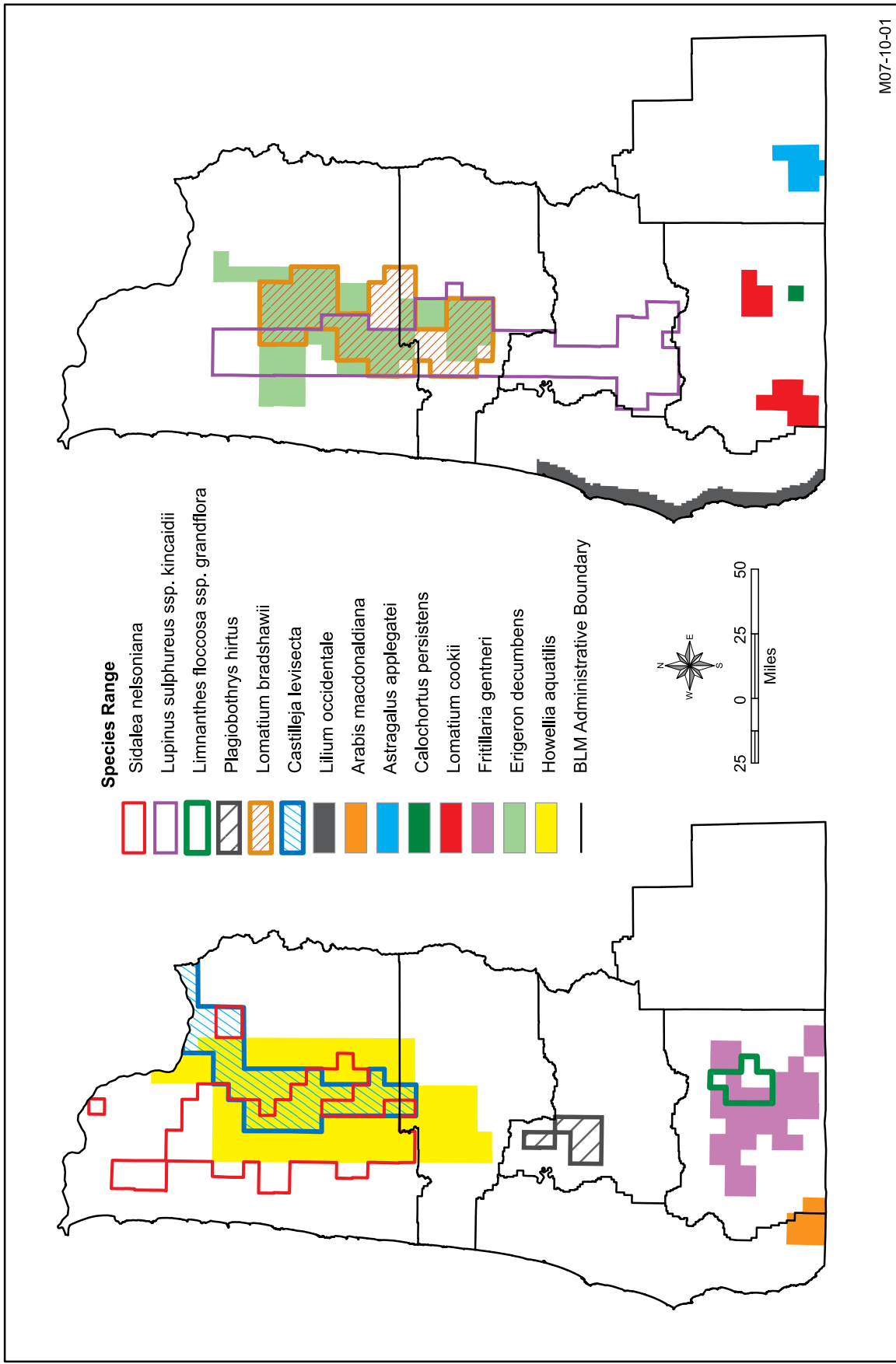


FIGURE F-1. FEDERALLY LISTED PLANTS



# Digest of Actions for Federally Listed Plant Species Contained in Recovery Plans and Conservation Agreements

## Recovery Plans and Recovery Actions

Recovery Plans for eight federally listed plant species have been completed and published by the U.S. Fish and Wildlife Service. The individual recovery plans are incorporated by reference and each stands on its own with a complete list of recovery actions. Conservation agreements were completed between the BLM and the U.S. Fish and Wildlife Service for Kincaid's lupine in 2006 for populations in Douglas County and Cook's lomatium in 2002 for populations in the Illinois Valley, Oregon.

The bulleted lists of conservation actions for each species are excerpts from each individual recovery plan and conservation agreement. The excerpts describe activities that would occur on the ground. The key elements vary by species and by recovery plan or agreement, and are not a comprehensive list of all actions. These recovery plans were written by numerous authors over a period of 20 years and vary in detail.

### **Nelson's checker-mallow (*Sidalcea nelsoniana*)**

(U.S. Fish and Wildlife Service. 1998.)

- Preserve and establish total of 18 reserves to manage for the recovery of the species.
- Actively manage habitat within reserves to achieve natural recruitment, population size and age structure; within each habitat reduce succession, competition and anthropogenic threats.
- Augment populations, collect seed, and propagate seedlings.
- Conduct population genetics studies.
- Create an outreach program for private landowners.

### **Rough popcorn-flower (*Plagiobothrys hirtus*)**

(U.S. Fish and Wildlife Service. 2003.)

- Conserve all existing populations and manage reserves within recovery areas for long-term viability of the species.
- Protect habitat within reserves including habitat for pollinators.
- Manage existing sites by reducing competition and impacts from native and nonnative species.
- Develop new populations in recovery units and augment existing populations by planting or seeding areas.
- Evaluate species genetic diversity.

### **Western lily (*Lilium occidentale*)**

(U.S. Fish and Wildlife Service. 1998.)

- Search for additional sites and potential suitable habitat.
- Protect all known populations.
- Control insect herbivory and disease outbreaks.



- Manage sites to enhance the habitat so that existing populations will naturally increase. Remove over-topping vegetation.
- Establish, delineate and secure management areas that include all necessary habitat and plants to sustain a viable population.
- Determine genetic diversity and effective population sizes for all populations
- Maintain representative seed bank; reintroduce or augment populations as prudent.
- Allow grazing with minimal negative effects to the lily, or suspend during the flowering and fruiting season as prudent.
- Conduct a public outreach program.

### **Gentener's fritillary (*Fritillaria gentneri*)**

(U.S. Fish and Wildlife Service. 2003.)

- Establish 8 management areas within 4 recovery units to provide for long-term maintenance or improvement of habitat.
- Develop protection strategies to reduce successional encroachment and shading, curtail new roads in habitat, control and prevention of invasive weed colonization, reduction of herbivory by deer and livestock, prevention of public bulb collection.
- Augment populations as needed to meet recovery criteria.
- Study genetic diversity and vegetative morphology of the species
- Collect and cultivate bulblets for augmentation within management areas, develop and establish germplasm bank.
- Survey for undiscovered populations in suitable habitat.
- Provide private landowners with assistance to manage *F. gentneri* habitat

### **Bradshaw's desert parsley (*Lomatium bradshawii*)**

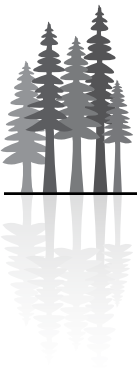
(U.S. Fish and Wildlife Service. 1993.)

- Secure and manage habitat within 4 recovery areas
- Establish 10 management areas, develop management plans, secure and protect the habitat supporting each population, and implement site specific plans.
- Enhance populations within management areas by reducing threats to the species. Manage secondary succession, habitat modification, competition from native and introduced species, removal of trees altering soil conditions, insect and fungal diseases, human impacts, herbicide impacts, and grazing impacts.
- Locate additional sites by identifying potential habitat and conducting searches for additional populations.
- Supplement existing seed bank and conduct life history, population, reproduction and genetics studies of the species.

### **McDonald's rock-cress (*Arabis mcdonaldiana*)**

(U.S. Fish and Wildlife Service. 1990.)

- Protect and conserve all existing populations and habitat.
- Identify and protect essential habitat.
- Survey additional suitable habitat.



- Withdraw lands from mining, designate as “special areas”, and acquire suitable habitat where possible.
- Conduct reproduction biology studies.
- Create a public awareness program.

### **Golden paintbrush (*Castilleja levisecta*)**

(U.S. Fish and Wildlife Service. 2000.)

- Maintain the current geographic distribution of the species by maintaining habitat integrity.
- Implement habitat management that includes: protection of sites with the best potential for providing long-term stable habitat, and maintenance of unoccupied, potential habitat in suitable condition.
- Establish new populations within the historic range of the species.
- Conduct inventory surveys for undiscovered populations in suitable habitat.
- Determine genetic variation, population dynamics and clarify reproductive biology aspects.
- Collect seed and reintroduce populations into unoccupied habitat in its former range.
- Promote conservation of existing habitat through collaboration with private landowners and public outreach program.

### **Applegate’s milk-vetch (*Astragalus applegate*)**

(U.S. Fish and Wildlife Service. 1998.)

- Search for and inventory undiscovered populations.
- Collect seed, propagate plants to establish introduced populations and augment existing populations.
- Conserve natural and introduced populations.
- Establish 6 recovery areas and develop management strategies for long-term stability.
- Manage the habitat of each population to achieve the desired population size and age structure, to encourage natural population recruitment and to minimize adverse impacts to populations.
- Conduct ecological and demographic studies.
- Implement an outreach program.

### **Water howellia (*Howellia aquatilis*)**

(U.S. Fish and Wildlife Service. Draft 1996.)

- Maintain the extant geographic range and habitat integrity to ensure functioning of meta-population dynamics.
- Habitat management should include the following key components: the maintenance of the natural vegetation, hydrologic, and geomorphologic conditions that determine the natural habitat succession rates and seasonal inundation and drying patterns of the habitat.
- Secure habitat through partnerships with private landowners and provide protection on federal lands through special management designations such as Research Natural Areas or other designations.
- Conduct inventories in suitable habitat throughout the range of the species
- Elucidate threats, as well as genetics and population biology characteristics.
- Develop and implement a reintroduction plan.



## Conservation Agreements

### Kincaid's lupine (*Lupinus sulphureus ssp. kincaidii*)

(Roseburg District BLM, U.S. Fish and Wildlife Service and USDA Forest Service Umpqua National Forest. 2006.)

- Maintain stable populations by protecting and restoring habitat of each population and by reducing threats.
- Conserve a minimum of two meta-populations within the recovery zone in Douglas Co.
- Conserve a minimum of 5,000 m<sup>2</sup> of occupied habitat.
- Survey suitable habitat for new populations and manage habitat to meet recovery goals.
- Create new reserve populations; protect and manage them to address threats and increase the meta-population size.
- Evaluate genetic variability; introduce and/or augment populations into suitable habitat.

### Cook's desert parsley (*Lomatium cookii*)

(Medford District BLM, U.S. Fish and Wildlife Service. 2002.)

- Manage all Cook's lomatium populations and associated habitat within Illinois Valley, OR.
- Protect significant biological and ecological values of populations and habitats.
- Protect populations from human activity, recreation and mining activity.
- Manage occupied habitat to reduce increasing cover.
- Pursue mineral withdrawal within French Flat ACEC and other occupied sites.
- Collect seed from populations.
- Survey additional suitable habit to determine distribution.
- Collect population demographic data to determine population trends.

## Digest of Conservation Plans for Special Status Plants

The lists below summarize the primary actions described in the agreements and strategies for Bureau sensitive species that would be applied on BLM managed lands. These lists are not intended to be complete and comprehensive. The conservation agreements and conservation strategies of each species are the documents that provide complete details and guide the management of the species.

## Conservation Strategies

### Gorman's Aster (*Aster gormanii* - new name: *Eucephalus gormanii*)

(1994 Interagency: Salem BLM; Willamette and Mt. Hood National Forest.)

- Maintain healthy reproductive populations at a variety of sites.
- Protect populations from immediate threats to their existence, such as: grazing by livestock or wildlife, habitat loss from timber harvest operations, road construction, quarrying and recreation.



- Ensure maintenance of suitable microclimate in timber-harvest sites by buffering *A. gormanii* populations.
- Inventory suitable habitat of the species and collect baseline data on habitat requirements and vegetation community characteristics.

### **Silvery Phacelia** (*Phacelia argentea*)

(1995 Coos Bay District, BLM)

- Survey suitable habitat for new populations and update information of existing populations including threats and habitat.
- Monitor population demography and changes to the habitat.
- Improve occupied habitat and protect known populations from OHV use, European beachgrass infestation.
- Collect seed for long term conservation.

### **Green Gentian** (*Frasera umpquaensis*)

(1993 Interagency: Eugene and Medford BLM; and Rogue River-Siskiyou, Willamette, and Umpqua National Forests)

- Ensure the continued viability of the species by designating all populations on BLM lands as critical to maintain viable, genetically stable populations.
- Monitor and collect demographic data of selected populations.
- Protect populations from timber harvest operations, encroachment of trees into meadows, and fire suppression.
- Conduct field reconnaissance and survey for *F. umpquaensis* populations in potential habitat.
- Research phenology, pollination, seed biology, and genetic variation of the species.

### **Columbia cress** (*Rorippa columbiae*)

(1996 Interagency: Spokane, Burns, and Lakeview BLM; Winema, Shasta-Trinity, and Modoc National Forests; Klamath Basin National Wildlife Refuge; and California Department of Fish and Game)

- Employ one or more of the following actions to protect this species from livestock grazing and trampling: fence habitat and known populations, provide alternative water sources for cattle, alter grazing schedules to avoid the growing season of *R. columbiae* (April-October), and reduce or eliminate the number of livestock in the grazing unit.
- Allow higher water levels in early spring to reproduce the scouring effects of floods to help control the establishment of woody and weedy species.
- Provide populations with a 200-300 foot buffer near timber harvest sites.
- Install gates and signs to manage access by vehicles.
- Conduct inventory for potential habitat and undiscovered populations.
- Protect local hydrologic function by avoiding habitat changes when implementing erosion control, timber harvests and road construction projects.
- Control competing herbaceous vegetation and invading tree species.

### **Tall Bugbane** (*Cimicifuga elata*)

(1996 Interagency: Eugene, Roseburg, Salem and Medford BLM; Rogue River-Siskiyou, Willamette, Mt. Hood and Umpqua National Forests; U.S. Army Corps of Engineers)



- Establish a system of Selected Populations representing a cross-section of sizes and habitats throughout the species' range and essential for its long-term viability.
- Manage and enhance habitat at the selected sites to maintain population viability:
- Mitigate direct and indirect impacts, including: alterations in hydrology, canopy closure, changes in habitat from timber harvest, and road building in order to create and maintain conditions favorable for the *C. elata*.
- Management for non-selected populations is discretionary;
- Improve the quality of existing habitat through broadcast burning and thinning to create and maintain forest gaps;
- Collect seeds and fruits for long term storage and potential future propagation;
- Install signs and protect populations within road right of ways. Restrict blading and ditching activities that would harm populations;
- Salvage plants for relocation when protection is not possible;
- Identify suitable habitat where reintroductions would benefit the species; and
- Monitor *C. elata* populations and inventory in suitable habitat.

## Conservation Agreements

### Wayside Aster (*Eucephalus vialis*; old name *Aster vialis*)

(2006 Interagency: Eugene, Roseburg and Medford BLM, Rogue River-Siskiyou National Forest; USFWS Roseburg Field Office)

- Elucidate taxonomy of *E. vialis* thorough morphology and genetics.
- Verify occurrences, conduct additional field surveys to describe habitat characteristics and population sizes.
- Survey for additional populations.
- Study response of *E. vialis* to disturbances.
- Enhance existing habitat of selected *E. vialis* populations.
- Share acquired data with interested agencies.
- If needed, outline additional actions through a Conservation Strategy.

**Large-flowered rush lily** (*Hastingsia bracteosa*), **Purple-flowered rush lily** (*Hastingsia atropurpurea*), **Mendocino gentian** (*Gentiana setigera*), **Oregon willow-herb** (*Epilobium oregonum*), and **Western bog violet** (*Viola primulifolia* ssp. *occidentalis*)

(2006 Interagency: Coos Bay and Medford BLM; Rogue River-Siskiyou and Six Rivers National Forests; Arcata and Roseburg USFWS)

- Provide conservation for five rare plant species and their serpentine wetland habitat, known as Darlingtonia californica fens.
- Inventory to identify new suitable and/or occupied habitat.
- Manage the Darlingtonia fens and protect their significant biological and ecological functions and values.
- Protect Darlingtonia fens from threats such as: mining activities, road construction and maintenance, up slope logging, OHV use, fire suppression activities, water siphoning, over utilization for commercial, recreational, scientific or educational purposes, and from several invasive and noxious weed species. Monitor known sites, conduct additional inventory and surveys for all five taxa.



- Reduce risk of Port-Orford-root rot disease on *Darlingtonia fens*.
- Research habitat restoration measures, including fire, on *Darlingtonia fens*.

### **Crinite Mariposa Lily (*Calochortus coxii*)**

(2004 Interagency: Roseburg and Medford BLM; Umpqua National Forest; USFWS)

- Monitor selected populations to detect possible declines in habitat quality and / or demography.
- Limit mining activity within the habitat.
- Identify habitat fire frequency requirements.
- Restore *Calochortus coxii* meadow habitat with native bunchgrasses and/or prescribe burn on a frequency matching natural fire return level. Thin or girdle trees to produce gaps in forest habitat.
- Inventory and control invasive and noxious weeds using integrated pest management (mechanical, manual, biological, and chemical methods).
- Exclude livestock inside habitat of *C. coxii*.
- Collect seeds for long term conservation and propagation.

### **Umpqua Mariposa Lily (*Calochortus umpquaensis*)**

(1995 Interagency: Roseburg BLM and USFWS)

- Acquire habitat on private lands to increase the amount of habitat in Federal ownership.
- Mitigate impacts from energy right of way and corridors.
- Manage livestock grazing and vehicle access inside habitat by installing gates and fences.
- Maintain and restore *Calochortus umpquaensis* meadow habitat with native bunchgrasses or other native species.
- Conduct prescribed burning and thinning to produce gaps in forest habitat.
- Conduct inventories of potential habitat.
- Monitor populations.

## **Habitat Groups**

For the analysis of effects, special status plant species were categorized based on habitat relationships as shown in Table F-2. A species can occur in more than one habitat group. The national, state, agency rankings are shown in Table F-3.

Habitat Groups and Abbreviations are as follows:

MG=Meadows/Grassland, SC=Shrub Community, OHW=Oak/Hardwood Woodlands, CF=Conifer/Mixed Evergreen Forest, SW=Seasonal Wetland Fens/Vernal Pools, RI=Riparian and Aquatic, SE=Serpentine Areas, RK=Rocky Areas Outcrops/Scree, MZ=Maritime Zone

Federal, State, and Bureau Status and abbreviations are as follows:

FEO=Federally Endangered Oregon, FTO=Federally Threatened Oregon, FC=Federal Candidate, FSC - Federal Species of Concern, SEO= State Endangered Oregon, STO=State Threatened Oregon, SC - Species of Concern, BSO=Bureau Sensitive Oregon,





Taxon and abbreviations are as follows:

VA=Vascular, FU=Fungi, BR=Bryophyte, LI=Lichen

BLM district abbreviations:

**BLM District Codes CB=CoosBay District, EU=Eugene District, KF=Klamath Falls Resource Area,  
MD=Medford District, RO=Roseburg District, SA=Salem District**

Species occurrences by BLM district:

D - Documented, S - Suspect



TABLE F-2. SPECIAL STATUS PLANT AND FUNGI SPECIES

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
BR	<i>Andreaea schrofieldiana</i>	Moss		CF, RK	Dry rock outcrops; moderate elevations, acidic rock, granite in conifer stands. <sup>a</sup>
BR	<i>Bryum calobryoides</i>	Moss	6-20 known populations	RI, RK	Forming sods or occurring as individuals among other mosses, on acid and basic rocks and soil in shaded to exposed; montane to alpine meadows, cliffs, outcrops and boulder fields; 915-2130 m. <sup>a</sup>
BR	<i>Calyptogeia sphagnicola</i>	Liverwort		SW, SE	Usually restricted to poor fens containing Sphagnum, acidic fen habitats, and in a fen on ultramafic soils. <sup>a</sup>
BR	<i>Campylopus schmidii</i>	Moss		CF, RI, SW, MZ	Nutrient-poor sandy substrates near the coast; forms sods in open stands of shore pine and <i>Cupressus governiana</i> ssp. <i>pigmaea</i> ; grows on shaded to exposed sand around the edges of vernal pools; on exposed, seasonally-flooded sand on deflation plains. <sup>a</sup>
BR	<i>Chiloscyphus gemmiparus</i>	Liverwort		CF, RI	Forming small turfs or clumps on rocks in beds of cold montane streams, submerged or emergent in the splash zone, full shade to partial sun; 1525-2130 m. <sup>a</sup>
BR	<i>Codiophorus depressus</i> - name change from <i>Racomitrium depressum</i>	Moss		CF, RI, OHW	Forming mats on rocks in perennial or intermittent streams, and in the spray zone of waterfalls; habitats subject to scour at high water; conifer and hardwood forests; 120-3350 m. <sup>a</sup>
BR	<i>Cryptomitrium tenerum</i>	Liverwort		CF, RK, RI	Forming small to locally extensive mats on bare, usually shaded and humid soil on hillsides, rock outcrops, and streambanks; root balls and outbanks are favored habitat in forests; >1180 m. <sup>a</sup>
BR	<i>Diplophyllum plicatum</i>	Liverwort	Habitat associated with older conifer forests	CF, RI, RK	Cool, moist habitats, decayed wood, downed logs, trunks, soil and rocks, moist shaded cliffs, along rivers and stream banks; narrow environmental specificity-high humidity and perennially cool temperatures. <sup>b</sup>
BR	<i>Encalypta brevicollis</i> - variety no longer recognized ( <i>E. brevicolla</i> var. <i>crumiana</i> )	Moss		RK	Grows on soil in shaded crevices in igneous rocks, along ridgetops subject to frequent fog penetration; single site in OR/WA. <sup>b</sup>
BR	<i>Encalypta brevipes</i>	Moss		RK	Grows on soil on ledges and in crevices on cliffs, usually on igneous or siliceous rocks; sites subject to frequent fog penetration. <sup>a</sup>
BR	<i>Entosthodon fascicularis</i>	Moss	< 6 known populations	RI, MG, OHW, SC, RK	Individual plants or forming small sods on seasonally wet, exposed soil in seeps or along intermittent streams. Habitats are grassland, oak savanna, grassy balds, and rock outcrops; < 915 m. <sup>a</sup>
BR	<i>Ephemerum crassinervium</i>	Moss	< 6 known populations	SW	Vernally moist soil, especially wet prairies. Willamette Valley and the edge of Fern Ridge Reservoir. <sup>c</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
BR	<i>Gymnomitrium concinnatum</i>	Liverwort		CF, RK	On peaty soil of cliffs and rock outcrops, full exposure or shaded; found in subalpine parkland areas in <i>Tsuga mertensiana</i> and <i>Abies lasiocarpa</i> associations; 100-1830 m. <sup>a</sup>
BR	<i>Helodium blandowii</i>	Moss		CF, SW, MG	Vernally moist, sparsely wooded areas, meadows and grasslands on rocky clay, generally ultramafic. <sup>a</sup>
BR	<i>Herbertus aduncus</i>	Liverwort		CF, RK	Exposed montane, windswept sites, in generally moist, protected microsites on rock outcrops, in crevices, and on ledges, wedged among stones or roots. <sup>b</sup>
BR	<i>Iwatsukiella leucotricha</i>	Moss	Habitat associated with older conifer forests	CF, MZ	Restricted to forests along maritime fog or cloud interception areas with high relative humidity, coastal ridges that usually have older, true fir present. <sup>d</sup>
BR	<i>Kurzia makinoana</i> (*)	Liverwort	< 6 known populations. Habitat associated with older conifer forests	CF, RI	On well-shaded, rotten wood and humic soil at low elevations, especially on stream terraces, floodplains, wetlands, and other cool, moist forest locations; associated with old-growth forests near riparian areas. <sup>b</sup>
BR	<i>Limbella fryei</i>	Moss		CF, RI, MZ	Forming sods to 3 feet in diameter on wet rotten wood, leaf litter and lower trunks of tall shrubs, in dense coastal shrub swamps; < 60 m. <sup>a</sup>
BR	<i>Lophozia laxa</i>	Liverwort		MZ, SW	Restricted to well-developed hummocks of Sphagnum in fens and bogs in full sun to partial shade along the coast and in the Cascade Range; < 150 m. <sup>a</sup>
BR	<i>Meesia uliginosa</i>	Moss	< 6 known populations	MG, RI	Forming turfs in medium to rich montane fens on saturated ground, usually in full sunlight; 1525-1830 m. <sup>a</sup>
BR	<i>Metzgeria violacea</i>	Liverwort		CF, MZ	Forming mats or mixed with other bryophytes on trunks of trees and shrubs in coastal rainforest; rarely on rotting wood or igneous rocks; usually in cool, moist riparian areas or shaded north-facing talus slopes and outcrops; scarce to locally abundant; full shaded to partial sun; < 300 m. <sup>a</sup>
BR	<i>Orthodontium pellucens</i>	Moss	Habitat associated with older conifer forests	CF, MZ	Forming dense cushions or mats on stumps, rotten logs and bark of living redwood trees, confined to redwood groves near the Pacific Ocean. <sup>a</sup>
BR	<i>Polytrichum sphaerothercium</i>	Moss		CF, RK	Forms green to brown sods on igneous rocks in exposed or sheltered sites, subalpine parkland to alpine krummholz. <sup>a</sup>
BR	<i>Porella bolanderi</i>	Liverwort	< 6 known populations	CF, RK, OHW	Forming shaded to partly exposed mats on a variety of rock types (siliceous, calcareous, and metamorphic) and trunks of <i>Quercus</i> , <i>Umbellularia</i> , and <i>Acer macrophyllum</i> ; 150-915 m. <sup>a</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
BR	<i>Pseudocalliergon trifarium</i> - name change from <i>Calliergon trifarium</i>	Moss		SW	Forming lawns or intermixed in medium to rich montane fens where it grows submerged to emergent in pools or on saturated ground, usually in full sunlight; fen pools may dry up in late summer; 1525-1830 m. <sup>a</sup>
BR	<i>Rhizomnium nudum</i> (*)	Moss	Habitat associated with older conifer forests	CF, RI	Moist conifer forest from mid to high elevation; humus and mineral soils in seepages, on soil over rock in the splash zone of a stream, and in vernal wet areas associated with forest depressions or ephemeral low gradient channels; full sun to full shade in dense forest stands. <sup>e</sup>
BR	<i>Rhytidium rugosum</i>	Moss		RK	Forming loose mats over dry, exposed rocks or soil, usually on the sides and tops of bluffs and cliffs, at middle to higher elevations; often subject to fog penetration; on calcareous, and basic and basalt substrates. <sup>a</sup>
BR	<i>Schistostega pennata</i> (*)	Moss	6-20 known populations Habitat associated with older conifer forests	CF, RI	Occurs on mineral soil in crevices on the lower and sheltered parts of the root mass of fallen trees; on soil around cave entrances in low light; along the edge or margin of the stream or wet area, stream terraces or lower slopes and where soils are relatively moist and humidity is high. Generally old-growth conifer stands. <sup>f</sup>
BR	<i>Scouleria marginata</i>	Moss	< 6 known populations	RI, RK	Occurs on bedrock material or very large boulders along the margins of perennial river systems; frequently submerged but is usually exposed during periods of low water flow; rock material is large granitic or volcanic that does not move during turbulent floodwater events; > 1200 m. <sup>g</sup>
BR	<i>Splachnum ampullaceum</i>	Moss		RI	Forming green sods on old dung of herbivores, or on soil enriched by dung, in peatlands or wetlands; plants in Oregon occurred in fens. <sup>a</sup>
BR	<i>Tayloria serrata</i>	Moss		CF, OHW	Forming green sods on old dung, rotten wood, or on soil enriched by dung on roadsides, trails, in dry to moist coniferous forest of various age classes including early seral, and in wetlands. <sup>a</sup>
BR	<i>Tetraphis geniculata</i> (*)	Moss	< 6 known populations Habitat associated with older conifer forests	CF	Found on large, legacy logs or stumps, decay class three, four and five, and occasionally on peaty banks; generally in old-growth conifer stands in cool moist micro-climate areas from sea level to subalpine elevations. <sup>h</sup>
BR	<i>Tetraplodon mnioides</i>	Moss	6-20 known populations	CF, SW	Forming stiff, densely-packed sods on old carnivore dung, or soil and rotten wood enriched by dung, on roadsides, trails, in dry to moist coniferous forest, and in peatlands. <sup>a</sup>
BR	<i>Tomentypnum nitens</i>	Moss		CF, RI	Forming loose or dense sods or intermixed with other bryophytes in medium to rich montane fens; favors slightly elevated sites such as logs, stumps, or hummocks formed by huckleberry and bog birch; 1525-1830 m. <sup>a</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
BR	<i>Tortula mucronifolia</i>	Moss		CF, RK	Forming small turfs or cushions on soil, tree roots, and sheltered ledges and crevices of rock outcrops and cliffs in conifer forests; 1525-2130 m. <sup>a</sup>
BR	<i>Trematodon boasii</i>	Moss		CF, RI	Forming loose mats on moist bare soil along the edges of trails, streams and ponds; subalpine zone. Soils usually have some organic content and are irrigated by meltwater from late-season snowbeds.
BR	<i>Tritomania exsectiformis</i>	Liverwort	Habitat associated with older conifer forests	CF, RI	Open to shaded coniferous forest, in association with low volume, perennial streams, springs and seeps; along gentle topographic gradients. Substratum is down wood, commonly decay class four, occasionally three or five; generally in direct contact with water. <sup>j</sup>
FU	<i>Albatrellus avellaneus</i>	Fungus	Habitat associated with older conifer forests	CF	Polypore. Endemic to the coastal lowlands; principally in coastal Sitka Spruce (50%) and Western Hemlock (38%) series, old growth forest; 30-335 m. <sup>k</sup>
FU	<i>Alpova alexsmithii</i>	Fungus		CF	Sequestrate. Principally on soil in Pacific Silver Fir (44%) and Mountain Hemlock (44%) series; mycorrhizal associate of <i>Tsuga</i> ; 835-1750 m. <sup>k</sup>
FU	<i>Arcangeliiella camphorata</i>	Fungus	< 6 known populations	CF, OHW	Sequestrate. Principally in soil and litter in Western Hemlock (44%), Tan Oak (31%) and Sitka Spruce (19%) series; associated species include Douglas fir, western hemlock, Pacific madrone, and incense cedar; 10-925 m. <sup>k</sup>
FU	<i>Boletus pulcherrimus</i> (*)	Fungus	< 6 known populations	CF, OHW	Bolete. In humus, associated with the roots of mixed conifers ( <i>Abies grandis</i> , <i>Pseudotsuga menziesii</i> ), and hardwoods ( <i>Lithocarpus densiflorus</i> ). <sup>k</sup>
FU	<i>Bridgeoporus nobilissimus</i> (*)	Fungus	Habitat associated with older conifer forests	CF	Polypore. A wood saprobe principally in Pacific silver fir (73%) and Western Hemlock (23%) series on noble fir and true fir decadent trees, snags, and stumps greater than 1 meter dbh; 90-1320 m. <sup>k</sup>
FU	<i>Chamonixia caespitosa</i>	Fungus		CF	Sequestrate. Found with <i>Tsuga</i> sp. and <i>Abies amabilis</i> at high elevation and <i>Tsuga heterophylla</i> , <i>Pseudotsuga menziesii</i> and <i>Picea sitchensis</i> in coastal forests. <sup>k</sup>
FU	<i>Choireomyces venosus</i>	Fungus	< 6 known populations	CF	Sequestrate. Associated with various <i>Pinaceae</i> spp., particularly <i>Pseudotsuga menziesii</i> and <i>Tsuga heterophylla</i> in low elevations; sporocarps beneath soil surface. <sup>k</sup>
FU	<i>Cortinariulus barlowensis</i>	Fungus	Habitat associated with older conifer forests	CF	Mushroom. Solitary to gregarious; principally in montane Pacific silver fir (44%) and coastal Western Hemlock (28%) series; 10-1435 m. <sup>k</sup>
FU	<i>Cudonia monticola</i> (*)	Fungus	6-20 known populations	CF	Earth tongue. Saprobe on <i>Picea</i> sp. needles and coniferous debris, litter and rotten wood; principally in Western Hemlock series (58%); associated species include Pacific silver fir, white fir, grand fir, subalpine fir, red fir, noble fir, Engelmann spruce, Douglas fir, western red cedar, western hemlock and mountain hemlock; 160-1830 m. <sup>k</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
FU	<i>Cystangium idahoensis</i> - name change from <i>Martellia idahoensis</i>	Fungus		CF	Sequestrate. Associated with roots of <i>Abies amabilis</i> , <i>A. lasiocarpa</i> , <i>A. procera</i> , <i>Picea engelmannii</i> , and <i>Tsuga mertensiana</i> from 1,200 to 1,650 m. <sup>k</sup>
FU	<i>Dermocybe humboldtensis</i>	Fungus	< 6 known populations	CF, MZ	Mushroom. Appears restricted to stable dunes in association with <i>Pinus</i> spp.; occurs in Douglas Fir (50%) and Grand Fir (50%) series; associated species include Douglas fir and ponderosa pine; 410-600 m. <sup>k</sup>
FU	<i>Destuntzia rubra</i> (*)	Fungus		CF, OHW, MZ	Sequestrate. Associated with roots of <i>Abies grandis</i> , <i>Arbutus menziesii</i> , <i>Lithocarpus densiflorus</i> , <i>Pseudotsuga menziesii</i> and <i>Sequoia sempervirens</i> ; >650 m. <sup>k</sup>
FU	<i>Gastroboletus imbellus</i> (*)	Fungus		CF	Sequestrate. Occurs in Pacific Silver Fir (50%) and Mountain Hemlock (50%) series; associated with roots of grand fir, subalpine fir and mountain hemlock; 770-1575 m. <sup>k</sup>
FU	<i>Gastroboletus vividus</i>	Fungus		CF	Sequestrate. Associated with roots of various Pinaceae; especially <i>Abies magnifica</i> and <i>Tsuga mertensiana</i> . <sup>k</sup>
FU	<i>Gomphus kauffmanii</i> (*)	Fungus	6-20 known populations	CF	Chanterelle. Mycorrhizal. Closely gregarious to caespitose in deep humus, litter, soil, wood or moss under pines or firs; partially hidden; occurs primarily in Pacific Silver Fir (31%), Mountain Hemlock (27%) or Western Hemlock (24%) series; associated species include Pacific silver fir, subalpine fir, Shasta red fir, Noble fir, lodgepole pine, Douglas fir, Pacific yew, western red cedar, western hemlock, mountain hemlock, Pacific dogwood and oak species; 60-2080 m. <sup>k</sup>
FU	<i>Gymnomycetes fragrans</i> - name change from <i>Martellia fragrans</i>	Fungus		CF	Sequestrate. Associated with roots of <i>Pseudotsuga menziesii</i> or <i>Tsuga mertensiana</i> ; 1,500-2,500 m. <sup>k</sup>
FU	<i>Gymnomycetes nondistincta</i>	Fungus		CF	Sequestrate. Associated with roots of Pacific silver fir and mountain Hemlock in Mountain Hemlock (50%) and Parkland (50%) series; 1820-2170 m. <sup>k</sup>
FU	<i>Helvella crassifunicata</i>	Fungus		CF	Elfin saddle. On soil in montane regions, with <i>Abies</i> spp. <sup>k</sup>
FU	<i>Leucogaster citrinus</i> (*)	Fungus	< 6 known populations	CF, OHW	Sequestrate. On soil; associated with roots of white fir, subalpine fir, lodgepole pine, western white pine, Douglas fir and western hemlock; other associated trees include Pacific silver fir, grand fir, mountain hemlock, tan oak, California laurel; 90-1490 m. <sup>k</sup>
FU	<i>Mythicomycetes corneipes</i>	Fungus		CF, RI	Mushroom. Associated with bog margins among mosses or on wet soil; coniferous forests and <i>Alnus</i> spp. <sup>k</sup>
FU	<i>Octaviania macrospora</i> - old spelling ( <i>Octavianina macrospora</i> ) (*)	Fungus		CF	Sequestrate. Associated with western hemlock in Western Hemlock series; 980 m. <sup>k</sup>
FU	<i>Otidea smithii</i> (*)	Fungus	< 6 known populations	CF, OHW	Cup fungi. On exposed soil, moss, litter or humus under Douglas fir, western hemlock, ponderosa pine, bigleaf maple, white oak and black cottonwood; occurs primarily in the Western Hemlock series (83%); 380-1140 m. <sup>k</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
FU	<i>Phaeocollybia californica</i>	Fungus		CF, OHW	Mushroom. Occurs on soil, litter and humus in association with roots of Pacific silver fir, Sitka spruce, Douglas fir and western hemlock; principally occurs in Western Hemlock series (57%); other tree associates include incense cedar, western red cedar, bigleaf maple, Pacific madrone, canyon live oak, Oregon white oak and California laurel; 95-1160 m. <sup>k</sup>
FU	<i>Phaeocollybia dissilifens</i> (*)	Fungus	6-20 known populations	CF, OHW	Mushroom. Occurs on soil, litter and humus in association with roots of Pacific fir, Sitka spruce, Douglas fir and western hemlock principally in Western Hemlock series (67%); other tree associates include western red cedar, bigleaf maple, red alder and California laurel; 95-740 m. <sup>k</sup>
FU	<i>Phaeocollybia gregaria</i>	Fungus	< 6 known populations	CF	Mushroom. Associated with the roots of Sitka spruce and Douglas fir in Sitka Spruce (50%) and Western Hemlock (50%) series; 145-455 m. <sup>k</sup>
FU	<i>Phaeocollybia olivacea</i> (*)	Fungus		CF, OHW	Mushroom. Scattered to gregarious; often found in arcs or fairy rings in thick humus, litter or soil in forests containing <i>Fagaceae</i> or <i>Pinaceae</i> species ( <i>Abies</i> , <i>Picea</i> , <i>Pseudotsuga</i> , <i>Pinus</i> , <i>Calocedrus</i> , <i>Sequoia</i> and <i>Tsuga</i> ); occurs primarily in Western Hemlock (55%), Tan Oak (14%) and Douglas Fir (13%) series; associated species include Pacific silver fir, white fir, grand fir, Noble fir, incense cedar, sugar pine, Sitka spruce, Douglas fir, Pacific yew, western hemlock, western red cedar, bigleaf maple, Pacific madrone, tan oak, canyon live oak, Oregon white oak and California black oak; 5-960 m. <sup>k</sup>
FU	<i>Phaeocollybia oregonensis</i> (*)	Fungus	6-20 known populations	CF	Mushroom. Soil in association with roots of Douglas fir, western hemlock and Pacific silver fir, primarily in Western Hemlock series (75%); associated species include Douglas fir, western hemlock and Pacific madrone; 250-1160 m. <sup>k</sup>
FU	<i>Phaeocollybia pseudofestiva</i> (*)	Fungus	6-20 known populations	CF, OHW	Mushroom. Scattered to caespitose, in humus or soil associated with species of <i>Pinaceae</i> , mixed conifers and hardwoods; occurs primarily in the Western Hemlock series (63%); associated species include western hemlock, Sitka spruce, western red cedar, Noble fir, Douglas fir, pines, oaks and bigleaf maple; 10-1120 m. <sup>k</sup>
FU	<i>Phaeocollybia scatesiae</i> (*)	Fungus	6-20 known populations	CF	Mushroom. Occurs in litter, associated with roots of Pacific silver fir, Douglas fir and western hemlock; occurs primarily in Western Hemlock (67%) and Pacific Silver Fir (17%) series; 190-1380 m. <sup>k</sup>
FU	<i>Phaeocollybia sipei</i> (*)	Fungus		CF, OHW	Mushroom. Occurs in humus, litter or soil, associated with roots of western hemlock, Douglas fir, red fir and Pacific silver fir; occurs primarily in Western Hemlock (68%) and Tan Oak (21%) series; associated species include western hemlock, Douglas fir, western red cedar, Port Orford cedar, Pacific yew, incense cedar, bigleaf maple, tan oak and California laurel; 110-1080 m. <sup>k</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
FU	<i>Phaeocollybia spadicea</i> (*)	Fungus		CF, OHW	Mushroom. Solitary, scattered or gregarious in humus, litter or soil, under mixed coniferous forests or forests associated with <i>Abies</i> , <i>Picea</i> , <i>Pseudotsuga</i> , and <i>Tsuga</i> ; occurs primarily in Western Hemlock (74%) and Sitka Spruce (16%) series; associated species include Pacific silver fir, incense cedar, Sitka spruce, Douglas fir, western red cedar, western hemlock, bigleaf maple and red alder; 3-960 m. <sup>k</sup>
FU	<i>Pseudorhizina californica</i> (*) (ex- <i>Gyromitra californica</i> )	Fungus	Habitat associated with older conifer forests	CF	Cup fungi. On or adjacent to well-rotted stumps or logs of coniferous trees, on litter or soil rich in brown rotted wood; primarily in Pacific Silver Fir (19%), Western Hemlock (17%) or White Fir (17%) series; associated species include Pacific silver fir, white fir, red fir, lodgepole pine, sugar pine, ponderosa pine, Douglas fir, Engelmann spruce, western red cedar, western hemlock, mountain hemlock, red alder and quaking aspen; 45-1835 m. <sup>k</sup>
FU	<i>Ramaria amyloidea</i> (*)	Fungus	< 6 known populations	CF	Coral. Occurs in humus, litter and soil, associated with <i>Abies</i> spp., <i>Pseudotsuga menziesii</i> and <i>Tsuga heterophylla</i> ; occurs primarily in Pacific Silver Fir (46%), White Fir (27%) and Western Hemlock (15%) series; associated species include Pacific silver fir, white fir, red fir, Shasta red fir, Noble fir, lodgepole pine, western white pine, Douglas fir, western red cedar, western hemlock and mountain hemlock; 550-1685 m. <sup>k</sup>
FU	<i>Ramaria gelatinaurantia</i> (*)	Fungus	< 6 known populations	CF	Coral. Occurs on litter and soil, associated with <i>Pinaceae</i> spp.; occurs primarily in Western Hemlock series (88%); associated species include western hemlock, Douglas fir, western red cedar and Sitka spruce; 500-1100 m. <sup>k</sup>
FU	<i>Ramaria largentii</i> (*)	Fungus	< 6 known populations	CF, OHW	Coral. Occurs on soil, litter and humus associated with <i>Pinaceae</i> spp.; primarily in Western Hemlock (48%), White Fir (19%), Douglas Fir (14%) and Pacific Silver Fir (14%) series; associated species include western hemlock, white fir, Douglas fir, Pacific silver fir, grand fir, sugar pine, western white pine, incense cedar, Pacific yew, western red cedar and Pacific madrone; 405-1555 m. <sup>k</sup>
FU	<i>Ramaria rubella</i> var. <i>blanda</i>	Fungus		CF	Coral. Fruits on wood in conifer forests. <sup>k</sup>
FU	<i>Ramaria spinulosa</i> var. <i>diminutiva</i>	Fungus	< 6 known populations	CF	Coral. Associated with <i>Pinaceae</i> spp; occurs in Douglas Fir series; 450 m. <sup>k</sup>
FU	<i>Rhizopogon chamaeleontinus</i>	Fungus		CF	Sequestrate/Truffle. Occurs in association with the roots of Douglas fir and sugar pine; 1065 m. <sup>k</sup>
FU	<i>Rhizopogon ellipsosporus</i>	Fungus	< 6 known populations	CF	Sequestrate/Truffle. In Oregon, occurs in soil in Douglas Fir (57%), Tan Oak (29%) and Mountain Hemlock (14%) series; associated species include western hemlock and <i>Acer circinatum</i> ; 330-1230 m. <sup>k</sup>
FU	<i>Rhizopogon exiguus</i>	Fungus		CF	Sequestrate/Truffle. Associated with roots of Douglas fir and western hemlock in Western Hemlock (80%) and Douglas Fir (20%) series; 25-1215 m. <sup>k</sup>



Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
FU	<i>Rhizopogon inquinatus</i>	Fungus		CF	Sequestrate/Truffle. Associated with roots of <i>Pinus jeffreyi</i> , <i>Pseudotsuga menziesii</i> and <i>Tsuga heterophylla</i> . <sup>k</sup>
FU	<i>Sowerbyella rhenana</i> (*)	Fungus	6-20 known populations Habitat associated with older conifer forests	CF, OHW	Cup fungi. Occurs in scattered to gregarious or caespitose groups in litter, humus or soil in older, relatively undisturbed conifer communities; occurs primarily in Western Hemlock (81%) and Douglas Fir (11%) series; associated species include incense cedar, sugar pine, ponderosa pine, Douglas fir, western hemlock, bigleaf maple, hazelnut, tan oak, California black oak; 180-1090 m. <sup>k</sup>
FU	<i>Stagnicola perplexa</i>	Fungus		CF	Mushroom. On rotten wood. <sup>k</sup>
FU	<i>Thaxterogaster pavelekii</i>	Fungus		CF	Sequestrate/Truffle. Associated with roots of Sitka spruce and lodgepole pine in Sitka Spruce (63%) and Western Hemlock (37%) series; 5-180 m. <sup>k</sup>
LI	<i>Bryoria pseudocapillaris</i>	Lichen	< 6 known populations Habitat associated with older conifer forests	CF, MZ	Occurs on a narrow ecological amplitude; maritime-influenced sites with moderated temperatures and high humidity; frequent fog; grows on exposed coastal trees, shrubs, and rock; predominantly on shore pine and Sitka spruce in old scrub forests, windswept dunes, or rocky headlands; < 500 m. <sup>l</sup>
LI	<i>Bryoria spirallifera</i>	Lichen	Habitat associated with older conifer forests	CF, MZ	Narrow ecological amplitude; exposed coastal trees, snags and shrubs, in forests or woodlands of windswept dunes and headlands; within 3 km of the ocean; predominantly on shore pine and Sitka; < 50 m. <sup>l</sup>
LI	<i>Bryoria subcana</i>	Lichen	< 6 known populations	CF, MZ	Bark and wood of conifers in Sitka spruce ( <i>Picea sitchensis</i> ), western hemlock ( <i>Tsuga heterophylla</i> ), wet Douglas-fir ( <i>Pseudotsuga menziesii</i> ), wet noble fir ( <i>Abies procera</i> ), and mixed hardwood-coniferous forests; along coastal bays and streams, dune forests (tentative), coastal mountain ridges, and high precipitation summits; high humidity, either as coastal fog or high precipitation; host plant is old or the stand age is late-seral to old-growth; tolerates shade tolerant to intolerant; found within 50 km of the ocean. <sup>l</sup>
LI	<i>Calicium adpersum</i> (*)	Lichen	Habitat associated with older conifer forests	CF	Highly textured bark on the boles of old growth conifer trees; very restricted to the bark of old trees; in the Pacific Northwest of North America all known occurrences are on conifers > 200 years old; relatively open stands in drier microhabitats where sheltered from precipitation, such as in crevices of bark, the dry side of leaning trunks, or the underside of limbs; occurs elsewhere on oak, spruce, and decorticated wood. <sup>a</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
LI	<i>Chaenotheca subroscida</i> (*)	Lichen	< 6 known populations Habitat associated with older conifer forests	CF	Very restricted to the bark of old trees; in the Pacific Northwest of North America, most known occurrences are on conifers > 200 years old, occasional occurrences on younger trees (e.g. 150 years old) southward in the Klamath region; correlated with increasing distance from; moderation of microclimate is an important determinant of site suitability. <sup>a</sup>
LI	<i>Dermatocarpon melophyllizum</i> (*)	Lichen		RI, RK	Typically found on rocks of stream channels and lake margins within the splash zone and seeps and on basic and acidic rocks; found mostly within 50 cm above the water surface, in the submerged condition, and up to 2 m above the water surface; 61-2300 m. <sup>m</sup>
LI	<i>Erioderma solediatum</i>	Lichen	6-20 known populations	CF, MZ	Found in the coastal fog zone, in shore pine and Sitka spruce forests interspersed with willow/wax myrtle or ericaceous shrub thickets; epiphytic on huckleberry, rhododendron, manzanita, western hemlock, and bark of red alder in a riparian area; about 16 km from the coast <sup>l</sup> .
LI	<i>Heterodermia leucomela</i> - name change from <i>H. leucomelos</i>	Lichen	6-20 known populations Habitat associated with older conifer forests	CF, MZ	Small branches of Sitka spruce and shore pine on forested headlands in the coastal fog zone; California habitats include moist, coastal redwood forests; open, low coastal scrub; and dry, open, savanna-like valley and foothill woodlands dominated by California oak species and other broad-leaved trees and shrubs, and occasionally on rocks; < 480 m. <sup>l</sup>
LI	<i>Heterodermia sitchensis</i> (*)	Lichen		CF, MZ	Sheltered twigs of <i>Picea sitchensis</i> in wet, maritime coastal forests. May be restricted to <i>Picea sitchensis</i> . <sup>a</sup>
LI	<i>Hypogymnia duplicata</i> (*)	Lichen	6-20 known populations Habitat associated with older conifer forests		Narrow ecological amplitude; epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas-fir and subalpine fir in old-growth forests of the western Cascades, Olympics and Coast Range; habitat for Oregon populations is moist hemlock stands, true fir forests, moss-covered basalt outcrops, and snags in a bog; 330-1660 m. <sup>n</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
LI	<i>Hypotrachyna revoluta</i> (*)	Lichen		CF, MZ	Found on headlands and ridges or in marine estuaries and dune landforms in densely canopied stands of <i>Picea sitchensis</i> , <i>Alnus rubra</i> , or <i>Tsuga heterophylla</i> within a few kilometers of the ocean; in young stands –under 80 years or open dunes and wetlands supporting scattered trees and shrubs; exposed rocks; substrates are bare or moss-covered boles and twigs of <i>A. rubra</i> , <i>P. sitchensis</i> , shrubs and bare rock; < 450 m. <sup>a</sup>
LI	<i>Leioderma solediatum</i>	Lichen		CF, MZ	Found in semi-open shrub thickets of shore pine and ericaceous shrubs on stabilized dunes and deflation plains; epiphytic over thin bryophyte mats on the stems of the <i>ericaceous</i> shrubs; found in a young riparian stand of red alder surrounded by clearcuts; wide range of elevations; < 2600 m. <sup>k</sup>
LI	<i>Leptogium burnetiae</i> (*) - name change from <i>L. burnetiae</i> var. <i>hirsutum</i> (*)	Lichen	Habitat associated with older conifer forests 6-20 known populations Habitat associated with older conifer forests	CF, RK	Epiphytic on tree bark on <i>Quercus garryana</i> bark in the Columbia River Gorge; also on decaying logs, mosses and rock; 40-120 m. <sup>a</sup>
LI	<i>Leptogium cyanescens</i> (*)	Lichen	Habitat associated with older conifer forests	CF, OHW	Epiphytic on hardwoods and <i>Picea sitchensis</i> , and on rock restricted to humid localities. <sup>o</sup>
LI	<i>Lobaria linita</i>	Lichen	6-20 known populations Habitat associated with older conifer forests	CF, RK	Strongly associated with old-growth and climax forests; occurs in areas of high precipitation or in sites with cold air drainage at lower elevations; prefers lower boles of conifers, especially <i>A. amabilis</i> , but in drier habitats or at higher elevations it may also grow on moss-covered boulders or rock outcrops in cool, shaded, humid microsites; 215-1370 m. <sup>a</sup>
LI	<i>Microcalicium arenarium</i>	Lichen	Habitat associated with older conifer forests	CF, RK	Parasitic on lichens that form farinose crusts on aged bark or wood in sheltered locations such as in caves under the boles of large, old trees and on humid, rocky cliff faces protected from direct rain interception; most occurrences are likely on cliffs within the Columbia Gorge, but some are known from old-growth forests outside of the gorge. <sup>i</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
LI	<i>Niebla cephalota</i>	Lichen	CF, MZ, RK		Found on trees, rocks, and shrubs and restricted to the coastal fog belt; on exposed boles and branches of Sitka spruce and Monterey cypress, shore pine, and Hooker's willow; on forest edges of windswept headlands and sand dunes; sparsely forested estuaries and willow-dominated marshy areas; within a few kilometers of the Pacific Ocean; < 75 m.
LI	<i>Pannaria rubiginosa</i> (*)	Lichen	6-20 known populations	CF, MZ	Restricted to within a few kilometers of the ocean at or near sea-level; habitat data are limited; microhabitat requirement may be high humidity; substrates are wood and bark of <i>Picea sitchensis</i> , <i>Salix hookeriana</i> , <i>Lonicera involucrata</i> and old woody <i>Cytisus scoparius</i> . <sup>p</sup>
LI	<i>Pilophorus nigricaulis</i>	Lichen	< 6 known populations	CF, RK	Primarily on volcanic rock substrates (basalt and andesite); on lava flows, cliffs, rock outcrops, talus slopes, and large boulders; in low- to mid-elevation old-growth conifer forests dominated by Douglas-fir, true fir and western hemlock and shrub communities dominated by vine maple, subalpine parkland, or in open sites on rock associated with other cryptogams; 40-1430 m. <sup>n</sup>
LI	<i>Pseudocyphellaria mallota</i>	Lichen	6-20 known populations Habitat associated with older conifer forests	CF	In humid stands of <i>Pseudotsuga menziesii</i> and <i>Tsuga heterophylla</i> along with an abundant and diverse cyanolichen flora approximately 40-year old second-growth stands immediately adjacent to older stands; small conifer branches appear to be the most common substrate. <sup>a</sup>
LI	<i>Ramalina pollinaria</i>	Lichen	< 6 known populations Habitat associated with older conifer forests	CF, MZ, RI	Bark and wood of various trees and shrubs, especially old ones, shaded rocks, low elevation moist areas, swamps. <sup>a</sup>
LI	<i>Stereocaulon spathuliferum</i>	Lichen	CF, RK		Small crusts on basalt blocks of talus slopes, shaded to partially exposed, usually sheltered from precipitation but requiring seasonally cool and moist conditions in conifer forest habitat; 915-1525 m. <sup>a</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
LI	<i>Teloschistes flavicans</i>	Lichen	< 6 known populations	CF, MZ	Confined to exposed headlands and dunes of the immediate coast; on twigs, boles, and limbs of Sitka spruce, shore pine, Hooker's willow, coastal scrub stands, and at times common in litterfall; < 440 m. <sup>a</sup>
LI	<i>Texosporium sancti-jacobi</i>	Lichen		SC, MG	Found in arid to semi-arid shrub-steppe, grassland or savannah communities on "open habitat soils", or natural openings or gaps in arid vegetation that are not maintained by fire; sparsely vegetated with native forbs and bunchgrasses, free of weeds and support well developed biological soil crusts; nearly flat ground or slightly north-facing slopes; soils are non-saline and non-calcareous, ranging from fine- to coarse-textured but often hardened; restricted to microsites containing small bits of decaying organic matter, such as decaying rabbit pellets, dead stems of Selaginella, stubble from dead tufts of bunchgrass, small twigs in soil duff and on other soil lichens; 1000 m. <sup>a</sup>
LI	<i>Tholuma dissimilis</i> (*)	Lichen	< 6 known populations	CF	Conifer branches at subalpine and alpine habitats mostly, subalpine fir and Engelmann spruce, rarely on rock. Occasionally lower elevation where cool, moist; >2040 m. <sup>n</sup>
LI	<i>Usnea nidulans</i>	Lichen		CF, MZ	Exclusively in hypermaritime forests on conifers and deciduous trees on the immediate coast and in the Coast Ranges. <sup>a</sup>
VA	<i>Abronia umbellata</i> ssp. <i>breviflora</i>	Pink Sand-Verbena		MZ	Sandy beaches and foredunes, typically between the high-tide line and below the zone of driftwood accumulation <sup>o</sup> .
VA	<i>Adiantum jordanii</i>	California Maiden-Hair	6-20 known populations	CF, RK	Seasonally moist, shaded, rocky banks, cliffs, canyons, and ravines; >1000 m <sup>r</sup>
VA	<i>Agoseris elata</i>	Tall Agoseris		MG, OHW, CF	Yellow Pine Forest, Red Fir Forest, Lodgepole Forest, Subalpine Forest, wetland-riparian; 1600 to 3200 m. <sup>s</sup>
VA	<i>Agrostis howellii</i>	Howell's Bentgrass	6-20 known populations	RK, CF	Growing in shady woodlands and damp, vertical cliffs and talus slopes along streams in the Columbia River Gorge.
VA	<i>Anemone oregana</i> var. <i>Bog Anemone</i>	Bog Anemone		RI, SW, CF	Sphagnum bogs and marshes of the immediate Pacific Coast and coast





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
	<i>felix</i>				range. <sup>1</sup>
VA	<i>Arabis koehleri</i> var. <i>koehleri</i>	Koehler's Rockcress	6-20 known populations	RK	Rock outcrops on the Umpqua River drainage; 225-380 m. <sup>1</sup>
VA	<i>Arabis macdonaldiana</i>	Macdonald's Rock-Cress		SE,RK	Deep reddish soils, steep slopes, dry ridges, serpentine areas; 1200 m. <sup>1</sup>
VA	<i>Arctostaphylos hispidula</i>	Hairy Manzanita		SE, SC, CF	Rocky serpentine soils or sandstone, open sites, forest; 300-600 m. <sup>1</sup>
VA	<i>Arnica viscosa</i>	Shasta Arnica		RK, CF	Open, rocky, subalpine to alpine sites; 2000-2500 m. <sup>1</sup>
VA	<i>Artemisia pycnocephala</i>	Coastal Sagewort	< 6 known populations	MZ, RK	Rocky or sandy soils, coastal strand; < 200 m. <sup>1</sup>
VA	<i>Asplenium septentrionale</i>	Grass-Fern		RK	Found in cracks and crevices of rock outcrops and large boulders within mixed conifer forest; composition of rock substrates is variable (basalt, granite, dacite, breccia); 600-3050 m. <sup>u</sup>
VA	<i>Astragalus applegatei</i>	Applegate's Milk-Vetch		SW	Flat, open, seasonally moist remnants of floodplain alkaline grassland of the Klamath Basin; 1250 m. <sup>1</sup>
VA	<i>Astragalus californicus</i>	California Milk-Vetch	6-20 known populations	MG	Dry, open areas in scrub, woodland; 300-1300 m. <sup>1</sup>
VA	<i>Astragalus gambelianus</i>	Gambel Milk-Vetch	6-20 known populations	MG, SC	Open, grassy areas, scrub; 50-900 m. <sup>1</sup>
VA	<i>Astragalus peckii</i>	Peck's Milk-Vetch		RK, MG	Very dry sites, on loose sandy soil or pumice; often found in or along dry water-courses; natural openings of sagebrush-juniper woodlands, lodgepole pine and ponderosa pine forests; 900-1100 m. <sup>1</sup>
VA	<i>Bensoniella oregana</i>	Bensonia		SW,RI,CF	Wet meadows, bogs and streams in deep soils under conifer forests; >1000 m. <sup>1</sup>
VA	<i>Botrychium minganense</i> (*)	Gray Moonwort	< 6 known populations	CF, RI	Habitat varies widely from dense forest to open meadow and from summer-dry meadows to permanently saturated fens and seeps. Plants stand in open sun or under dense herbaceous cover. Often found in association with old (>10 year) disturbances such as logging roads and road shoulders. <sup>v</sup>
VA	<i>Botrychium montanum</i>	Mountain Grape-Fern		CF, RI	Under old growth western red cedar in the northern part of its range and under incense cedar in CA. On alluvial terraces along small streams in fens, seeps and meadows where the soil is moist and high in organic matter. <sup>v</sup>
VA	<i>Botrychium pumicola</i>	Pumice Grape-Fern		RK, CF	Typically in loose volcanic (pumice) soils, often, at lower elevations, in frost pockets or comparable areas that retain moisture into late spring in relatively open sites with little competing vegetation. Also <i>Pinus contorta</i> — <i>Purshia tridentata</i> forests. <sup>v</sup>
VA	<i>Brodiaea terrestris</i>	Dwarf Brodiaea	< 6 known populations	MZ, MG, CF	Grassland, open woodlands; 0-1500 m. <sup>1</sup>
VA	<i>Calamagrostis breweri</i>	Brewer's Reedgrass		RI	Moist, subalpine and alpine meadows, lake margins, streambanks; 1300-3800 m. <sup>1</sup>
VA	<i>Callitriche marginata</i>	Winged Water-Starwort	< 6 known populations	RI	Becoming stranded (often in vernal pools) or submersed < ± 6 dm; < ± 1500 m. <sup>1</sup>
VA	<i>Calochortus coxii</i>	Crimite Mariposa-Lily	6-20 known populations	SE, MG, CF	North-facing open grassy slopes or woods, on serpentine; 200-1000 m. <sup>1</sup>
VA	<i>Calochortus greenei</i>	Greene's Mariposa-Lily		SC, MG	Shrubby hillsides, open woodlands, dry soils and slopes; 700-1100 m. <sup>1</sup>
VA	<i>Calochortus howellii</i>	Howell's Mariposa-Lily		SE	Dry, rocky, serpentine soils; 300-500 m. <sup>1</sup>
VA	<i>Calochortus indecorus</i>	Sexton Mt.		SE, MG CF, RK	Rocky, serpentine substrates. Probably in woodlands with grassy openings <sup>1</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
		Mariposa-Lily			
VA	<i>Calochortus monophyllus</i>	One-Leaved Mariposa-Lily	< 6 known populations	RK, MG	Wooded slopes, clay-loam soils; 400-1200 m. <sup>r</sup>
VA	<i>Calochortus nitidus</i>	Broad-Fruit Mariposa-Lily	< 6 known populations	RK, RI, MG	Low meadows along creeks; 700-900 m. <sup>r</sup>
VA	<i>Calochortus persistens</i>	Siskiyou Mariposa-Lily	< 6 known populations	RK, MG	Open areas in rocky soils; 1000-1500 m. <sup>w</sup>
VA	<i>Calochortus umpquaensis</i>	Umpqua Mariposa-Lily		SE, MG, CF	Grassland-forest ecotones on serpentine-derived soils; from closed canopy coniferous forests to open grass-forb meadows; 300-500 m. <sup>r</sup>
VA	<i>Camassia howellii</i>	Howell's Camas		SE, CF, OHW, MG	Serpentine endemic, on open, seasonally wet slopes. Rocky openings in low elevation Jeffrey pine woodlands and moist, grassy meadows. <sup>r</sup>
VA	<i>Camissonia gracilliflora</i>	Slender-Flowered Evening-Primrose		MG, SC, OHW	Open or shrubby slopes, generally clay soils, grasslands, oak; < 800 m. <sup>t</sup>
VA	<i>Cardamine pattersonii</i>	Saddle Mountain Bittercress		RI, MG	Grass balds, moist cliffs, rock crevices, moss mats over bedrock; in gravel along streams in forest; 820-960 m. <sup>a</sup>
VA	<i>Carex abrupta</i>	Abrupt-Beaked Sedge		MG	Moist mountain meadows and slopes; 1400-3300 m. <sup>r</sup>
VA	<i>Carex brevicaulis</i>	Short Stemmed Sedge	6-20 known populations	MZ, RI	Dry, open, sandy or rocky slopes, cliffs, and dunes; < 90 m. <sup>r</sup>
VA	<i>Carex capitata</i>	Capitate Sedge		RI, SW	Generally wet places, meadows, slopes; 1900-3900 m. <sup>t</sup>
VA	<i>Carex comosa</i>	Bristly Sedge		RI, SW	Swamps and wet thickets, stream, pond, and lakeshores, depressions in wet meadows, marshes, including freshwater tidal marshes; often in shallow water or on emergent stumps, floating logs, and floating mats of vegetation; < 700 m. <sup>r</sup>
VA	<i>Carex crawfordii</i>	Crawford's Sedge		RI, SW	Often in standing water, moist to wet places, open, sandy, dryish disturbed areas; 100-1500 m. <sup>r</sup>
VA	<i>Carex diandra</i>	Lesser Panicked Sedge		RI	Swampy, marshy, or boggy areas, especially wet meadows, fens, muskegs, floating mats, and peaty or marly shores of lakes and ponds (often in shallow, sometimes brackish water), less often swales, springy thickets, ditches, and wet sandy beaches of nonalkaline lakes; < 2800 m. <sup>r</sup>
VA	<i>Carex gynodynamia</i>	Hairy Sedge		RI, MG, CF, SW	Seeps, stream banks, roadside ditches, wet meadows and slopes, coastal prairies, mixed evergreen forest along the Pacific Coast; < 600 m. <sup>r</sup>
VA	<i>Carex klamathensis</i> (sw OR pops. of <i>Carex livida</i> )	A Sedge		RI, CF	Boreal fens, calcareous floating mats; 0-1100 m. <sup>r</sup>
VA	<i>Carex lasiocarpa</i> var. <i>americana</i>	Slender Sedge		RI	Sedge meadows, fens, bogs, lakeshores, stream banks, usually in very wet sites and sometimes forming floating mats; < 1300 m. <sup>r</sup>
VA	<i>Carex livida</i>	Pale Sedge		RI, CF	Boreal fens, calcareous floating mats; < 1100 m. <sup>r</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Carex nervina</i>	Sierra Nerved Sedge		MG	Subalpine meadows; 1200–3000 m. <sup>r</sup>
VA	<i>Carex retrorsa</i>	Retorse Sedge		SW, RI	Swamps, wet thickets, often along streams, marshes, sedge meadows, shores of streams, ponds, and lakes; < 1900 m. <sup>r</sup>
VA	<i>Carex scabriuscula</i>	Siskiyou Sedge		SE, RI, SW, MG	Serpentine soils; 1000–2000 m. <sup>r</sup>
VA	<i>Carex serratodens</i>	Saw-Tooth Sedge		OHW, SW, RI, MG	Moist places on open hillsides, adjacent to springs, seeps, or streams; 100–1400 m. <sup>r</sup>
VA	<i>Castilleja chlorotica</i>	Green-Tinged Paintbrush		CF	In loose sandy soils; often in ponderosa pine woods; 1400–2500 m. <sup>i</sup>
VA	<i>Castilleja levisecta</i>	Golden Paintbrush		SW, MG	Open grasslands; moist in the winter but not inundated with water; often on glacial outwash or deposits; < 100 m. <sup>i</sup>
VA	<i>Castilleja mendocinensis</i>	Mendocino Coast Indian Paintbrush		MZ, SC, CF	Coastal bluffs, coastal prairie, scrub and conifer forests; < 100 m. <sup>t</sup>
VA	<i>Cheilanthes covillei</i>	Coville's Lip-Fern		RK	Rocky slopes, cliffs, and ledges, usually on igneous substrates; 100–2500 m. <sup>r</sup>
VA	<i>Cheilanthes intertexta</i>	Coastal Lipfern		RK	Rocky slopes and ledges, usually on igneous substrates; 500–2800 m. <sup>r</sup>
VA	<i>Chlorogalum angustifolium</i>	Narrow-Leaved Amole	< 6 known populations	MG, OHW	Heavy soils of grassland or woodland; < 500 m. <sup>r</sup>
VA	<i>Cicendia quadrangularis</i>	Timwort		RI, OHW, SW, MG, RK	Crevices, bases of rocks, coastal wetlands, vernal pools, moist valley grasslands and oak woodland; < 2700 m. <sup>r</sup>
VA	<i>Cicuta bulbifera</i>	Bulb-Bearing Water-Hemlock		RI, OHW, SW, MG, RK	Along the edges of marshes and lake margins, in bogs, wet meadows, shallow standing water and along slow moving streams; found on hummocks and floating mats and partially submerged rotting logs. <sup>x</sup>
VA	<i>Cimicifuga elata</i> var. <i>elata</i>	Tall Bugbane		CF, RI	In or along the margins of mixed, mature or old growth stands of mesic coniferous forest, or mixed coniferous-deciduous forest; Old-growth forests provide optimal light conditions; < 915 m. <sup>x</sup>
VA	<i>Collomia mazama</i>	Mt. Mazama Collomia		CF, RI, MG	Alpine meadows and slopes and dry rocky places in black hemlock, fir or lodgepole forest; 900–1850 m. <sup>i</sup>
VA	<i>Coptis trifolia</i>	Three-Leaf Goldthread		RI, CF	Associated with small wetland areas within mature coniferous forest on poorly drained soils. Not uniformly wet, a mosaic of channels and boggy depressions interspersed with slightly higher, drier hummocks. On hummocks growing in mineral soil or organic substrates; 1000–1170 m. <sup>y</sup>
VA	<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	Point Reyes Bird's Beak		RI	Coastal salt marshes (< 10 m), inland alkaline flats; 1200–1900 m. <sup>t</sup>
VA	<i>Corydalis aquae-gelidae</i>	Cold-Water Corydalis		RI, CF	Close proximity to seeps, springs or streams with relatively cold water, a substrate of gravely sand, canopy closure of 70 to 90 percent; 370–1310 m. <sup>z</sup>
VA	<i>Cryptantha leiocarpa</i>	Seaside Cryptantha	6–20 known populations	MZ	Sandy soils, dunes; < 200 m. <sup>t</sup>
VA	<i>Cryptantha milo-bakeri</i>	Milo Baker's Cryptantha		RK	Rocky or gravely soils, generally coniferous forest; < 300–1500 m. <sup>t</sup>
VA	<i>Cryptogramma stelleri</i>	Steller's Rockbrake		RK, CF	Sheltered calcareous cliff crevices and rock ledges; typically in coniferous forest or other boreal habitats; < 3000 m. <sup>r</sup>
VA	<i>Cupressus bakeri</i>	Baker's Cypress	6–20 known populations	CF	Mixed evergreen forests; open slopes, flats, often serpentine; 1100–1800 m. <sup>t</sup>



Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Cyperus acuminatus</i>	Short-Pointed Cyperus		RI, SW	Wet, often sandy shores and damp, disturbed soils; < 1500 m. <sup>r</sup>
VA	<i>Cyripedium fasciculatum</i> (*)	Clustered Lady's-Slipper		CF	Along stream banks and on slopes that vary in steepness and aspect, under shrubs and cover of hardwoods in mixed conifer/hardwood under mature coniferous forests; frequently in mixed successional forest openings and edges with shade; strong association with <i>Pseudotsuga menziesii</i> ; suggests disturbance habitats such as fire; found growing in roadcuts, skid trails. <sup>aa</sup>
VA	<i>Delphinium leucophaeum</i>	White Rock Larkspur		MG, RK	Rock outcrops, rocky meadows; 50-100 m. <sup>r</sup>
VA	<i>Delphinium nudicaule</i>	Red Larkspur		RK,CF,OHW	Wooded, rocky slopes, moist talus, cliff faces; < 2600 m. <sup>r</sup>
VA	<i>Delphinium nuttallii</i>	Nuttall's Larkspur		RI, MG	Rock outcrops, rocky meadows; 20-300 m. <sup>r</sup>
VA	<i>Delphinium pavonaceum</i>	Peacock Larkspur		MG, OHW	Meadows, open woodlands; 50-100 m. <sup>r</sup>
VA	<i>Dicentra pauciflora</i>	Few-Flowered Bleedingheart		RK, CF	Openings in coniferous forests, in volcanic and granitic soils; 1200-2700 m. <sup>r</sup>
VA	<i>Dodecatheon austrofrigidum</i>	Frigid Shootingstar	6-20 known populations	RI, CF	At high elevations on basalt cliffs near streams and waterfalls, sometimes on rotting wood; at low elevations basalt rock crevices in major rivers, below high water line; 30-1200 m. <sup>a</sup>
VA	<i>Draba howellii</i>	Howell's Whitlow-Grass	6-20 known populations	RK	Rock crevices; 2000-3000 m. <sup>t</sup>
VA	<i>Epilobium oregonum</i>	Oregon Willow-Herb		SW, RI	Ultramafics, full sun or part shade; bogs, small streams, ditches; 500-1600 m. <sup>#</sup>
VA	<i>Ericameria arborescens</i>	Golden Fleece		CF, OHW, SC	Woodland, open forest, chaparral, especially after fire; generally < 1200 m. <sup>t</sup>
VA	<i>Erigeron cervinus</i>	Siskiyou Daisy		SE, MG, RK	Open, rocky slopes, meadows, pine to fir woods; 900-1900 m. <sup>t</sup>
VA	<i>Erigeron decumbens</i> var. <i>decumbens</i>	Williamette Valley Daisy	6-20 known populations	MG, OHW, SW	Clay soiled prairie in valley bottoms, often by creek drainages. <sup>bb</sup>
VA	<i>Erigeron howellii</i>	Howell's Daisy		RK, MG	Often found in moist, rocky sites, on protected slopes within mixed coniferous forests. Within the Columbia gorge; 20-1460 m. <sup>a</sup>
VA	<i>Eriogonum lobbii</i>	Lobb's Buckwheat		RK, MG, SC, CF	Gravelly to rocky or talus slopes, mixed grassland, shrub, and sagebrush communities, montane, subalpine, or alpine conifer woodlands; 1600-3800 m. <sup>r</sup>
VA	<i>Eriogonum umbellatum</i> var. <i>glaberrimum</i>	Green Buckwheat		MG	Sand or gravel; 1600-2300 m. <sup>t</sup>
VA	<i>Eriophorum charmissonis</i>	Russet Cotton-Grass	6-20 known populations	RI	Peat, bogs, marshes, muskegs; 0-3000 m. <sup>r</sup>
VA	<i>Erythronium elegans</i>	Coast Range Fawn-Lily		MG, SC, CF, RK	Open sites on rocky slopes and cliffs; edges of sphagnum bogs; mountain bogs, meadows, rocky balds; 820-1020 m. <sup>a</sup>
VA	<i>Erythronium howellii</i>	Howell's Adder's-Tongue		SE,CF, SC, MG	Serpentine influence, meadows open woodlands, mixed evergreen. <sup>cc</sup>
VA	<i>Eschscholzia caespitosa</i>	Gold Poppy	6-20 known populations	RK, MG, SC	Open chaparral, rocky slopes; < 1500 m. <sup>r</sup>
VA	<i>Eucephalus vialis</i>	Wayside Aster		CF, MG, OHW	Typically occurs on dry, upland conifer forests dominated by <i>P. menziesii</i> , usually accompanied by hardwoods typical of drier forests such as Pacific madroñ, golden chinquapin, and Oregon white oak; 152-457 m. <sup>dd</sup>
VA	<i>Eucephalus gormanii</i>	Gorman's Aster		RK, CF	Open rocky slopes and exposed cliffs; 1200-1900 m. <sup>r</sup>
VA	<i>Filipendula occidentalis</i>	Queen-Of-The-Forest		RI, CF	Shady damp sites; on river banks, in rock crevices and seeps just above high water level; damp salmonberry shrublands; rock cliffs in remnant stands of





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Fritillaria camtschaticensis</i>	Black Lily		MG, RI	<i>Abies</i> and <i>Tsuga</i> ; in full sun or partial shade; < 950 m. <sup>a</sup> Moist areas from near tidesflats to mountain meadows; < 1000 m. <sup>r</sup>
VA	<i>Fritillaria gentneri</i>	Gentner's Fritillary		OHW, MG, SC, CF	Dry hillsides in open canopies of oak woodlands and chaparral shrub communities, mixed hardwood forests, coniferous forests and grasslands; 180-1360 m. <sup>es</sup>
VA	<i>Gentiana newberryi</i>	Newberry's Gentian		SW, MG	Wet mtn meadows; 1200-4000 m. <sup>t</sup>
VA	<i>Gentiana plurisetosa</i>	Elegant Gentian		SW	Lower montane coniferous forest, meadows, upper montane coniferous forest, mesic; 1230-1938 m. <sup>t</sup>
VA	<i>Gentiana setigera</i>	Waldo Gentian		SW, SE, MG	Serpentine bogs and wet meadows, in open to semi-shaded areas. <sup>ff</sup>
VA	<i>Gilia millefoliata</i>	Seaside Gilia	6-20 known populations	MZ	Stabilized coastal dunes; < 10 m. <sup>t</sup>
VA	<i>Hackelia bella</i>	Beautiful Stickseed		MG	Streambanks, roadsides, forest openings; 900-2000 m. <sup>t</sup>
VA	<i>Hastingsia bracteosa</i> var. <i>atropurpurea</i>	Purple-Flowered Rush-Lily		SW, SE	Ultramafic river-beds that have year-round water in rooting horizon and wet, open, sunny bogs; 500-700 m. <sup>ff</sup>
VA	<i>Hastingsia bracteosa</i> var. <i>bracteosa</i>	Large-Flowered Rush-Lily		SW, SE	Bogs, moist open meadows, seeps and wetlands often overlying serpentine or peridotite rock formations; open; < 240 m. <sup>ff</sup>
VA	<i>Heliotropium curassavicum</i>	Salt Heliotrope		SW	Moist to dry, saline soils; < 2100 m. <sup>t</sup>
VA	<i>Hieracium horridum</i>	Shaggy Hawkweed		RK	Boulders, gravels, meadows, pine forests; 1500-3700 m. <sup>r</sup>
VA	<i>Horkelia congesta</i> ssp. <i>congesta</i>	Shaggy Horkelia		MG, OHW	Grassland and oak savannah remnants and grassy balds. <sup>t</sup>
VA	<i>Horkelia tridentata</i> ssp. <i>tridentata</i>	Three-Toothed Horkelia		MG, OHW, CF	Dry, open coniferous forest; 300-2500 m. <sup>t</sup>
VA	<i>Howellia aquatilis</i>	Water Howellia		RI	In stagnant ponds, sloughs, orphaned rivers, oxbows; shallow. Typically in a matrix of dense forest vegetation. <sup>gg</sup>
VA	<i>Hydrocotyle verticillata</i>	Whorled Marsh-Pennywort		MZ, RI	Along edges of coastal and inland lakes, swampy ground, wetlands; < 100 m. <sup>t</sup>
VA	<i>Iliamna latibracteata</i>	California Globe-Mallow		CF, RI	Moist ground and stream sides in conifer forests, often on shady, disturbed ground; 500-2000 m. <sup>r</sup>
VA	<i>Iris tenax</i> var. <i>gormanii</i>	Gorman's Iris		MG	Dry soils in fields and open woods. <sup>r</sup>
VA	<i>Juncus kelloggii</i>	Kellogg's Rush		SW, RI	Sandy and clayey damp soils around vernal pools, seepage areas, and low spots in fields and meadows; < 800 m. <sup>r</sup>
VA	<i>Kalmiopsis fragrans</i>	Fragrant Kalmiopsis		RK, CF	Rock outcrops and crevices, in sun or shady coniferous forests; 480-1300 m. <sup>a</sup>
VA	<i>Keckeilla lemmonii</i>	Bush Beardtongue		CF, OHW, SC	Rocky slopes, coniferous and mixed forests, chaparral; 200-1900 m. <sup>t</sup>
VA	<i>Lasthenia ornduffii</i> - name change from <i>L. macrantha</i> ssp. <i>prisca</i>	Large-Flowered Goldfields		MZ, MG	Coastal bluffs; < 500 m. <sup>r</sup>
VA	<i>Lathyrus holochlorus</i>	Thin-Leaved Peavine		OHW, CF, MG	Low elevation roadsides, fencerows, creek banks, forest edges, oak savannas, shrublands, and grasslands; 30-610 m. <sup>a</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Lewisia columbiana</i> var. <i>columbiana</i>	Columbia Lewisia		RK	Rocky slopes and crevices; 500-2300 m. <sup>r</sup>
VA	<i>Lewisia leana</i>	Lee's Lewisia		RK, CF	Sandy, rocky places, pine forest; 1300–3300 m. <sup>r</sup>
VA	<i>Lilium occidentale</i>	Western Lily		MZ, CF, SW	Poorly drained, organic soils on the edges of coastal bogs; < 100 m. <sup>hh</sup>
VA	<i>Limnanthes floccosa</i> ssp. <i>bellingiana</i>	Bellinger's Meadow-Foam	6-20 known populations	SW, SC, OHW	Edges of vernal ponds or seasonally wet rocky, open meadows and grassy openings in oak-pine/buckbrush chaparral woodlands; volcanic origin; low elevation. <sup>i</sup>
VA	<i>Limnanthes floccosa</i> ssp. <i>grandiflora</i>	Large-Flowered Woolly Meadowfoam		SW	High-elevation vernal pools (seasonal wetlands) in rocky meadows with shallow soils that are at least partially shaded in the spring; 1100-1200 m. <sup>ii</sup>
VA	<i>Limnanthes floccosa</i> ssp. <i>pumila</i>	Dwarf Meadow-Foam	6-20 known populations	SW	Narrow endemic; near the edges of vernal pools, wet trails, roads, and small streams; soils volcanic in origin; known only from Table Rock, OR. <sup>i</sup>
VA	<i>Limnanthes gracilis</i> ssp. <i>gracilis</i>	Slender Meadow-Foam		SW	Wet, open, serpentine valley bottomlands; meadows, intermittent creeks, depressions, swales, ditches. <sup>i</sup>
VA	<i>Limonium californicum</i>	Western Marsh-Rosemary	6-20 known populations	SW, RI	Coastal strand, salt marshes, sand hills, beaches, bays, alkaline flats; < 50 m <sup>t</sup>
VA	<i>Lomatium bradshawii</i>	Bradshaw's Desertparsley		MG, SW	Moist meadows and remnant prairie patches at low elevations. <sup>jj</sup>
VA	<i>Lomatium cookii</i>	Cook's Lomatium		MG, SC, OHW	Populations in the Agate Desert are found on the margins and bottoms of vernal pools with standing water from December to April or May; populations in the Illinois Valley can be found in moist, grassy meadows. <sup>ii</sup>
VA	<i>Lomatium engelmannii</i>	Englemann's Desert-Parsley	6-20 known populations	SE, CF	Gravelly serpentine slopes within conifer forests, usually Jeffrey Pine forest; 1150–2300 m. <sup>t</sup>
VA	<i>Lotus stipularis</i>	Stipuled Trefoil	6-20 known populations	CF, SC, RI	Open pine forests, streambeds, ditches, thickets, chaparral, logged areas; mixed evergreen forest, chaparral; < 1200 m. <sup>t</sup>
VA	<i>Lupinus sulphureus</i> ssp. <i>kincaidii</i>	Kincaid's Lupine		MG, OHW, CF	Open montane forest, dry, open woods, valley prairie grasslands, oak forests, often in sandy soil. <sup>bb</sup>
VA	<i>Lupinus tracyi</i>	Tracy's Lupine		CF	Dry, open montane forest; 1500–2000 m. <sup>t</sup>
VA	<i>Lycopodiella inundata</i>	Bog Club-Moss		SW, RI	Peat bogs, lakeshores, marshes, muddy depressions, pond margins, borrow pits; < 2000 m. <sup>t</sup>
VA	<i>Lycopodium complanatum</i>	Ground Cedar		CF	Dry open coniferous or mixed forest alpine slopes; < 2000 m. <sup>r</sup>
VA	<i>Meconella oregana</i>	White Fairpoppy	6-20 known populations	OHW, MG, SW	Sandy bluffs, meadows and partly sunny, moist banks; of conservation concern; < 300 m <sup>r</sup>
VA	<i>Microseris bigelovii</i>	Coast Microseris		MZ, RI, MG	Open sandy soil, or soil pockets on rocky coastal headlands, grasslands; < 100 m <sup>t</sup>
VA	<i>Microseris howellii</i>	Howell's Microseris		SE, SC, CF	Rocky serpentine soils, hillsides and alluvial flats, open shrublands and Pinus jeffreyi savannas; 300–1000 m. <sup>r</sup>
VA	<i>Mimulus bolanderi</i>	Bolander's Monkeyflower	6-20 known populations	RK, SC, OHW, CF	Burns, openings in chaparral, foothill woodland, yellow pine forest; disturbed areas; < 2000 m. <sup>t</sup>
VA	<i>Mimulus congdonii</i>	Congdon's Monkeyflower	< 6 known populations	RK	Disturbed areas or seepage, runoff areas on slopes, generally granitic soils; 120–1100 m. <sup>t</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Mimulus evanescens</i>	Disappearing Monkeyflower	< 6 known populations	SW, RI	Moist gravelly, rocky areas, and low, wet fields, in sagebrush-juniper zones; 1200-1700 m. <sup>a</sup>
VA	<i>Mimulus tricolor</i>	Three-Colored Monkey-Flower		RI, SW	Vernally wet depressions, streambanks; generally < 600 m. <sup>t</sup>
VA	<i>Navarretia leucocephala</i> ssp. <i>leucocephala</i>	White-Flowered Navarretia	6-20 known populations	SW, MG, SC, OHW	Vernal pools, valley grassland, foothill woodland; < 500 m. <sup>t</sup>
VA	<i>Nemacladus capillaris</i>	Slender Nemacladus	< 6 known populations	RK	Dry slopes, burned areas in chaparral, yellow pine forest; 4000-2100 m. <sup>t</sup>
VA	<i>Oenothera wolffii</i>	Wolf's Evening-Primrose		MZ, MG	Pacific coastal headlands, bluffs, and dunes; roadcuts and roadsides near the coast and, possibly, moist sandy riparian areas. <sup>i</sup>
VA	<i>Ophioglossum pusillum</i>	Adder's-Tongue		MZ, RI SW	Open fens, marsh edges, pastures, and grassy shores and roadside ditches, north of the southern boundary of Wisconsin glaciation; 100-2000 m. <sup>r</sup>
VA	<i>Pellaea andromedifolia</i>	Coffee Fern		RK, SE, CF, OHW, SC	Rocky outcrops or dry areas, non-calcareous rock Generally rocky, 30-1800 m. <sup>t</sup>
VA	<i>Pellaea mucronata</i> ssp. <i>mucronata</i>	Bird's-Foot Fern	6-20 known populations	RK, CF, OHW, SC	Rocky outcrops, dry areas; Yellow Pine Forest, Foothill Woodland, Chaparral, Valley Grassland, Coastal Sage Scrub; 20-2400 m. <sup>t</sup>
VA	<i>Penstemon glaucinus</i>	Blue-Leaved Penstemon		CF, RK	At mid-elevations in open understory of pine forests, usually lodgepole or white-bark, occasionally ponderosa; open areas on exposed slopes, rims, ridges at higher elevations. <sup>i</sup>
VA	<i>Perideridia erythrorhiza</i>	Red-Rooted Yampah		MG,CF,OHW, SW	Lower elevations in poorly drained, heavy clay soils; found in moist prairies with tufted hairgrass and California oatgrass; pastureland and wood edges
VA	<i>Phacelia argentea</i>	Silvery Phacelia		MZ	Ponderosa pine, Jeffrey pine, or Oregon white woods; 1525 m. <sup>t</sup>
VA	<i>Phacelia leonis</i>	Siskiyou Phacelia		CF, SE	Sand dunes, bluffs, and bases of coastal headlands along the northern California and southern Oregon Pacific coast; < 20 m. <sup>t</sup>
VA	<i>Pilularia americana</i>	American Pillwort		SW	Moist to wet meadows, gravelly serpentine soils; openings in conifer forests; 1200-1900 m. <sup>t</sup>
VA	<i>Plagiobothrys austinae</i>	Austin's Plagiobothrys		SW	Vernal pools, mud flats, lake margins, reservoir margins, shallow water of ponds and temporary pools; 50-600 m. <sup>t</sup>
VA	<i>Plagiobothrys figuratus</i> ssp. <i>corallicarpus</i>	Coral Seeded Allocarya		SW, RI	Vernal pools, wet sites; < 500 m. <sup>t</sup>
VA	<i>Plagiobothrys greenei</i>	Greene's Popcorn Flower		SW, RI	Local endemic to Rogue Valley, Oregon.; semi-perennial wetlands in low areas on granitic soils. <sup>i</sup>
VA	<i>Plagiobothrys hirtus</i>	Rough Popcorn Flower	6-20 known populations	SW	Wet sites, grassland to woodland. <sup>t</sup>
VA	<i>Plagiobothrys lamprocarpus</i>	Shiny-Fruited Popcorn Flower		SW, RI	Seasonal wetlands that are inundated by water from late fall to early spring (vernal pools) at lower elevations; 100 to 150 m. <sup>kk</sup>
VA	<i>Poa rhizomata</i>	Timber Bluegrass	6-20 known populations	CF, MG	Only collection from "moist places in an old [dirt] road." Specific habitat data nonexistent. <sup>i</sup>
VA	<i>Poa unilateralis</i>	San Francisco Bluegrass		MG, MZ, SC	Shady, moist slopes in forest, in rich loose soils, over granitics; < 100 m. <sup>t</sup>
VA	<i>Pogogyne floribunda</i>	Profuse-Flowered Mesa Mint	< 6 known populations	SW	Rocky headlands, rocky or sandy coastal bluffs, and cliffs, cracks and ledges, at the top near the edges and on the steep faces. <sup>i</sup>
					Vernal pools and edges of seasonal ponds and intermittent flooded drainages; < 1500 m. <sup>t</sup>

Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Polystichum californicum</i>	California Sword-Fern	6-20 known populations	CF, RI, RK	Woods, stream banks, to rocky open slopes with moisture; < 800 m. <sup>†</sup>
VA	<i>Potamogeton diversifolius</i>	Rafinesque's Pondweed		RI	Shallow water, ditches, ponds, lakes; < 2500 m. <sup>†</sup>
VA	<i>Pyrrocoma racemosa</i> var. <i>racemosa</i>	Racemose Pyrrocoma	< 6 known populations	SW, MZ	Coastal valleys and marshes, neutral or saline soils; < 300 m. <sup>†</sup>
VA	<i>Ranunculus austroreganus</i>	Southern Oregon Buttercup		OHW, MG	Open oak savannas and grasslands and along the margins of rocky vernal pools at low elevations on a valley floor and margins. <sup>†</sup>
VA	<i>Rhamnus ilicifolia</i>	Redberry		SC	Chaparral, montane forests; < 2000 m. <sup>†</sup>
VA	<i>Rhynchospora alba</i>	White Beakrush		RI	Acid, sphagnum, boggy, open sites, poor fens, often on floating mats or peaty intersites of rocky shores; 0–2000 m; < 2000 m. <sup>†</sup>
VA	<i>Ribes divaricatum</i> var. <i>pubiflorum</i>	Straggly Gooseberry	6-20 known populations	CF	Coastal bluffs, forest edges, uplands; < 650 m. <sup>†</sup>
VA	<i>Romanzoffia thompsonii</i>	Thompson's Mistmaiden		MG, SW, RK, RI	Grows in seasonally wet, usually open, rocky, sunny areas; moist rocky areas, wet cliffs, south facing slopes steep, well drained slopes; 230–1830m. <sup>†</sup>
VA	<i>Rorippa columbiae</i>	Columbia Cress	6-20 known populations	RI, SW	Meadows, playas, seasonal stream bottoms, river margins. <sup>†</sup>
VA	<i>Rotala ramosior</i>	Lowland Toothcup		RI, SW	Wet places, lake and pond margins, streams, sloughs, vernal pools, irrigated fields; < 1900 m. <sup>†</sup>
VA	<i>Saxifragopsis fragarioides</i>	Joint-Leaved Saxifrage		RK	Uncommon; rock crevices; 1500–3000 m. <sup>†</sup>
VA	<i>Scheuchzeria palustris</i> var. <i>americana</i>	Scheuchzeria		RI, SW	Floating mats, bogs, lake margins, Cascades; 1400–2000 m <sup>†</sup>
VA	<i>Schoenoplectus subterminalis</i> - name change from <i>Scirpus subterminalis</i>	Water Clubrush		RI, SW	Aquatic, shallow ponds, streams or standing water with mucky substrate; < 35, 920-1450 m. <sup>a</sup>
VA	<i>Scirpus pendulus</i>	Drooping Bulrush		RI, SW	Marshes, wet meadows, ditches, often associated with calcareous substrates; < 600 m. <sup>†</sup>
VA	<i>Sedum moranii</i>	Rogue River Stonecrop		RK, SE	Steep south to west facing slopes and rock outcrops; 200-275 m. <sup>a</sup>
VA	<i>Sericocarpus rigidus</i>	White-Topped Aster		MG	Open grasslands dominated by Idaho fescue and surrounded by Douglas fir; typically moist most of the year, but dry, or moisture-stressed, during late summer; in the clayey and exposed bedrock habitats; <i>Quercus garryana</i> and <i>Arbutus menziesii</i> are often present, but do not form a closed overstory. <sup>†</sup>
VA	<i>Sidalcea hickmanii</i> ssp. nov.	Hickman's Checkerbloom	< 6 known populations	MG, RK, SC	Chaparral, open conifer forest, sometimes on serpentine; 50-2200 m. <sup>†</sup>
VA	<i>Sidalcea malviflora</i> ssp. <i>patula</i>	Coast Checker Bloom	6-20 known populations	MZ, MG, CF, SE, ME	Open coastal forest, prairie, mixed evergreen forest, grassy coastal headlands and meadows, often serpentine soils; generally < 900 m. <sup>†</sup>
VA	<i>Sidalcea nelsoniana</i>	Nelson's Checkermallow		MG	Relatively open areas on damp soil, in meadows, wet prairie remnants, fencerows, roadsides, deciduous forest edges, occasionally Oregon ash wetlands; 45-610 m. <sup>a</sup>





Taxon	Scientific Name	Common Name	Comments	Habitat Group	Habitat
VA	<i>Silene hookeri</i> ssp. <i>bolanderi</i>	Bolander's Catchfly		SE, OHW, CF	Serpentine, rocky slopes, open areas, northern oak woodlands to yellow-pine forests; < 5000 feet. <sup>†</sup>
VA	<i>Sisyrinchium hitchcockii</i>	Hitchcock's Blue-Eyed Grass	6-20 known populations	MG	Grassy areas, openings in woods, mostly where somewhat dry later in season; Willamette Valley and Umpqua Valley; 200-1000 m. <sup>†</sup>
VA	<i>Sisyrinchium sarmentosum</i>	Pale Blue-Eyed Grass		MG, SW	Moist, grassy areas; 500-1000 m. <sup>†</sup>
VA	<i>Solanum parishii</i>	Parish's Horse-Nettle		CF, OHW, SC	Dry chaparral, oak/pine woodland, pine forest; < 2000 m. <sup>†</sup>
VA	<i>Sophora leachiana</i>	Western Sophora		OHW, CF, SE	Dry, open areas, open mixed woodlands, roadcuts and clearcuts; 140-460 m. <sup>a</sup>
VA	<i>Stellaria humifusa</i>	Creeping Chickweed		MZ	Lake shores, beaches, marshes, salt marshes, mainly northern coastal; 0-100 m. <sup>†</sup>
VA	<i>Streptanthus glandulosus</i>	Common Jewel Flower	< 6 known populations	SE,CF,OHW, MG, SC	Dry, open grasslands, chaparral, open conifer/oak woodland, sometimes on serpentine, mostly away from coast; 15-1300 m. <sup>†</sup>
VA	<i>Streptanthus howellii</i>	Howell's Streptanthus		SE,CF,OHW	Dry, serpentine slopes, mixed evergreen forests, open pine woods or brushy areas; 485-1220 m. <sup>a</sup>
VA	<i>Streptopus streptopoides</i>	Kruhsea		CF	Dense, damp coniferous forests; 0-1600 m. <sup>†</sup>
VA	<i>Sullivantia oregana</i>	Oregon Sullivantia		RK	Moist, shaded cliffs, especially near waterfalls; surrounding forest dominated by Douglas fir; 30-365 m. <sup>a</sup>
VA	<i>Thelypodium brachycarpum</i>	Short-Podded Thelypody		MG, SW, SE	Alkaline soils, adobe flats, pond margins; 800-2320 m. <sup>†</sup>
VA	<i>Trillium kurabayashii</i>	Siskiyou Trillium		CF, RI, SC, OHW	Moist conifer-hardwood forest, slopes, especially lower slopes, predominantly deciduous flat woods along streams; in open grassy meadows with scattered oak trees; 20-500 m. <sup>†</sup>
VA	<i>Utricularia gibba</i>	Humped Bladderwort	< 6 known populations	SW, RI	Shallow water, mud, mat-forming at surface of deep waters or not; 10-2300 m. <sup>†</sup>
VA	<i>Utricularia minor</i>	Lesser Bladderwort		SW, RI	Shallow (gen < 30 cm) acidic waters; 800-2900 m. <sup>†</sup>
VA	<i>Utricularia ochroleuca</i>	Northern Bladderwort		RI	Shallow (gen < 30 cm) acidic waters; 1300-2400 m. <sup>†</sup>
VA	<i>Viola primulifolia</i> ssp. <i>occidentalis</i>	Western Bog Violet		SE, SW	Serpentine bogs, fens, swamps, or marshes in mixed evergreen forests; < 800 m. <sup>†</sup>
VA	<i>Wolffia borealis</i>	Dotted Water-Meal		RI, SW	Freshwater wetlands, ponds, sloughs; < 1000m. <sup>†</sup>
VA	<i>Wolffia columbiana</i>	Columbia Water-Meal		RI, SW	Freshwater wetlands, ponds, sloughs; < 200m. <sup>†</sup>
VA	<i>Zigadenus fontanus</i>	Small-Flowered Death Camas	< 6 known populations	MG,SW,SE	Vernally moist or marshy areas, often on serpentine; < 500 m. <sup>†</sup>

(\*) - Species with an (\*) are former Survey and Manage species that remained Bureau Sensitive in Oregon.



- <sup>a</sup> USDI, BLM. 2008. Species Fact Sheets. Interagency Special Status / Sensitive Species Program (ISSSSP). <http://www.fs.fed.us/r6/sfpnw/issssp/planning-tools/>
- <sup>b</sup> USDA Forest Service Region 6, USDI BLM Oregon and Washington. 2005. Conservation Assessments for 11 Species of Bryophytes - *Batrachopsis lescurei* (James) Kindb., *Diplophyllum plicatum* Lindb., *Encalypta brevicolla* (Bruch & Schimp.) Bruch ex Angstr. var. *crumiana* (Horton) Crum & Anderson, *Herbertus aduncus* (Dicks.) S.F. Gray, *Herbertus sakuraii* (Warmst.) Hattori, *Kurzia makinoana* (Steph.) Grolle *Marsupella emarginata* (Ehrh.) Dum.var. *aquatica* (Lindbenb.) Dum. *Orthodontium gracile* (Wils. in Sm. & Sowerby) Schwaegr. ex B.S.G., *Plagiophila semidecurrens* Lehm. & Lindbenb. var. *alaskana* (Evans) H.Inoue, *Radula brunnea* Steph., *Tritomaria quinqueidentata* (Huds.) Buch
- <sup>c</sup> USDI BLM 2007. Unpublished Data. Eugene BLM.
- <sup>d</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Iwatsukiella leucotricha* (Mitt.) Buck & Crum.
- <sup>e</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Rhizomnium nudum* (Britt. & Williams) Kop.
- <sup>f</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Schistostegia pennata* (Hedw.) Web. & Mohr.
- <sup>g</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Scouleria marginata* Britton
- <sup>h</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Tetraphis geniculata* Grig. ex Mitt
- <sup>i</sup> NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: June 23, 2008 )
- <sup>j</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Judith A. Harpel Ph.D. and Lance Holmberg M.S. Conservation Assessment for *Tritomaria exsectiformis* (Breidl.) Schiffn
- <sup>k</sup> Huff, R.; Kushman, K. 2007. Conservation Assessment for Fungi Included in Forest Service Regions 5 and 6 Sensitive and BLM California, Oregon and Washington Special Status Species Programs. Appendix I. Fungi species currently included in BLM CA or ORWA Special Status or Forest Service Regions 5 or 6 Sensitive Species Programs. Appendix II. Information on Additional Fungal Species. Appendix III. Fungi Work Group Priority Information and Conservation Gaps
- <sup>l</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Conservation Assessment for 11 Species of Coastal Lichens. *Bryoria pseudocapillaris* Brodo & D. Hawksw., *Bryoria spiriferella* Brodo & D. Hawksw., *Bryoria subcana* (Nyl. ex Stizenb.) Brodo & D. Hawksw., *Erioderma sorediatum* D.J. Galloway & P.M. Jørg., *Heteroderma leucomeles* Hedw., *Kaernefeltia californica* (Tuck.) Thell & Goward, *Leioderma sorediatum* D.J. Galloway & P.M. Jørg., *Leptogium brebissonii* Mont., *Niebla cephalota* (Tuck.) Rundel & Bowler, *Pyrrhospora quereina* (Dickson) Körber, *Teloschistes flavicans* (Sw.) Norman
- <sup>m</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2007. Doug A. Glavich. Conservation Assessment for *Dermatocarpon meiophyllizum* Vainio
- <sup>n</sup> SDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Conservation Assessment for 5 Species of Lichens *Hypogymnia duplicata* (Ach.) Rasm., *Pilophorus nigricaulis* Sato, *Pseudocyphellaria rainierensis* Imshaug, *Sitica arctica* Degel., *Tholurna dissimilis* (Norman) Norman.
- <sup>o</sup> USDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2006. Dr. Daphne Stone & Andrea Ruchty. *Leptogium cyanescens* - a catchall name for gray isidiate *Leptogium* species in the Pacific Northwest?
- <sup>p</sup> SDA Forest Service Region 6 and USDI BLM Oregon and Washington. 2005. Conservation Assessment for *Pannaria rubiginosa* (Ach.) Bory. Originally issued As Management Recommendations, 2003. Robin Leshner, Chiska Derr, and Linda Geiser. Reconfigured and updated, 2007. Jennifer L. Ferriell, Rob D. Huff, Doug A. Glavich
- <sup>q</sup> USDI BLM Coos Bay District and USDA F.S. Siuslaw N.F. 2004 Draft Conservation Strategy for Pink Sand-verbena (*Abronia umbellata* ssp. *breviflora*)
- <sup>r</sup> Flora of North America. 2008. <http://www.efloras.org>
- <sup>s</sup> California. <http://www.calflora.org/index0.html>
- <sup>t</sup> Hickman, J.C., ed. 1993. *The Jepson Manual: Higher plants of California*. University of California Press, Berkeley. [Third Printing, 1996].
- <sup>u</sup> USDA, U.S. Forest Service USDI, BLM. 2005. Conservation Assessment for the Forked Spleenwort (*Asplenium septentrionale*) Kathy Cushman and Sarah Malaby
- <sup>v</sup> USDA, U.S. Forest Service USDI, BLM. 2007. Conservation Assessment for 13 Species of Moonworts (*Botrychium* Swartz Subgenus *Botrychium*) Kathy Ahlenslager and Laura Potash.
- <sup>w</sup> USDI, USFWS. 2004. Species Assessment and Listing Priority Assignment. *Calochortus persistens* (Siskiyou mariposa lily)
- <sup>x</sup> Washington Natural Heritage Program. 2008. Washington Dept. of Natural Resources, Olympia, WA. [www.dnr.wa.gov/ResearchScience/Topics/NaturalHeritage/Pages/](http://www.dnr.wa.gov/ResearchScience/Topics/NaturalHeritage/Pages/)
- <sup>y</sup> USDA, U.S. Forest Service USDI, BLM. 2005. Conservation Assessment for *Coptis trifolia* (L.) Salisb. Originally issued as Management Recommendations, December 1998 by Marty Stein. Reconfigured-January 2005 by Tracy L. Fuentes.
- <sup>z</sup> USDA, U.S. Forest Service USDI, BLM. 2005. Conservation Assessment for *Corydalis aquae-geidae* Peck & Wilson. Originally issued as Version 1.3 Management Recommendations, January, 1998 M. Stein. Reconfigured – January 2005 N. C. Vance and L. S. Larson
- <sup>aa</sup> USDA, U.S. Forest Service USDI, BLM. 2005. Conservation Assessment for *Cypripedium fasciculatum* Kellogg ex S. Watson. Originally issued as Management Recommendations December 1998 J. Seevers and F. Lang. Reconfigured – January 2005 N. Vance.
- <sup>ab</sup> USFWS. 2005. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Fender's Blue Butterfly (*Icaricia icaroides fenderi*), *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine), and *Erigeron decumbens* var. *decumbens* (Willamette Daisy). Proposed Rule. Federal Register 70:66492-66539. November 2, 2005.
- <sup>ac</sup> Illustrated Flora of the Pacific States, Abrams, 1960



- <sup>dd</sup> USDA, U.S. Forest Service USDI, BLM. 2005. Conservation Assessment for *Eucephalus vialis* [Bradshaw] Blake. Originally issued as v. 2.0 Management Recommendations, 1998 by N. S. Wogen. Reconfigured 2005 by N. C. Vance and L. S. Larson
- <sup>ee</sup> USFWS. 2003. Recovery plan for *Fritillaria gentneri* (Gentner's fritillary). U.S. Fish and Wildlife Service, Portland, Oregon. viii + 89 pp.
- <sup>ff</sup> USDI, BLM Medford and Coos Bay Districts, USDA Six Rivers and Rogue-Siskiyou National forests, and USDI, USFWS Arcata and Roseburg Field Offices. 2006. Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oregonum*, and *Viola primumifolia* ssp. *Occidentalis* and serpentine Darlingtonia wetlands and fens from Southwestern Oregon and Northwestern California.
- <sup>gg</sup> USFWS. 1996. Water Howellia (*Howellia aquatilis*) Recovery Plan. Helena, Montana. 52 p.
- <sup>hh</sup> USFWS. 1998. Recovery Plan for the Endangered Western Lily (*Lilium occidentale*). Portland, Oregon. 82 pp.
- <sup>ii</sup> USFWS. 2006. Draft Recovery Plan for Listed Species of the Rogue Valley Vernal Pool and Illinois Valley Wet Meadow Ecosystems. Region 1, Portland, Oregon. xiii + 136 pages
- <sup>jj</sup> USFWS. 1993. *Lomatium bradshawii*, (Bradshaw's lomatium) Recovery Plan. Portland, Oregon. 47 p.
- <sup>kk</sup> USFWS. 2003. Recovery Plan for the Rough Popcornflower (*Plagiobothrys hirtus*). Portland, Oregon. 60 p.





TABLE F-3. BOTANY SPECIES RANKINGS

Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
BR	ANDREAEA SCHOFIELDIANA	MOSS		N1?	G2G3	S1	2		OR-SEN						D
BR	BRYUM CALBRYOIDES	MOSS		N2N3	G3	S2	2		OR-SEN				D		
BR	CALYPOGEIA SPHAGNICOLA	LIVERWORT		NNR	G4	S2	2		OR-SEN	D	S				S
BR	CAMPYLOPUS SCHMIDII	MOSS		NNR	G4	S2	2		OR-SEN	S	D				S
BR	CHILOSCYPHUS GEMMIPARUS	LIVERWORT		N1	G1Q	S1	1		OR-SEN	S	S				S
BR	CODRIOPHORUS DEPRESSUS - name change from Racomitrium depressum	MOSS			G2G3	S1	2		OR-SEN				D		
BR	CRYPTOMITRIUM TENERUM	LIVERWORT		NNR	G4	S1	2		OR-SEN	S					
BR	DIPLOPHYLLUM PLICATUM	LIVERWORT		N3	G4	S2	2		OR-SEN	D	S			S	S
BR	ENCALYPTA BREVICOLLIS - variety no longer recognized (E. brevicolla var. crumiana)	MOSS		N1	G4	S1	2		OR-SEN	S			S		
BR	ENCALYPTA BREVIPES	MOSS		NNR	G3	S1	2		OR-SEN	S					
BR	ENTOSTHODON FASCICULARIS	MOSS		NNR	G4G5	S1	2		OR-SEN	S	D		D	S	S
BR	EPHEMERUM CRASSINERVIVUM	MOSS		NNR	G4	S1	2		OR-SEN	S			D		
BR	GYMNOMITRIUM CONCINNATUM	LIVERWORT		NNR	G5	S1	2		OR-SEN						S
BR	HELODIUM BLANDOWII	MOSS		NNR	G5	S2	2		OR-SEN				S	S	S
BR	HERBERTUS ADUNCUS	LIVERWORT		N3N4	G5	S1	2		OR-SEN						S
BR	IWATSUKIELLA LEUCOTRICHA	MOSS		N2	G4G5	S1	2		OR-SEN						S
BR	KURZIA MAKINOANA (*)	LIVERWORT		N2Q	G2G4Q	S1	2		OR-SEN	D					
BR	LIMBELLA FRYEI	MOSS	FSC		G1	S1	1	SC	OR-SEN	S	S				
BR	LOPHOZIA LAXA	LIVERWORT		NNR	G4	S2	2		OR-SEN	S					S
BR	MEESIA ULIGINOSA	MOSS		NNR	G4	S1	2		OR-SEN				D	S	
BR	METZGERIA VIOLACEA	LIVERWORT			G4	S1	2		OR-SEN	D	S				S
BR	ORTHODONTIUM PELLUCENS	MOSS		N1	G5	S1	2		OR-SEN						S
BR	POLYTRICHUM SPHAEROTHECIUM	MOSS		N1N2	G3G4	S1	2		OR-SEN						S
BR	PORELLA BOLANDERI	LIVERWORT		N2N3	G3	S1	2		OR-SEN	S	D		D		
BR	PSEUDOCALLIERGON TRIFARIUM - name change from Calliergon trifarium	MOSS		NNR	G4	S1	2		OR-SEN						S
BR	RHIZOMNIUM NUJUDUM (*)	MOSS		N4	G4	S2	NL		OR-SEN						S
BR	RHYTIDIUM RUGOSUM	MOSS		NNR	G5	S1	2		OR-SEN	D	S				
BR	SCHISTOSTEGA PENNATA (*)	MOSS		N3N4	G3G4	S2	2		OR-SEN	S	S		D	S	
BR	SCOULERIA MARGINATA	MOSS			G3	S2	3		OR-SEN	S	S		D	S	
BR	SPLACHNUM AMPULLACEUM	MOSS		NNR	G5	S1	2		OR-SEN	S	S				
BR	TAYLORIA SERRATA	MOSS		NNR	G4	S2	2		OR-SEN	S	D		D	D	S
BR	TETRAPHIS GENICULATA (*)	MOSS		N3	G3G5	S1	2		OR-SEN	S	S			S	D
BR	TETRAPLONDON MNIOIDES	MOSS		NNR	G4	S2	2		OR-SEN		D				D
BR	TOMENTYPNUM NITENS	MOSS		NNR	G5	S2	2		OR-SEN					S	S
BR	TORTULA MUCRONIFOLIA	MOSS		NNR	G5	S2	2		OR-SEN				S	D	S
BR	TREMATODON BOASII	MOSS		N1	G1	S1	1		OR-SEN	S					S



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
BR	TRITOMARIA EXSECTIFORMIS	LIVERWORT		N4	G5	S2	2		OR-SEN			S			
FU	ALBATRELLUS AVELLANEUS	FUNGUS		N2	G2	S1?	1		OR-SEN	S	S				
FU	ALPOVA ALEXSMITHII	FUNGUS		N2	G2	S2	1		OR-SEN						S
FU	ARCANGELIELLA CAMPHORATA	FUNGUS		N2	G2	S2	1		OR-SEN	D	S				S
FU	BOLETUS PULCHERRIMUS (*)	FUNGUS		N2N3	G2G3	S2	1		OR-SEN	S	S	D	D		S
FU	BRIDGEOPORUS NOBILISSIMUS (*)	FUNGUS		N2	G3	S2S3	1		OR-SEN					S	D
FU	CHAMONIXIA CAESPITOSA	FUNGUS		NU	GU	S1	2		OR-SEN	S	S				D
FU	CHOIROMYCES VENOSUS	FUNGUS		N2	G4	S1	2		OR-SEN		D				
FU	CORTINARIUS BARLOWENSIS	FUNGUS		N3?	G3?	S2	2		OR-SEN	S	S				S
FU	CUDONIA MONTICOLA (*)	FUNGUS		N3	G3	S2S3	3		OR-SEN	D	S	D	D		D
FU	CYSTANGIUM IDAHOENSIS - name change from Martellia idahoensis	FUNGUS		N2N3	G2G3	S1	1		OR-SEN	S	S				S
FU	DERMOCYBE HUMBOLDTENSIS	FUNGUS		N1N2	G1G2	S1	1		OR-SEN	S	S	S	D		S
FU	DESTUNTZIA RUBRA (*)	FUNGUS		N2	G2	SH	1		OR-SEN						S
FU	GASTROBOLETUS IMBELLUS (*)	FUNGUS		NU	GH	SH	1		OR-SEN						S
FU	GASTROBOLETUS VIVIDUS	FUNGUS		N2?	G2?	S1	1		OR-SEN			S			S
FU	GOMPHUS KAUFFMANII (*)	FUNGUS		N2N4	G2G4	S3?	3		OR-SEN	S	S	S	D	D	D
FU	GYMNOMYCES FRAGRANS - name change from Martellia fragrans	FUNGUS		N2N3	G2G3	S1S3	1		OR-SEN					S	S
FU	GYMNOMYCES NONDISTINCTA	FUNGUS		N1	G1	S1	1		OR-SEN	S	S				S
FU	HELVELLA CRASSITUNICATA	FUNGUS		N3	G3	S2	2		OR-SEN	S	S	S			S
FU	LEUCOGASTER CITRINUS (*)	FUNGUS		N4	G3G4	S3S4	3		OR-SEN	S	S	D	D	D	D
FU	MYTHICOMYCES CORNEIPES	FUNGUS		N2N4	G2G4	S2?	2		OR-SEN	S	S				S
FU	OCTAVIANA MACROSPORA - spelling corrected from Octavianina macrospora (*)	FUNGUS		NH	GH	SH	1		OR-SEN	S	S				S
FU	OTIDEA SMITHII (*)	FUNGUS		N2	G2	S2	3		OR-SEN	S	S	S	D	D	D
FU	PHAEOLLYBIA CALIFORNICA	FUNGUS		N2?	G2?	S2?	1		OR-SEN	D	D	D	D	D	D
FU	PHAEOLLYBIA DISSILIENS (*)	FUNGUS		N2N3	G2G3	S2S3	3		OR-SEN	D	D				S
FU	PHAEOLLYBIA GREGARIA	FUNGUS		N1N2	G1G2	S1S2	1		OR-SEN	S	S				S
FU	PHAEOLLYBIA OLIVACEA (*)	FUNGUS		N2	G2	S2	NL		OR-SEN	D	D	D	D	D	D
FU	PHAEOLLYBIA OREGONENSIS (*)	FUNGUS		N2?	G2?	S2?	1		OR-SEN	D	D	S	S		D
FU	PHAEOLLYBIA PSEUDOFESTIVA (*)	FUNGUS		N3	G3	S3?	3		OR-SEN	D	S	D	S		D
FU	PHAEOLLYBIA SCATESIAE (*)	FUNGUS		N3?	G3?	S3?	3		OR-SEN	D	S				D
FU	PHAEOLLYBIA SIPEI (*)	FUNGUS		N3?	G3?	S3?	3		OR-SEN	D	D				D
FU	PHAEOLLYBIA SPADICEA (*)	FUNGUS		N3N4	G3G4	S3?	3		OR-SEN	D	D				D
FU	PSEUDORHIZINA CALIFORNICA (*)	FUNGUS		N4	G4	S2	2		OR-SEN	S	D	S	S		S
FU	RAMARIA AMYLOIDEA (*)	FUNGUS		N3	G3	S2?	2		OR-SEN	S	S				S
FU	RAMARIA GELATINIAURANTIA (*)	FUNGUS		N4	G4	S2?	3		OR-SEN	D	S				S
FU	RAMARIA LARGENTII (*)	FUNGUS		N3	G3	S2?	3		OR-SEN	D	S	D	D		S
FU	RAMARIA RUBELLA VAR. BLANDA	FUNGUS		NU	GU	S1?	2		OR-SEN	S	S				S
FU	RAMARIA SPINULOSA VAR. DIMINUTIVA	FUNGUS		NU	GU	S1?	1		OR-SEN	S	S				S



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
FU	RHIZOPOGON CHAMALEONTINUS	FUNGUS		N1N2	G2G3	S1S2	2		OR-SEN		S		S		S
FU	RHIZOPOGON ELLIPSOPORUS	FUNGUS		N1N3	G2G3	S1S2	2		OR-SEN		S	S	D		
FU	RHIZOPOGON EXIGUUS	FUNGUS		N1N3	G2G3	S1S2	2		OR-SEN	S	S	S	S	S	S
FU	RHIZOPOGON INQUINATUS	FUNGUS		N2N4	G2G3	S1S2	2		OR-SEN		S				S
FU	SOWERBYELLA RHENANA (*)	FUNGUS		N3	G3G4	S3	3		OR-SEN	D	S	S	D	D	D
FU	STAGNICOLA PERPLEXA	FUNGUS		N2N4	G2G4	S1S2	2		OR-SEN						S
FU	THAXTEROGASTER PAVELEKII	FUNGUS		N2	G2	S2	1		OR-SEN	S					
LI	BRYORIA PSEUDOCAPILLARIS	LICHEN		N1N2	G3	S2	2		OR-SEN	D	S				S
LI	BRYORIA SPIRALIFERA	LICHEN		N1	G3	S2	2		OR-SEN	D	S				S
LI	BRYORIA SUBCANA	LICHEN		N2N3	G2G4	S2	2		OR-SEN	D	S			S	D
LI	CALICIUM ADPERSUM (*)	LICHEN		N2N3	G3G4	S1	2		OR-SEN	S	S			S	S
LI	CHAENOTHECA SUBROSCIDA (*)	LICHEN		N3	G3G4	S2	2		OR-SEN		S		D	D	D
LI	DERMATOCARPON MEIOPHYLLIZIUM (*)	LICHEN		N4	G4G5	S1S2	3		OR-SEN	S	S		D	D	D
LI	ERIODERMA SOREDIATUM	LICHEN		N1N3	G4	S2	2		OR-SEN	D	D				
LI	HETERODERMIA LEUCOMELA - name change from H. leucomelos	LICHEN		NNR	G4	S2S3	2		OR-SEN	D					D
LI	HETERODERMIA SITCHENSIS (*)	LICHEN		N1N2	G2G3	S1	2		OR-SEN						S
LI	HYPOGYMNA DUPLICATA (*)	LICHEN		N4	G4	S2	3		OR-SEN	S	S			S	D
LI	HYPOTRACHYNA REVOLUTA (*)	LICHEN		N4	G3G4	S1	2		OR-SEN	S	S				S
LI	LEIODERMA SOREDIATUM	LICHEN		NNR	G4	S1	2		OR-SEN	S	S				
LI	LEPTOGIUM BURNETIAE (*) - name change from L. burnetiae var. hirsutum (*)	LICHEN		N4	G5Q	S1	3		OR-SEN						D
LI	LEPTOGIUM CYANESCENS (*)	LICHEN		N4	G5	S1	2		OR-SEN	D	S		D	D	S
LI	LOBARIA LINITA	LICHEN		N3	G4G5	S1	2		OR-SEN	S	S		S	S	D
LI	MICROCALICIUM ARENARIUM	LICHEN		N3N4	G4G5	S1	2		OR-SEN		S				
LI	NIEBLA CEPHALOTA	LICHEN		N1N3	G3G4	S2	2		OR-SEN	D	S				S
LI	PANNARIA RUBIGINOSA (*)	LICHEN		N4	G4G5	S2	2		OR-SEN	S	D			S	D
LI	PILOPHORUS NIGRICAULIS	LICHEN		NNR	G3	S2	2		OR-SEN		S			S	D
LI	PSEUDOCYPHELLARIA MALLOTA	LICHEN		NNR	G4	S1	2		OR-SEN	S	D				
LI	RAMALINA POLLINARIA	LICHEN		N4	G4	S1S2	2		OR-SEN	D					S
LI	STEREOCAULON SPATHULIFERUM	LICHEN		NNR	G4G5	S1	2		OR-SEN		S			S	S
LI	TELOSCHISTES FLAVICANS	LICHEN		N4	G4	S1	2		OR-SEN	D					D
LI	TEXOSPORIUM SANCTI-JACOBI	LICHEN	FSC	N2	G3	S1	2		OR-SEN			S			
LI	THOLURNA DISSIMILIS (*)	LICHEN		N3	G3G5	S2	2		OR-SEN		S				S
LI	USNEA NIDULANS	LICHEN			G3G4	S1	2		OR-SEN		S				
VA	ABRONIA UMBELLATA SSP. BREVIFLORA	PINK SAND-VERBENA	FSC	N2	G4G5	S1	1	SE	OR-SEN	D					
VA	ADIANTUM JORDANII	CALIFORNIA MAIDEN-HAIR		NNR	G4G5	S2	2		OR-SEN	D			D	D	D
VA	AGOSERIS ELATA	TALL AGOSERIS		NNR	G4	S1	2		OR-SEN		S				



FEIS for the Revision of the Western Oregon RMPs

Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHC State Rank	ORNHC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	AGROSTIS HOWELLII	HOWELL'S BENTGRASS	FSC	N2	G2	S2	1	SC	OR-SEN		S				S
VA	ANEMONE OREGANA VAR. FELIX	BOG ANEMONE	FSC	N2	G4	S1	2		OR-SEN						D
VA	ARABIS KOEHLERI VAR. KOEHLERI	KOEHLER'S ROCKCRESS	FSC	N1	G3	S1	1	SC	OR-SEN						D
VA	ARABIS MACDONALDIANA	MACDONALD'S ROCK-CRESS	FE	N2	G2	S1	1	SE	FE				S		
VA	ARCTOSTAPHYLOS HISPIDULA	HAIRY MANZANITA	FSC	N3	G3	S2	2		OR-SEN	D			D		S
VA	ARNICA VISCOSA	SHASTA ARNICA	NNR	N4	G4	S2	2		OR-SEN				S		
VA	ARTEMISIA PYCNOCEPHALA	COASTAL SAGEWORT	NNR	N4	G4G5	S1	2		OR-SEN	D					
VA	ASPLENIUM SEPTENTRIONALE	GRASS-FERN	N4N5	N4	G4G5	S1	2		OR-SEN				S		S
VA	ASTRAGALUS APPLIGATEI	APPLIGATE'S MILK-VETCH	FE	N1	G1	S1	1	SE	FE			S			
VA	ASTRAGALUS CALIFORNICUS	CALIFORNIA MILK-VETCH		N3	G3	S1	2		OR-SEN				D		
VA	ASTRAGALUS GAMBELIANUS	GAMBEL MILK-VETCH		NNR	G5	S1	2		OR-SEN				D		
VA	ASTRAGALUS PECKII	PECK'S MILK-VETCH		N3	G3	S3	1	ST	OR-SEN			S			
VA	BENSONIELLA OREGANA	BENSONIA	FSC	N3	G3	S3	1	SC	OR-SEN	D			D		D
VA	BOTRYCHUM MINGANENSE (*)	GRAY MOONWORT		NNR	G4	S3	4		OR-SEN			D			S
VA	BOTRYCHUM MONTANUM	MOUNTAIN GRAPE-FERN	FSC	N3	G3	S2	2		OR-SEN			S			
VA	BOTRYCHUM PUMICOLA	PUMICE GRAPE-FERN		N3	G3	S3	1	ST	OR-SEN			S			
VA	BRODIAEA TERRESTRIS	DWARF BRODIAEA		N4N5	G4G5	S2	2		OR-SEN	D					
VA	CALAMAGROSTIS BREWERI	BREWER'S REEDGRASS		NNR	G3	S2	2		OR-SEN						S
VA	CALLITRICHE MARGINATA	WINGED WATER-STARWORT			G4	S2	2		OR-SEN				D		
VA	CALOCHORTUS COXII	CRINITE MARIPOSA-LILY	FSC	N1	G1	S1	1	SE	OR-SEN			S			D
VA	CALOCHORTUS GREENEI	GREENE'S MARIPOSA-LILY	FSC	N2	G3	S3	1	SC	OR-SEN			S			D
VA	CALOCHORTUS HOWELLII	HOWELL'S MARIPOSA-LILY	FSC	N3	G3	S3	1	ST	OR-SEN				D		
VA	CALOCHORTUS INDECORUS	SEXTON MT. MARIPOSA-LILY		NX	GX	SX	1	SE	OR-SEN				S		
VA	CALOCHORTUS MONOPHYLLUS	ONE-LEAVED MARIPOSA-LILY		NNR	G3G4	S1	2		OR-SEN				D		
VA	CALOCHORTUS NITIDUS	BROAD-FRUIT MARIPOSA-LILY	FSC	N3	G3	S1	2		OR-SEN				D		



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	CALOCHORTUS PERSISTENS	SISKIYOU MARIPOSA-LILY		N1	G1	S1	1		OR-SEN					D	
VA	CALOCHORTUS UMPQUAENSIS	UMPQUA MARIPOSA-LILY	FSC	N1	G1	S1	1	SE	OR-SEN				S	D	
VA	CAMASSIA HOWELLI	HOWELL'S CAMAS	FSC	N2	G2	S2	1	SC	OR-SEN				D	S	
VA	CAMISSONIA GRACILIFLORA	SLENDER-FLOWERED EVENING-PRIMROSE		N4	G4	S2	2		OR-SEN					D	
VA	CARDAMINE PATTERSONII	SADDLE MOUNTAIN BITTERCRESS	FSC	N2	G2	S2	1	SC	OR-SEN		S				
VA	CAREX ABRUPTA	ABRUPT-BEAKED SEDGE		NNR	G5	S1	2		OR-SEN			D	S		
VA	CAREX BREVICALUS	SHORT STEMMED SEDGE		NNR	G5	S2	2		OR-SEN	D	S			S	
VA	CAREX CAPITATA	CAPITATE SEDGE		NNR	G5	S2	2		OR-SEN			S	D		
VA	CAREX COMOSA	BRISTLY SEDGE		NNR	G5	S1	2		OR-SEN	S	D	D	S		
VA	CAREX CRAWFORDII	CRAWFORD'S SEDGE		NNR	G5	S1	2		OR-SEN	D				S	
VA	CAREX DIANDRA	LESSER PANICLED SEDGE		NNR	G5	S1	2		OR-SEN					S	
VA	CAREX GYNODYNAMA	HAIRY SEDGE		NNR	G4G5	S2	2		OR-SEN	D	D	D	D	D	
VA	CAREX KLAMATHENSIS (SW OR pops. of Carex livida)	A SEDGE			G2	S2	1		OR-SEN					D	
VA	CAREX LASIOCARPA VAR. AMERICANA	SLENDER SEDGE		NNR	G5	S2	2		OR-SEN					D	
VA	CAREX LIVIDA	PALE SEDGE		NNR	G5	S2	2		OR-SEN		S			S	
VA	CAREX NERVINA	SIERRA NERVED SEDGE		NNR	G5	S1	2		OR-SEN					S	
VA	CAREX RETRORSA	RETROSE SEDGE			G5	S1	2		OR-SEN		S				
VA	CAREX SCABRUSCULA	SISKIYOU SEDGE		N3N4	G3G4	S3	2		OR-SEN	S				D	
VA	CAREX SERRATODENS	SAW-TOOTH SEDGE		NNR	G5	S2	2		OR-SEN				D	D	
VA	CASTILLEJA CHLOROTICA	GREEN-TINGED PAINTBRUSH		N3	G3	S3	1		OR-SEN					S	
VA	CASTILLEJA LEVISECTA	GOLDEN PAINTBRUSH	FT	N1	G1	SH	1	SE	FT	S				S	
VA	CASTILLEJAMENDOCINENSIS	MENDOCINO COAST INDIAN PAINTBRUSH	FSC	N2	G2	S1	1		OR-SEN	S					
VA	CHEILANTHES COVILLEI	COVILLE'S LIP-FERN		NNR	G4?	S1	2		OR-SEN					D	
VA	CHEILANTHES INTERTEXTA	COASTAL LIPFERN		NNR	G5	S1	2		OR-SEN					D	
VA	CHLOROGALUM ANGUSTIFOLIUM	NARROW-LEAVED AMOLE		NNR	G4G5	S1	2		OR-SEN					D	



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHC State Rank	ORNHC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	CICENDIA QUADRANGULARIS	TIMWORT		NNR	G4	S2	2		OR-SEN	D	D			D	S
VA	CICUTA BULBIFERA	BULB-BEARING WATER-HEMLOCK			G5	SH	2-ex		OR-SEN			S			
VA	CIMICIFUGA ELATA VAR. ELATA	TALL BUGBANE	FSC	N3	G3	S3	1	SC	OR-SEN	S	D		D	D	D
VA	COLLOMIA MAZAMA	MT. MAZAMA COLLOMIA		N3	G3	S3	1		OR-SEN			S			
VA	COPTIS TRIFOLIA	THREE-LEAF GOLDTHREAD		N5	G5	S1	2		OR-SEN						S
VA	CORDYLANTHUS MARITIMUS SSP. PALUSTRIS	POINT REYES BIRD'S BEAK	FSC	N2	G4?	S2	1	SE	OR-SEN	D					
VA	CORYDALIS AQUAE-GELIDAE	COLD-WATER CORYDALIS	FSC	N3	G3	S3	1	SC	OR-SEN	S					D
VA	CRYPTANTHA LEIOCARPA	SEASIDE CRYPTANTHA		NNR	G3G4	S1	2		OR-SEN	D					
VA	CRYPTANTHA MILO-BAKERI	MILO BAKER'S CRYPTANTHA		NNR	G3G4	S1	2		OR-SEN				D		
VA	CRYPTOGRAMMA STELLERI	STELLER'S ROCKBRAKE		NNR	G5	S1	2		OR-SEN	S					
VA	CUPRESSUS BAKERI	BAKER'S CYPRESS	FSC	N3	G3	S1	2		OR-SEN				D		
VA	CYPERUS ACUMINATUS	SHORT-POINTED CYPERUS		N5	G5	S1	2		OR-SEN	S	S		S	S	S
VA	CYPRIPEDIUM FASCICULATUM (*)	CLUSTERED LADY'S-SLIPPER	FSC	N4	G4	S3	2	SC	OR-SEN			S	D	S	S
VA	DELPHINIUM LEUCOPHAEUM	WHITE ROCK LARKSPUR	FSC	N2	G4	S2	1	SE	OR-SEN						S
VA	DELPHINIUM NUJICAULE	RED LARKSPUR		NNR	G4	S2	2		OR-SEN				D	S	S
VA	DELPHINIUM NUTTALLII	NUTTALL'S LARKSPUR		N4	G4	S1	2		OR-SEN						S
VA	DELPHINIUM PAVONACEUM	PEACOCK LARKSPUR	FSC	NNR	G1Q	S1	1	SE	OR-SEN						S
VA	DICENTRA PAUCIFLORA	FEW-FLOWERED BLEEDINGHEART	FSC	NNR	G3?	S1	2		OR-SEN				D		
VA	DODECATHEON AUSTRORFRIGIDUM	FRIGID SHOOTINGSTAR	FSC	N2	G2	S2	1		OR-SEN						D
VA	DRABA HOWELLII	HOWELL'S WHITLOW-GRASS		NNR	G4	S2	2	SC	OR-SEN						S
VA	EPILOBIUM OREGANUM	OREGON WILLOW-HERB	FSC	N2	G2	S1	1	SC	OR-SEN				D	S	S
VA	ERICAMERIA ARBORESCENS	GOLDEN FLEECE		NNR	G4	S1	2		OR-SEN	D					S
VA	ERIGERON CERVINUS	SISKIYOU DAISY	FSC	N3	G3	S2	2		OR-SEN	S					S
VA	ERIGERON DECUMBENS VAR. DECUMBENS	WILLAMETTE VALLEY DAISY	FE	N1	G4	S1	1	SE	FE	D					S
VA	ERIGERON HOWELLII	HOWELL'S DAISY	FSC	N2	G2	S2	1	SC	OR-SEN						S



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	ERIOGONUM LOBBII	LOBB'S BUCKWHEAT		N4	G4	S2	2		OR-SEN					S	
VA	ERIOGONUM UMBELLATUM VAR. GLABERRIMUM	GREEN BUCKWHEAT	FSC	N2?	G5	S1?	1		OR-SEN					S	
VA	ERIOPHORUM CHAMISSONIS	RUSSET COTTON-GRASS		NNR	G5	S1	2		OR-SEN	D	S				
VA	ERYTHRONIUM ELEGANS	COAST RANGE FAWN-LILY	FSC	N1	G1	S1	1	ST	OR-SEN		S				D
VA	ERYTHRONIUM HOWELLII	HOWELL'S ADDER'S-TONGUE		N3	G3G4	S3	1		OR-SEN					D	
VA	ESCHSCHOLZIA CAESPITOSA	GOLD POPPY		NNR	G5	S1	2		OR-SEN					D	S
VA	EUCEPHALUS VIALIS	WAYSIDE ASTER	FSC	N3	G3	S3	1	ST	OR-SEN	S	D			D	D
VA	EUCHEPHALUS GORMANII	GORMAN'S ASTER		N3	G3	S3	1		OR-SEN						D
VA	FILIPENDULA OCCIDENTALIS	QUEEN-OF-THE-FOREST	FSC	N2N3	G2G3	S2	1	SC	OR-SEN						D
VA	FRITILLARIA CAMSCHATCENSIS	BLACK LILY		NNR	G5	S1	2		OR-SEN					D	
VA	FRITILLARIA GENTNERI	GENTNER'S FRITILLARY	FE	N1	G1	S1	1	SE	FE		S			D	
VA	GENTIANA NEWBERRYI	NEWBERRY'S GENTIAN		N4	G4	S2	2		OR-SEN					S	
VA	GENTIANA PLURISETOSA	ELEGANT GENTIAN	FSC	N3	G3	S1	1		OR-SEN					S	
VA	GENTIANA SETIGERA	WALDO GENTIAN	FSC	N2	G2	S2	1	SC	OR-SEN	D				D	
VA	GILIA MILLEFOLIATA	SEASIDE GILIA	FSC	N2	G2	S1	1		OR-SEN	D					
VA	HACKELIA BELLA	BEAUTIFUL STICKSEED		N3?	G3?	S1	2		OR-SEN					D	
VA	HASTINGSIA BRACTEOSA VAR. ATROPURPUREA	PURPLE-FLOWERED RUSH-LILY	FSC	N1	G2	S1	1	ST	OR-SEN					D	
VA	HASTINGSIA BRACTEOSA VAR. BRACTEOSA	LARGE-FLOWERED RUSH-LILY	FSC	N2	G2	S2	1	ST	OR-SEN					D	
VA	HELIOTROPICUM CURASSAVICUM	SALT HELIOTROPE		N2N4	G5	S2	2		OR-SEN					D	
VA	HIERACIUM HORRIDUM	SHAGGY HAWKWEED			G4	S1	2		OR-SEN					S	
VA	HORKELIA CONGESTA SSP. CONGESTA	SHAGGY HORKELIA	FSC	N2	G4	S2	1	SC	OR-SEN	D				D	S
VA	HORKELIA TRIDENTATA SSP. TRIDENTATA	THREE-TOOTHED HORKELIA		N4?	G4G5	S1	2		OR-SEN					D	S
VA	HOWELLIA AQUATILIS	WATER HOWELLIA	FT	N3	G3	S1	1		FT		S			S	
VA	HYDROCOTYLE VERTICILLATA	WHORLED MARSH-PENNYWORT		N4N5	G5	S1	2		OR-SEN	S	S				
VA	ILIAMNA LATIBRACTEATA	CALIFORNIA GLOBE-MALLOW		N3	G3	S2	2		OR-SEN	D				D	D
VA	IRIS TENAX VAR. GORMANII	GORMAN'S IRIS			G4G5	S1	1		OR-SEN		S			D	
VA	JUNCUS KELLOGGII	KELLOGG'S RUSH			G3?	SNR	3		OR-SEN	D				S	S



FEIS for the Revision of the Western Oregon RMPs

Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHC State Rank	ORNHC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	KALMIOPSIS FRAGRANS	FRAGRANT KALMIOPSIS	FSC		G1	S1	1		OR-SEN						S
VA	KECKIELLA LEMMONII	BUSH BEARDTONGUE		NNR	G4	S1	2		OR-SEN				S		
VA	LASTHENIA ORNDUFFII - name change from L. macrantha ssp. prisca	LARGE-FLOWERED GOLDFIELDS	FSC	N2	G3	S2	1	SC	OR-SEN	D					
VA	LATHYRUS HOLOCHLORUS	THIN-LEAVED PEAVINE	FSC	N3	G2	S2	1		OR-SEN		D			S	D
VA	LEWISIA COLUMBIANA VAR. COLUMBIANA	COLUMBIA LEWISIA		NNR	G4	S2	2		OR-SEN						S
VA	LEWISIA LEANA	LEE'S LEWISIA		NNR	G4	S2	2		OR-SEN				D	S	
VA	LILIUM OCCIDENTALE	WESTERN LILY	FE	N1	G1	S1	1	SE	FE		D				
VA	LIMNANTHES FLOCCOSA SSP. BELLINGERIANA	BELLINGER'S MEADOW-FOAM	FSC	N2	G4	S2	1	SC	OR-SEN			D	D		
VA	LIMNANTHES FLOCCOSA SSP. GRANDIFLORA	LARGE-FLOWERED WOOLY MEADOWFOAM	FE	N1	G4	S1	1	SE	FE				S		
VA	LIMNANTHES FLOCCOSA SSP. PUMILLA	DWARF MEADOW-FOAM	FSC	N1	G4	S1	1	ST	OR-SEN				D		
VA	LIMNANTHES GRACILIS SSP. GRACILIS	SLENDER MEADOW-FOAM		N2	G3	S2	1	SC	OR-SEN				D	D	
VA	LIMONIUM CALIFORNICUM	WESTERN MARSH-ROSEMARY		NNR	G4	S1	2		OR-SEN	D					
VA	LOMATIUM BRADSHAWII	BRADSHAW'S DESERTPARSLEY	FE	N2	G2	S2	1	SE	FE		D				S
VA	LOMATIUM COOKII	COOK'S LOMATIUM	FE	N1	G1	S1	1	SE	FE				D		
VA	LOMATIUM ENGELMANNII	ENGELMANN'S DESERT-PARSLEY		N3	G3	S1	2		OR-SEN				S		
VA	LOTUS STIPULARIS	STIPULED TREFOIL		NNR	G5	S2	2		OR-SEN				D	S	
VA	LUPINUS SULPHUREUS SSP. KINCAIDII	KINCAID'S LUPINE	FT	N2	G5	S2	1	ST	FT		D			D	S
VA	LUPINUS TRACYI	TRACY'S LUPINE		NNR	G4	S2	2		OR-SEN				S		
VA	LYCOPODIELLA INUNDATA	BOG CLUB-MOSS		NNR	G5	S2	2		OR-SEN	D	D				D
VA	LYCOPODIUM COMPLANATUM	GROUND CEDAR		NNR	G5	S2	2		OR-SEN						S
VA	MECONELLA OREGANA	WHITE FAIRYPOPPY	FSC	N2	G2G3	S1	1	SC	OR-SEN		S		D	S	
VA	MICROSERIS BIGELOVII	COAST MICROSERIS		NNR	G4	S2	2		OR-SEN	D	S				
VA	MICROSERIS HOWELLII	HOWELL'S MICROSERIS		N3	G3	S3	4	ST	OR-SEN				D		
VA	MIMULUS BOLANDERI	BOLANDER'S MONKEYFLOWER		NNR	G4	S1	2		OR-SEN				D		
VA	MIMULUS CONGDONII	CONGDON'S MONKEYFLOWER		NNR	G4G5	S1?	2		OR-SEN				D		
VA	MIMULUS EVANESCENS	DISAPPEARING MONKEYFLOWER	FSC	N2	G2	S2	1	SC	OR-SEN			D			





Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHC State Rank	ORNHC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	MIMULUS TRICOLOR	THREE-COLORED MONKEY-FLOWER		NNR	G4	S2	2		OR-SEN			S			S
VA	NAVARRETTIA LEUCOCEPHALA SSP. LEUCOCEPHALA	WHITE-FLOWERED NAVARRETTIA		NNR	G4	S2	2		OR-SEN		S	D	D		
VA	NEMACLADUS CAPILLARIS	SLENDER NEMACLADUS		NNR	G4	S1	2		OR-SEN					D	
VA	OENOTHERA WOLFII	WOLF'S-EVENING-PRIMROSE	FSC	N1	G1	S1	1	ST	OR-SEN		D				
VA	OPHIOGLOSSUM PUSILLUM	ADDER'S-TONGUE		NNR	G5	S1	2		OR-SEN	S	S				S
VA	PELLAEA ANDROMEDIFOLIA	COFFEE FERN		NNR	G4	S2	2		OR-SEN	D	S	D	D		D
VA	PELLAEA MUCRONATA SSP. MUCRONATA	BIRD'S-FOOT FERN		N4?	G5	S1	2		OR-SEN					D	
VA	PENSTEMON GLAUCINUS	BLUE-LEAVED PENSTEMON	FSC	N3	G3	S3	1		OR-SEN			D			
VA	PERIDERIDIA ERYTHORHIZA	RED-ROOTED YAMPAH	FSC	N1	G1	S1	1	SC	OR-SEN		S	D	D		D
VA	PHACELIA ARGENTEA	SILVERY PHACELIA	FSC	N2	G2	S2	1	ST	OR-SEN	D					
VA	PHACELIA LEONIS	SISKIYOU PHACELIA	FSC	N2	G2	S1	1		OR-SEN					S	
VA	PILULARIA AMERICANA	AMERICAN PILLWORT		NNR	G5	S2	2		OR-SEN		S	S			
VA	PLAGIOBOTHRY'S AUSTINIAE	AUSTIN'S PLAGIOBOTHRY'S		NNR	G4	S2?	2		OR-SEN					D	
VA	PLAGIOBOTHRY'S FIGURATUS SSP. CORALLICARPUS	CORAL SEEDED ALLOCARYA	FSC	N1	G4	S1	1	SC	OR-SEN					D	
VA	PLAGIOBOTHRY'S GREENEI	GREENE'S POPCORN FLOWER		NNR	G4	S2?	2		OR-SEN					D	
VA	PLAGIOBOTHRY'S HIRTUS	ROUGH POPCORN FLOWER	FE	N1	G1	S1	1	SE	FE					D	
VA	PLAGIOBOTHRY'S LAMPROCARPUS	SHINY-FRUITED POPCORN FLOWER		NX	GX	SX	1	SE	OR-SEN					S	
VA	POA RHIZOMATA	TIMBER BLUEGRASS		N3N4	G3G4	S1?	2		OR-SEN					D	
VA	POA UNILATERALIS	SAN FRANCISCO BLUEGRASS			G3	S1	2	SC	OR-SEN	S					
VA	POGOGYNE FLORIBUNDA	PROFUSE-FLOWERED MESA MINT	FSC	N3	G3	S1	1		OR-SEN					D	
VA	POLYSTICHUM CALIFORNICUM	CALIFORNIA SWORD-FERN		NNR	G4	S2	2		OR-SEN	D	S	D	D		D
VA	POTAMOGETON DIVERSIFOLIUS	RAFINESQUE'S PONDWEED		N5	G5	S1	2		OR-SEN					S	
VA	PYRROCOMA RACEMOSA VAR. RACEMOSA	RACEMOSE PYRROCOMA		NNR	G5	S1	2		OR-SEN	D					S

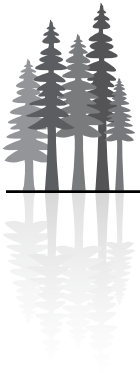


Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	RANUNCULUS AUSTROOREGANIUS	SOUTHERN OREGON BUTTERCUP		N2	G2	S2	1	SC	OR-SEN				D		
VA	RHAMNUS ILICIFOLIA	REDBERRY		N5	G5	S1	2		OR-SEN				D		
VA	RHYNCHOSPORA ALBA	WHITE BEAKRUSH		NNR	G5	S2	2		OR-SEN	D	S	S			S
VA	RIBES DIVARICATUM VAR. PUBIFLORUM	STRAGGLY GOOSEBERRY		NNR	G4	S2	2		OR-SEN		S		D		
VA	ROMANZOFFIA THOMPSONII	THOMPSON'S MISTMAIDEN		N3	G3	S3	1		OR-SEN	D	D		S	D	S
VA	RORIPPA COLUMBAE	COLUMBIA CRESS	FSC	N3	G3	S3	1	SC	OR-SEN				D		
VA	ROTALA RAMOSIOR	LOWLAND TOOTHCUP		N5	G5	S2	2		OR-SEN		S				
VA	SAXIFRAGOPSIS FRAGARIOIDES	JOINT-LEAVED SAXIFRAGE		NNR	G3?	S1	2		OR-SEN				D		
VA	SCHEUCHZERIA PALUSTRIS VAR. AMERICANA	SCHEUCHZERIA		NNR	G5	S2	2		OR-SEN		S	S			
VA	SCHOENOPLECTUS SUBTERMINALIS - name change from Scirpus subterminalis	WATER CLUBRUSH		NNR	G4G5	S2	2		OR-SEN	D	S	S	S	S	S
VA	SCIRPUS PENDULUS	DROOPING BULRUSH		N5?	G5	S1	2		OR-SEN	S	S		D	S	S
VA	SEDUM MORANII	ROGUE RIVER STONECROP		N1	G1	S1	1	SC	OR-SEN				D		
VA	SERICOCARPUS RIGIDUS	WHITE-TOPPED ASTER	FSC	N3	G3	S2	1	ST	OR-SEN		D				S
VA	SIDALCEA HICKMANII SSP. NOV.	HICKMAN'S CHECKERBLOOM			G3	S1	1		OR-SEN				D		
VA	SIDALCEA MALVIFLORA SSP. PATULA	COAST CHECKER BLOOM	FSC	N1	G5	S1	1	SC	OR-SEN	D					
VA	SIDALCEA NELSONIANA	NELSON'S CHECKERMALLOW	FT	N2	G2	S2	1	ST	FT						D
VA	SILENE HOOKERI SSP. BOLANDERI	BOLANDER'S CATCHFLY		N4?	G4	S1	2		OR-SEN				D		
VA	SISYRINCHIUM HITCHCOCKII	HITCHCOCK'S BLUE-EYED GRASS	FSC	N1	G2	S1	1		OR-SEN		D				D
VA	SISYRINCHIUM SARMENTOSUM	PALE BLUE-EYED GRASS	FSC	N1N2	G1G2	S1	1	SC	OR-SEN		S				S
VA	SOLANUM PARISHII	PARISH'S HORSE-NETTLE		NNR	G4	S2	2		OR-SEN				D		
VA	SOPHORA LEACHIANA	WESTERN SOPHORA	FSC	N2	G2	S2	1	SC	OR-SEN				D		
VA	STELLARIA HUMIFUSA	CREeping CHICKWEED		NNR	G5?	S1	2		OR-SEN						D
VA	STREPTANTHUS GLANDULOSUS	COMMON JEWEL FLOWER		NNR	G4	S1	2		OR-SEN				D		



Taxon	Scientific Name	Common Name	Federal Status	National Rank	Global Rank	ORNHIC State Rank	ORNHIC List	ODA State Status	Bureau Status	CB	EU	KF	MD	RO	SA
VA	STREPTANTHUS HOWELLII	HOWELL'S STREPTANTHUS		N2	G2	S2	1	SC	OR-SEN	S			D		
VA	STREPTOPUS STREPTOPOIDES	KRUHSEA		NNR	G5	S2	2		OR-SEN						S
VA	SULLIVANTIA OREGANA	OREGON SULLIVANTIA	FSC	N2	G2	S2	1	SC	OR-SEN						S
VA	THELYPODIUM BRACHYCARPUM	SHORT-PODED THELYPODY	FSC	N3	G3	S2	2		OR-SEN			S			
VA	TRILLIUM KURABAYASHII	SISKIYOU TRILLIUM		NNR	G4G5	S1	2		OR-SEN	D					
VA	UTRICULARIA GIBBA	HUMPED BLADDERWORT		N5	G5	S1	2		OR-SEN	D	D				S
VA	UTRICULARIA MINOR	LESSER BLADDERWORT		NNR	G5	S2	2		OR-SEN	D	S	S	D	S	S
VA	UTRICULARIA OCHROLEUCA	NORTHERN BLADDERWORT		NNR	G4?	S1	2		OR-SEN						S
VA	VIOLA PRIMULIFOLIA SSP. OCCIDENTALIS	WESTERN BOG VIOLET	FSC	N2	G5	S2	1	SC	OR-SEN	S			D		
VA	WOLFFIA BOREALIS	DOTTED WATER-MEAL		NNR	G5	S1	2		OR-SEN		S		D	D	D
VA	WOLFFIA COLUMBIANA	COLUMBIA WATER-MEAL		NNR	G5	S1	2		OR-SEN		S		S	S	D
VA	ZIGADENUS FONTANUS	SMALL-FLOWERED DEATH CAMAS	FSC	N3?	G3	S1	2		OR-SEN				D		

(\*) = Survey and Manage species that remained Bureau Sensitive in Oregon.  
See preceding text for abbreviations and their meanings.



# Appendix G

## Invasive Plants



---

This appendix provides background on the methodology used in the analysis of invasive plants.

**In this appendix:**

Analytical methods used to determine relative risk of introducing  
invasive plant species among the alternatives .....196



# Analytical Methods Used to Determine Relative Risk of Introducing Invasive Plant Species Among the Alternatives

Analytical assumptions used for the effects analysis are integrated into the invasive plants portion of *Chapters 3 and 4*. The analytical methods used to determine the relative risk of introducing invasive plant species among the alternatives are described in this appendix.

The condition of invasive plant infestations on BLM-administered lands in western Oregon can be characterized by analyzing a few invasive species. The following representative sample of invasive species is used to describe the condition of invasive plants on BLM-administered lands in western Oregon on BLM-administered lands:

- Yellow starthistle
- Knotweeds
- False brome
- Spotted and diffuse knapweeds
- Meadow knapweed
- Scotch and French brooms
- Dyer's woad
- Canada thistle

## Step 1

Determined the current Invasive Plant Species Distribution Category at the fifth-field watershed level:

The representative invasive plant species' distribution data was imported from Weed Mapper in February 2008. All of the representative invasive plant species' distribution data was pooled for the analysis. The collective pool of reported sites was evaluated for each square mile in a grid applied to the planning area.

Invasive Plant Species Distribution Categories of *abundant*, *limited*, and *low* were based on the known representative species' distribution in the fifth-field watersheds:

### **Abundant**

The representative invasive plant species were reported from more than 25% of the square miles within the fifth-field watershed.

### **Limited**

The representative invasive plant species were reported from between less than 25% and more than 1% of the square miles within the fifth-field watershed.

### **Low**

The representative invasive plant species were reported in no more than 1% of the square miles in the fifth-field watershed.

The results of *Step 1* are displayed in *Chapter 3*, in *Figure 3-63 (Distribution categories of invasive plant species for the fifth-field watersheds within the planning area)*.



## Step 2

Determined the relative risk of introducing invasive plant species into fifth-field watersheds over the first ten years of plan implementation as an inadvertent result of timber harvest activities for each alternative.

### Step 2a

Weights of 1 or 5 were assigned to the four timber harvest types based on their respective post-harvest light levels. Regeneration and partial harvests were assigned a weight of 5. Commercial thinning and uneven-aged management activities were assigned a weight of 1.

### Step 2b

Weights of 1, 3, and 5 were assigned to logging methods based on their respective levels of soil disturbance. Aerial harvests were assigned a weight of 1, cable yarding systems a weight of 3, and ground-based methods a weight of 5.

### Step 2c

A combined timber harvest activity weighted value was calculated by multiplying the weights from *Steps 2a* and *2b*.

### Step 2d

These combined timber harvest activity weights were multiplied by the total acres by harvest category per fifth-field watershed in the first ten years, to generate a set of values describing the level of susceptibility for invasive plant introduction as a result of probable timber harvest activities.

### Step 2e

The susceptibility values were evenly divided into three categories: *high*, *medium* and *low*.

Zero values were assigned to fifth-field watersheds where there are no BLM-administered lands.

The results of *Step 2e* are displayed in *Chapter 4*, in *Figure 4-72 (Relative susceptibility of fifth-field watersheds to invasive plant species introduction as a result of timber harvesting activities over the next 10 years)*.

### Step 2f

Representative invasive plant species presence were combined, with susceptibility generated by probable timber harvest activities to determine relative risk of introduction.

For each alternative, *Table G-1 (Matrix to determine the relative risk for the introduction of invasive plant species that are associated with timber harvesting activities over the next 10 years)* was used to determine relative risk of invasive species introduction associated with timber harvest activities in the first ten years for each fifth-field watershed in the planning area.

Watersheds with a combination of *Low* representative invasive plant species distribution category and *Low* susceptibility for introduction of invasive plants from timber harvest activities would have the lowest risk of invasion. Fifth-field watersheds with the highest category for either distribution or susceptibility would have a greater risk of invasive plant species introduction than watersheds with lower categories.

The greatest risk of invasion would be in fifth-field watersheds where both representative invasive plant species are *Abundant* and where the susceptibility of introducing invasive plants associated timber harvest activities would be *High*.



**TABLE G-1. MATRIX TO DETERMINE THE RELATIVE RISK FOR THE INTRODUCTION OF INVASIVE PLANT SPECIES THAT ARE ASSOCIATED WITH TIMBER HARVESTING ACTIVITIES OVER THE NEXT 10 YEARS**

Species Distribution Categories	Susceptibility Categories for Introduction of Invasive Plant Species from Timber Harvesting Activities		
	Low	Moderate	High
Low	Low	Moderately Low	Moderate
Limited	Moderately Low	Moderately High	High
Abundant	Moderate	High	Highest

The results of *Step 2f* are displayed in *Chapter 4*, in *Figure 4-74 (Comparison of the risk by mapped watershed for the introduction of invasive plant species that are associated with timber harvesting activities over the next 10 years)* and *Figure 4-75 (Comparison of the risk by watersheds for the introduction of invasive plant species associated with timber harvesting activities over the next 10 years..)*

### Step 3

Determined the relative risk of introducing invasive plant species into riparian habitats over the first ten years of plan implementation as a result of timber harvest and associated management activities

A similar analytical process as the one used to determine risk associated with timber harvest activities under all alternatives was used to compare the risk of introducing invasive plants into riparian habitats.

#### Step 3a

Weights were applied to the different riparian management area prescriptions to compare the relative risk of invasive plant introduction into riparian areas as an inadvertent result of timber harvest activities.

Thinning that would occur within the riparian management areas was assumed to be a constant proportion of the total thinning acres under each alternative. Therefore, the thinning acres used to determine the relative risk of introducing invasive plants into fifth-field watersheds in the first ten years was also used for the riparian habitat risk analysis. The analytical assumption for the risk for the introduction of invasive plant species along intermittent streams under Alternatives 2 and 3 is that the light levels for the riparian areas associated with these streams would mimic the levels in the surrounding timber harvest units, because of the relatively narrow width of the riparian management areas along most intermittent streams under Alternatives 2 and 3. The intermittent stream post-harvest shade levels would be lower under Alternatives 2 and 3 than under the PRMP, No Action Alternative, and Alternative 1.

In addition to the riparian management areas under the PRMP which would be broader than those under Alternatives 2 and 3, there would be exclusion areas along both intermittent and perennial streams where there would be no thinning. The analytical assumption for risk of invasive plant introduction in the riparian habitats within the riparian management areas under the PRMP is that the post-harvest shade levels would be the same as the pre-harvest levels. Therefore, there would be no riparian susceptibility weight assigned to thinning under the PRMP.

Riparian susceptibility weights for invasive plant introduction to riparian habitats associated with timber harvest activities under all alternatives were assigned using *Table G-2 (Susceptibility weights for harvest activity types for introduction of invasive species into riparian areas)*.





**TABLE G-2. SUSCEPTIBILITY WEIGHTS FOR HARVEST ACTIVITY TYPES FOR INTRODUCTION OF INVASIVE SPECIES INTO RIPARIAN AREAS**

Alternative	Timber Harvest Type	Riparian Susceptibility Weight
All Alternatives	Thinnings	1
Alternatives 2 and 3	Uneven-age management in Klamath Falls Resource Area	1
Alternative 3	Uneven-age management in a portion of the Medford District	1
Alternative 2	Regeneration harvest	2
Alternative 3	Partial harvest	2

### Step 3b

For each alternative, the weights were multiplied by total probable acres per fifth-field watershed for each harvest type in the first ten years to generate a set of values describing the level of susceptibility for invasive plant introduction into riparian areas.

### Step 3c

Likewise, for each alternative, weights assigned to the logging methods as described in *Step 2b* were multiplied by total probable acres per fifth-field watershed for each logging method in the first ten years to generate a set of values describing the level of riparian susceptibility for invasive plant introduction into riparian areas.

### Step 3d

Together, the riparian susceptibility values associated with harvest types and logging methods determine the overall riparian susceptibility to invasion in the first ten years of plan implementation under each alternative.

These two values were multiplied together to generate a comprehensive riparian susceptibility value for each fifth-field watershed. These values were divided into three equal categories: *high*, *moderate* and *low*.

The results of *Step 3d* are displayed in *Chapter 4*, in *Table 4-47* (*Susceptibility comparison for the introduction of invasive plant species into riparian habitats that are associated with timber harvesting in the fifth-field watersheds over the next 10 years*).

### Step 3e

The riparian susceptibility category and invasive plant distribution category were used to determine the relative risk of introducing invasive species in riparian habitats for the first ten years of plan implementation using the same methods described for timber harvest activities in *Step 2e* above.

The results of this analysis are displayed in *Chapter 4*, in *Figure 4-77* (*Relative risk of introducing invasive plant species in riparian habitats over the next 10 years*) and *Figure 4-78* (*Riparian risk category comparison for the introduction of invasive plant species over the next 10 years*).



## Step 4

Determined the relative susceptibility of invasive plant introductions as an inadvertent result of off-highway vehicle designation.

### Step 4a

Assigned off-highway vehicle designation weights, as identified below, to each part of the fifth-field watershed having a different off-highway vehicle designation.

#### Off-Highway Vehicle Designation Susceptibility weights:

Open, Off-Highway Vehicle/limited Off-Highway Vehicle emphasis areas and potential emphasis areas = 5

Limited = 3

Closed = 0

### Step 4b

Determined the relative susceptibility for introduction of invasive species related to off-highway vehicle use as an inadvertent result of the off-highway vehicle designations.

For each alternative, the susceptibility weights were multiplied by total probable acres per watershed for each designation to generate a set of susceptibility values for the fifth-field watersheds. These values were divided into three equal categories: *high*, *medium* and *low*.

### Step 4c

The susceptibility category and invasive plant distribution category were used to determine the relative risk of introducing invasive species as an inadvertent result of off-highway vehicle use, in fifth-field watersheds using the same methods described for timber harvest activities in *Step 2e* above.

The products of this step are displayed in *Chapter 4*, in *Figure 4-80 (Relative risk for the introduction of invasive plant species that are associated with off-highway vehicle designations)* and *Figure 4-81 (Risk comparison for introduction of invasive plant species that are associated with off-highway vehicle use)*.

## Step 5

Determined the risk to fifth-field watersheds of roadside invasive plant introductions from their invasive plant distribution categories and the relative amounts of new road construction and road related activities, by alternative.

### Step 5a

Divided total new road mileage from the total square miles per fifth-field watershed to determine New road miles by fifth-field watershed.



## Step 5b

Divided the amount of new road construction and road related activities per fifth-field watershed, evenly into three categories, *high*, *moderate* and *low*.

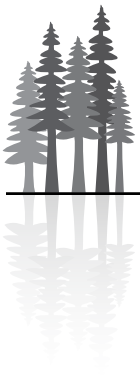
## Step 5c

Used *Table G-3* to determine the relative risk categories of invasive plant introduction from the amounts of new road construction and road related activities and species distribution categories.

The products of *Step 5c* are displayed in *Chapter 4*, in *Figure 4-79* (*Risk comparison for the introduction of invasive plant species associated with new road construction over the next 10 years*) and *Table 4-49* (*Risk comparison for the introduction of invasive plant species associated with new road construction by fifth-field watershed over the next 10 years*).

**TABLE G-3. MATRIX TO DETERMINE THE RELATIVE RISK CATEGORIES OF INVASIVE PLANT INTRODUCTION FROM NEW ROAD CONSTRUCTION AND RELATED ACTIVITIES**

Species Distribution Categories	Relative Levels of Road Construction and Related Activities		
	Low	Moderate	High
Low	Low	Moderately Low	Moderate
Limited	Moderately Low	Moderately High	High
Abundant	Moderate	High	Highest



# Appendix H Wildlife



---

This appendix provides background on the analysis of wildlife including detailed data from recovery plans, critical habitat for the northern spotted owl and marbled murrelet, management opportunities for special status animal species, and information about how the Partners-in-Flight focal landbird species relate to landbird habitat groups.

## **In this appendix:**

Management Opportunities on BLM-Administered Lands in the Recovery Plans for the Columbia White-tailed Deer (Columbia River population), and Marbled Murrelet .....	204
Management Opportunities on BLM- Administered Lands for Special Status Species .....	210
Northern Spotted Owl Critical Habitat .....	212
Marbled Murrelet Critical Habitat .....	214
Special Status Animal Species .....	217
Landbirds .....	222



# Management Opportunities on BLM- Administered Lands in the Recovery Plans for the Columbia White-Tailed Deer and Marbled Murrelet.

## Columbia White-Tailed Deer (Columbia River Population)

The focus of the recovery strategy is on the national wildlife refuge lands and surrounding privately owned lands. Nothing has been excerpted from the recovery plan.

## Marbled Murrelet

Portions excerpted from *Recovery Plan For The Threatened Marbled Murrelet (Brachyramphus marmoratus) In Washington, Oregon, And California* (pages 125-160 in USFWS 1997).

### D. Narrative Outline for Recovery Actions.

#### 1. Implement management plans for each Marbled Murrelet Conservation Zone

##### 1.3 Oregon Coast Range Zone (Zone 3).

The Oregon Coast Range Zone extends from the Columbia River, south to North Bend, Coos County, Oregon. This Zone includes waters within 2 kilometers (1.2 miles) of the Pacific Ocean shoreline and extends inland a distance of up to 56 kilometers (35 miles) from the Pacific Ocean shoreline and coincides with the “Zone 1” boundary line described by the Forest Ecosystem Management Assessment Team, with minor adjustments (U.S. Department of Agriculture *et al.* 1993). The boundary encompasses all of the marbled murrelet critical habitat units designated (the boundary extends slightly beyond 56 kilometers (35 miles) in certain areas.

This Zone includes the majority of known marbled murrelet occupied sites in Oregon. Marbled murrelet occupied sites along the western portion of the Tillamook State Forest are especially important to maintaining well distributed marbled murrelet populations. Efforts should focus on maintaining these occupied sites, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new habitat. Relatively few known occupied sites occur north of the Tillamook State Forest. Recovery efforts should be directed at restoring some of the north-south distribution of marbled murrelet populations and habitat in this Zone. Maintenance of suitable and occupied marbled murrelet nesting habitat in the Elliott State Forest, Tillamook State Forest, Siuslaw National Forest, and Bureau of Land Management- administered forests is an essential component for the stabilization and recovery of the marbled murrelet.

##### 1.4 Siskiyou Coast Range Zone (Zone 4).

The Siskiyou Coast Range Zone extends from North Bend, Coos County, Oregon, south to the southern end of Humboldt County, California. It includes waters within 2 kilometers (1.2 miles) of the Pacific Ocean shoreline (including Humboldt and Arcata bays) and, in general, extends inland a distance of 56 kilometers (35 miles) from the Pacific Ocean shoreline and coincides with the “Zone 1” boundary line described by the Forest Ecosystem Management Assessment Team with minor adjustments (U.S. Department of Agriculture *et al.* 1993). The boundary encompasses all of



the marbled murrelet critical habitat units designated (the boundary extends slightly beyond 56 kilometers (35 miles) in certain areas.

This Zone includes the marbled murrelet population occupying sites in Redwood National Park and several state parks (Jedediah Smith, Del Norte, Prairie Creek, Grizzly Creek, and Humboldt) in California. In addition, this Zone includes nesting habitat on private lands in southern Humboldt County. Additional marbled murrelet nesting habitat occurs at lower elevations in western portions of the Smith River National Recreation Area. State policies regarding protection of marbled murrelet occupied sites on private lands differ in the Oregon and California portions of this Zone.

Recovery actions should be focused on preventing the loss of occupied nesting habitat, minimizing the loss of unoccupied but suitable habitat, and decreasing the time for development of new suitable habitat. Much marbled murrelet nesting habitat is found in state and national parks that receive considerable recreational use. The need to maintain high quality marbled murrelet terrestrial habitat should be considered in planning any modifications to state or national parks for recreational purposes. Both highway and campground construction, including picnic areas, parking lots, and visitors centers, could present threats to the marbled murrelet through loss of habitat, nest disturbance, and/or increasing potential predation from corvids associated with human activities such as Steller's jays and crows. Implementing appropriate garbage/trash disposal may help decrease potential predator populations in high human use areas such as county, state and national parks.

This Zone has large blocks of suitable habitat critical to the three-state marbled murrelet population recovery over the next 100 years. However, the amount of suitable habitat protected in parks is probably not sufficient by itself to guarantee long-term survival of marbled murrelets in this Zone. On the other hand, a considerable amount of habitat is preserved in parks such that survival may be more likely in this Zone than in several other Zones. Private lands at the southern end of this Zone are important for maintaining the current distribution of the species. There is already a considerable gap in distribution between this area and the central California population in Zone 6. Efforts should be implemented to, at a minimum, not expand the current distribution gap.

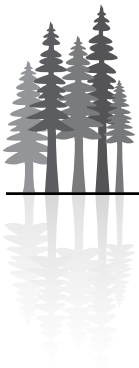
## 2. Delineate and protect areas of habitat within each Zone.

Areas within each Zone that are essential for marbled murrelet recovery should be delineated and protected, using a variety of means (e.g., designation as critical habitat, protection through Habitat Conservation Plans, management [as reserves] under the Forest Plan, other existing regulatory mechanisms, etc.).

### 2.1 Protect terrestrial habitat essential for marbled murrelet recovery.

There appears to be little opportunity for increases in marbled murrelet productivity as a result of forest maturation in the near future. Even under optimum conditions and with the successful use of various silvicultural techniques, it will take 50 to 100 years or more to develop new suitable nesting habitat within most reserve areas. Any further substantial reduction in occupied nesting habitat for the marbled murrelet would hamper efforts to stabilize the population and the recovery of the species.

Marbled murrelet population trends described above (also see Appendix B) have led the U.S. Fish and Wildlife Service to conclude that a number of areas, including nesting areas and feeding sites well-distributed throughout its terrestrial and marine range, are essential to the conservation of the species. Late-Successional Reserves, as described in the Forest Plan and the final rule designating critical habitat for marbled murrelets, will eventually contribute to recovery. However, these areas alone are insufficient to reverse the decline and maintain a well-distributed population. Thus, additional areas, including non-Federal lands and marine areas, should be protected using a variety of means including critical habitat, Habitat Conservation Plans, and other existing regulatory mechanisms as described below. If these areas are protected, there is a high likelihood that populations will stabilize.



2.2 Essential nesting habitats that occur on forest lands managed by the Federal government include:

- (1) Any suitable habitat in Late-Successional Reserves located in the Forest Ecosystem Management Assessment Team Zone 1 (see pages IV-23 and IV-24 in U.S. Department of Agriculture *et al.* 1993 for a description of Zone 1);
- (2) Other large areas of suitable nesting habitat outside of Late- Successional Reserves on Federal lands. For example, large areas of suitable nesting habitat occur on the Siskiyou National Forest, Oregon, the Six Rivers National Forest, California, and in Redwood National and State Park, California.

2.3 Develop and implement a landscape management strategy for each of the six Conservation Zones.

Although many of the factors that have contributed to the decline of marbled murrelet populations in the three-state area are common to all zones, each zone presents unique challenges to the recovery of the species. For example, mortality resulting from incidental capture in net fisheries is a major concern in Zone 1, mortality from oil spills is a major concern in Zones 2 and 6, and potential loss of key suitable nesting habitat on non-Federal lands is of major concern for all Zones. A landscape management plan that addresses the unique circumstances of each Zone should be developed, taking into consideration all affected parties (Federal, state, tribal, private, etc.).

2.3.1 Develop and implement management plans that incorporate the needs of the marbled murrelet for each protected habitat area on Federal lands.

Each protected habitat area within a particular Zone may have unique ecological features and exists in a unique spatial context with lands that may be managed for a variety of values. It is important that these unique characteristics be addressed in the context of a management plan for each of these areas, including the development of appropriate definitions of suitable marbled murrelet habitat for each Zone. In the development of these plans for each Zone, all managers should have an opportunity to be involved, regional issues must be considered, and recovery objectives must be addressed in a consistent manner throughout the range. In some cases, these management plans could be developed using information from the Late-Successional Reserve assessments called for in the Forest Plan Record of Decision.

Management plans should be based on the best available information on the biology and recovery needs of the marbled murrelet and should be able to adapt to new information as it becomes available. For example, a variety of management activities could decrease predation mortality at marbled murrelet nests (e.g., silvicultural practices designed to provide shelter to nest sites or to speed development of murrelet habitat; garbage removal from state and national parks). Efforts to reduce or eliminate these manmade food sources in state and national parks are currently being discussed. As successful strategies are developed to reduce predation at the nest, they should be incorporated into management plans for specific secured areas. An outline of specific management recommendations is provided in task 3.

3. Incorporate management recommendations for protected habitat areas.

Management recommendations for the marbled murrelet need to address two different biological time frames, which reflect (1) aspects of the murrelet's life history and demographic trends, and (2) the length of time required to develop the majority of new nesting habitat or improve current forest habitat conditions. Short-term actions must address the apparent rapid decline of current populations and the need for immediate stabilization. The ability of marbled murrelet populations to recover rapidly is low due to the low reproductive potential of the species. Long-term actions address the long time- frames required to cultivate





or enhance mature forest habitat conditions or to improve marine habitat quality because of the nature and complexity of these ecosystems. Little additional older forest habitat will become available until after 2040.

### 3.1 Implement short-term actions to stabilize and increase the population.

#### 3.1.1 Maintain/protect occupied nesting habitat and minimize loss of unoccupied but suitable nesting habitat.

##### 3.1.1.1 Maintain occupied nesting habitat.

The loss of occupied nesting habitat appears to be the primary cause of marbled murrelet population declines in Washington, Oregon, and California. The low reproductive potential of this species, and lack of knowledge concerning its ability to locate and reestablish new nesting areas after elimination of nesting habitat, makes it imperative to maintain all occupied nesting habitat, as is being done, for the most part, through implementation of the Forest Plan on Forest Service and Bureau of Land Management lands.

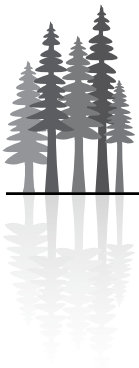
On non-Federal lands the maintenance of all occupied sites also should be the goal. However, it is realized that through the Habitat Conservation Plan process, there may be some limited loss of occupied sites or unsurveyed suitable habitat. In the short-term (the next 5 - 10 years), until additional information is obtained, loss of any occupied sites or unsurveyed suitable habitat should be avoided or the potential impacts significantly reduced through a habitat evaluation and ranking process outlined in the Habitat Conservation Plan.

Short term trade-offs for long-term benefits should be evaluated very carefully at this early stage of marbled murrelet recovery and should be done on a case-by-case basis.

##### 3.1.1.2 Maintain potential and suitable habitat in larger contiguous blocks while maintaining current north/south and east/west distribution of nesting habitat.

By maintaining occupied sites and suitable habitat in larger blocks with low levels of fragmentation, several objectives will be met. Larger stands will (1) have more nesting and hiding opportunities, (2) provide for multiple alternative nesting sites for individual pairs of birds over time, (3) facilitate nesting for multiple pairs of birds (and thus promote increased social contact), and (4) provide greater interior forest habitat conditions (to reduce potential nest and adult predation, increase protection of nests from windstorms and environmental changes, and reduce loss of habitat from windthrow and fire). Larger stands also may provide a core of birds to attract or develop sufficient activity and eventual nesting by subadults or nonbreeding adult birds to replace breeding adults lost from this habitat over time due to natural causes or human activities. The more contiguous the habitat distribution, the lower the likelihood of future large gaps in distribution of the species due to catastrophic events such as oil spills or large wildfires. Preventing further erosion of the already patchily-distributed nesting habitat is a key element in buffering the species against such catastrophic events. This is especially important in areas where gaps already occur. Furthermore, it is currently unknown how nesting success differs with distance from the coast, and far inland habitats may be as important to species survival as those nearer to shore. Therefore, it is important to maintain both north/south and east/west distribution of suitable habitat.

##### 3.1.1.3 Maintain and enhance buffer habitat surrounding occupied habitat.



Maintaining buffers around occupied habitat will mediate the effects of edge by helping to reduce environmental changes within the stand, reduce loss of habitat from windthrow and fire, reduce fragmentation levels, increase the amount of interior forest habitat available, and potentially help reduce predation at the nest. To have the greatest benefits, buffer widths should be a minimum of 300-600 feet and should consist of whatever age stand is present, including existing plantations (which should be managed to provide replacement).

### 3.1.3 Minimize nest disturbances to increase reproductive success.

Low juvenile:adult ratios have been documented throughout the three- state range of the marbled murrelet (Appendix B). Current evidence suggests that the cause of this low reproductive rate may be due to high rates of predation on eggs, young, and possibly adults at the nest site. Population modeling indicates that adjusted juvenile:adult ratios should be 15 - 22 percent at a minimum to result in stable or increasing populations. Current best estimates of unadjusted ratios average 5 percent (range 0.1 - 13.8 percent) and it is unlikely that adjustment will result in 4 - 10 times larger ratios. Breeding adult alcids in general are sensitive to nest site disturbance during the incubation period and the first few days of chick rearing. Disturbances near marbled murrelet nest sites that flush incubating or brooding adults from the nest site may expose adults and young to increased predation or accidental loss of eggs or nestlings by falling or being knocked out of nests. Human activities near nesting areas that result in an increase in the number of predators also could lead to a greater likelihood of nest predation. The timing of disturbances should be adjusted to avoid disruption of marbled murrelet activities, such as courtship, mating, and nesting. Human activities should be modified to reduce attraction of predators to specific forest areas although this action may not reduce actual predator numbers over wider areas. Higher-than normal predation levels are likely to occur in nesting habitat due to forest fragmentation and other causes in many cases.

## 3.2 Implement long-term actions to stop population decline and increase population growth.

### 3.2.1 Increase the amount and quality of suitable nesting habitat.

An increase in amount and quality of suitable nesting habitat is important in all zones. However, it is especially important in the western Washington Coast Range and the northern portions of the Oregon Coast Range Zones. In these areas, remaining patches of suitable nesting habitat are relatively small and fragmented, involve private and state lands, and are vitally important for maintaining the current small populations in these areas; thus, blocking up habitat is needed to increase patch size. It also would be desirable to increase and block up suitable nesting habitat in the Mendocino and Santa Cruz Mountains Zones. Little habitat remains outside parks in these two zones, such that an increase in the short term does not appear feasible.

#### 3.2.1.1 Decrease fragmentation by increasing the size of suitable stands to provide a larger area of interior forest conditions.

The majority of suitable nest stands currently exist as small islands within a matrix of younger forests. Although these fragments will provide critically important habitat during the several decades required for younger stands to develop structural characteristics suitable for marbled murrelet nesting, they cannot be considered high quality habitat because of vulnerability to wildfire and windthrow, and perhaps a higher abundance of avian predators. Research is needed to develop judicious ways to use silvicultural techniques such as thinning in young (nonhabitat) stands to hasten development of large trees and decrease vulnerability of habitat fragments to fire,



wind, and perhaps predators. Consistent with the Forest Plan Record of Decision, thinning within Late-Successional Reserves should be restricted to stands younger than 80 years. However, the Record of Decision also permits thinning within Late-Successional Reserves up to age 110 in Coast Range lands administered by the Bureau of Land Management (Nestucca block) and in the Oregon and California Klamath Provinces (U.S. Department of Agriculture and U.S. Fish and Wildlife Service 1994b). Unthinned buffers should be left around any occupied stands. Precautions should be taken to reduce fire hazard from thinning slash and avoid soil compaction.

3.2.1.2 Protect “recruitment” nesting habitat to buffer and enlarge existing stands, reduce fragmentation, and provide replacement habitat for current suitable nesting habitat lost to disturbance events.

Stands (currently 80 years old or older) that will produce suitable habitat within the next few decades are the most immediate source of new habitat and may be the only replacement for existing habitat lost to disturbance (e.g., timber harvest, fires, etc.) over the next century. Such stands are particularly important because of the vulnerability of many existing habitat fragments to fire and wind and the possibility that climate change will increase the effects of the frequency and severity of natural disturbances. Such stands should not be subjected to any silvicultural treatment that diminishes their capacity to provide quality nesting habitat in the future. Within secured areas, these “recruitment” stands should not be harvested or thinned. In the matrix (on Federal lands), harvest in younger-aged stands should adhere to the techniques discussed in the following task (3.2.1.3) to more quickly develop into marbled murrelet habitat.

3.2.1.3 Use silvicultural techniques to increase speed of development of new habitat.

Nesting marbled murrelets select stands with large trees that provide suitable nesting platforms (large, protected branches, preferably with moss). When available, large stands appear to be preferred over small ones. Nests have been located in stands with a wide range of stocking densities, however the low rate of nesting success raises considerable uncertainty regarding what constitutes quality habitat. It is expected that since marbled murrelets require very specific structures in order to successfully nest, silvicultural techniques may be available to speed the development of these structures in stands of younger forest.

Several silvicultural techniques may be appropriate to increase the area of suitable nesting stands and the rate at which they develop (e.g., thinning, long rotations, etc.). Thinning accelerates tree growth and can be used as a tool to produce large trees more quickly than in normal stand development. However, simply growing large trees is not sufficient to obtain suitable marbled murrelet habitat. Trees must have large moss-covered, or mistletoed branches that provide nest platforms, something that is likely to be achieved only by growing at least some trees on long rotations. There are two alternatives for doing that (1) “Green-tree retention” designates approximately 20 - 40 trees per hectare to be retained at harvest, with a new crop of younger trees established beneath the older tree canopy. Leaving trees on site and allowing them to grow to an older age will likely produce marbled murrelet nest trees and eventually produce coarse woody debris (important habitat for numerous other species). As younger trees mature, a multilayered canopy develops, which is also an important structural attribute of older forest habitat; and (2) evidence available at this time indicates that growing whole stands on long rotations will produce higher quality habitat in the long-term than green tree retention, which may create sink habitat for a number of bird species. Long rotations have other ecological and economic benefits as well. Landscapes with a higher proportion of older stands should



be less susceptible to catastrophic wildfire (providing reduced hazard from thinning slash). Because thinned Douglas-fir maintains good growth well into its second century, silviculturists now conclude that long rotations are economically viable in the Douglas-fir region.

### 3.2.2 Improve Distribution of Nesting Habitat.

3.2.2.1 Improve and develop north/south distribution of nesting habitat. Improving the distribution of nesting habitat helps to buffer existing populations against poor breeding success and catastrophic loss and probably facilitates gene flow among separated populations. Three major gaps in existing habitat are particularly apparent: (1) from the southern Olympic Peninsula in Washington to Tillamook in northwestern Oregon; (2) between Patrick's Point and southern Humboldt Bay in northern California (see Figure 1); and (3) throughout most of the Mendocino Zone and the northern part of the Santa Cruz Mountains Zone (between southern Humboldt County and central San Mateo County). These three geographic gaps represent probable partial barriers to gene flow across them. They include large areas of second-growth forests that originated after logging, from fire (parts of northwestern Oregon), or from natural discontinuities of nesting habitat (especially parts of northern and central California). Gap areas often have a high proportion of private lands and little or no Federal land. State lands cover significant portions of northwest Oregon (the Tillamook and Clatsop State Forests) and southwest Washington. Silvicultural techniques to create suitable habitat at both the stand and landscape level (discussed in task 3.2.1.3) may be particularly beneficial to marbled murrelet recovery in the long term if applied in these areas. Portions of the Mendocino Zone and Santa Cruz Mountains Zone also contain blocks of unsuitable habitat that probably naturally created small gaps in the murrelet's terrestrial range. Again, loss of suitable habitat around these small natural gaps has greatly widened them. These gaps have probably grown together and eliminated suitable nesting habitat over a large section of their range. The existence of small natural gaps in suitable habitat must be recognized when designing ways to improve and develop north/south distribution of nesting habitat.

3.2.2.2 Improve and develop east/west distribution of nesting habitat. Improving east-west distribution means filling in habitat gaps within the Conservation Zone boundaries described earlier. Many portions of the species range no longer have large amounts of suitable nesting habitat close to the coast and marbled murrelets must fly considerable distances inland to nest. In addition to the north-south gaps discussed above, opportunities exist on the Olympic Peninsula, Puget trough, and along virtually the entire California coast within the murrelet's range to improve the current east/west distribution of habitat. An important step in developing methods to improve this distribution will be the complete identification of the inland boundary of suitable nesting habitat for the three-state area and identification of factors determining these boundaries in different regions.

## Management Opportunities on BLM-Administered Lands for Special Status Species

The BLM is a partner in the following agreements that would further the conservation of special status species:

**Memorandum of Understanding among the Tillamook Resource Area, Bureau of Land Management, Other Partners in the Tillamook Native Plant Cooperative, Other Watershed Councils in the Tillamook Resource Area and Horning Seed Orchard.** (BLM-MOU-OR080-2002-02)

**Partners:**

Tillamook Resource Area, Salem BLM  
 Horning Seed Orchard, Salem BLM  
 Lower and Upper Nehalem Watershed Councils  
 Nestucca/Neskowin Watersheds Council  
 Oregon Youth Authority (Camp Tillamook)  
 Scappoose Bay Watershed Council  
 Tillamook Bay Watershed Council  
 Tillamook County Soil and Water Conservation District  
 Tillamook Estuaries Partnership  
 Tualatin River Watershed Council  
 Yamhill Basin Council

**Description:**

The primary objective of the partnership is to promote healthy forest/riparian ecosystem conditions throughout the Tillamook Resource Area by collecting and growing native plant seeds and cuttings to develop into large planting stock better able to withstand competition and depredation for management plans and restoration activities on lands administered by BLM and on lands of interest by the various watershed and bay area councils.

**Species Benefited:**

Chinook salmon  
 Coho salmon  
 Steelhead  
 Chum salmon  
 Coastal cutthroat trout

**Memorandum Of Understanding Bureau Of Land Management Roseburg Resources Company And Oregon Department Of Fish And Wildlife (OR 090-07-02)**

For cooperation in the enhancement, restoration, and maintenance of anadromous fish habitat in locations with intermingled land ownership in the Siuslaw River Basin

**Memorandum Of Understanding Bureau Of Land Management, Eugene District And Davis Hoveland (OR 090-07-03)**

Objective: Integrated pest management and vegetative control in Tyrrell Seed Orchard using grazing.

**Assistance Agreement: Haa031p00. Bureau Of Land Management, Eugene District and the Siuslaw Watershed Council**

Objective: Help the SWC with monitoring, restoration and education efforts to improve watershed health in the Siuslaw Basin. Oct. 1, 2008 (end). Agreement will likely be revisited.

**McKenzie River Habitat Restoration Environmental Assessment Bureau of Land Management, Eugene District (OR 090-EA-05-01)**

Objective: Provides for funding and technical expertise to improve the quality and quantity of aquatic habitats on private lands within the McKenzie basin.

**USDI Coos Bay BLM. 2005. Memorandum of Understanding between Siuslaw National Forest, Coos Bay BLM, US Fish and Wildlife Service Oregon and Washington Office, Washington Department of Fish and Wildlife, Washington State Parks and Recreation Commission, Oregon Department of Fish and Wildlife, Oregon Parks and Recreation Department, USDA Animal and Plant Health Inspection Service, Oregon State University - Oregon Institute for Natural Resources. BLM Agreement No. OR120-02005-02. On file at Coos Bay BLM, North Bend, Oregon.**



Agreement with various agencies that provides a framework for cooperation of mutual goals among participating state and federal land management agencies, research and regulatory agencies for conservation and recovery of the western snowy plover Pacific Coast population.

**USDI Coos Bay BLM. 2003. Cooperative Management Agreement between Coos Bay BLM, Curry County and Oregon Parks and Recreation Department. On file at Coos Bay BLM, North Bend, OR.**

The purpose of this Cooperative Management Agreement (CMA) is to allow BLM, County and OPRD to enter into a partnership to collaborate in management of the western snowy plover and responsible public use of the Floras Lake portion of the New River Area of Critical Environmental Concern.

**Siskiyou Mountains Salamander Conservation Strategy**

This Conservation Strategy describes the management actions necessary to manage for this species to maintain well-distributed populations across the known range of the species on federal lands administered by Forest Service Region 6, Rogue River-Siskiyou National Forest, Siskiyou Mountains Ranger District, and the Oregon Bureau of Land Management, Medford District, Ashland Resource Area, in the northern portion of its range, the Applegate River 4<sup>th</sup> field watershed, and to avoid a trend towards listing under the Endangered Species Act.

**Jackson Cooperative Travel Management Area Conservation Agreement with ODFW**

This Conservation Agreement provides secure seasonal habitat for wintering big game in selected areas through the “green dot” program.

## Northern Spotted Owl Critical Habitat

Section 7(a)(2) of the Endangered Species Act of 1973, as amended, prohibits the BLM from any action that would “result in the destruction or adverse modification” of designated critical habitat. 50 CFR §402.02 defines destruction or adverse modification as: “a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alternations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.” The U.S. Fish and Wildlife Service evaluates potential effects to critical habitat at scales that range from the physiographic province to the area of the proposed project.

The No Action Alternative and Alternatives 1, 2 and 3 were developed before the most recent designation of northern spotted owl critical habitat in the planning area (USFWS 2008b). As a result, those alternatives contain no specific provisions to avoid the destruction or adverse modification of at least some recently-designated critical habitat; and therefore each of those alternatives would include actions that would be likely to appreciably diminish the value of some critical habitat.

The BLM developed the land use allocations of the PRMP in conjunction with the U.S. Fish and Wildlife Service’s development of the *Final Recovery Plan for the Northern Spotted Owl* (USFWS 2008a), on which the current northern spotted owl Critical Habitat Units (Critical Habitat Units) were based. As a result, all northern spotted owl Critical Habitat Units on BLM-administered lands within the planning area would be in the nonharvest land base under the PRMP. The northern spotted owl Critical Habitat Units overlap, to a substantial degree, the late-successional management areas allocated under the PRMP, which would be managed with practices that would enhance the value of critical habitat for the survival and recovery of the northern spotted owl.



The acreage of suitable habitat and dispersal habitat on BLM-administered lands within Critical Habitat Units would increase in each decade under the PRMP (Table H-1). Under the PRMP between 2006 and 2106, the acreage of suitable habitat in Critical Habitat Units would increase by 74.2% and the acreage of dispersal habitat in Critical Habitat Units would increase by 10.2%. The No Harvest reference analysis indicates that the development of suitable and dispersal habitat within the Critical Habitat Units under the PRMP would be substantially similar to that which would occur if there were no active management. The differences in habitat development between the PRMP and the No Harvest reference analysis are due to thinning and other stand treatments that would occur under the PRMP to improve habitat conditions or reduce wildfire risk within the nonharvest land base. These treatments are not part of the analytical assumptions in the No Harvest reference analysis.

Table H-1 shows the changes in the acres of suitable and dispersal habitats within northern spotted owl Critical Habitat Units on BLM-administered lands within the planning area under the PRMP and the No Harvest reference analysis. The acres of dispersal habitat include acres of suitable habitat.

**TABLE H-1. ACRES OF SUITABLE AND DISPERSAL HABITATS WITHIN NORTHERN SPOTTED OWL CRITICAL HABITAT UNITS ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA UNDER THE PRMP AND THE NO HARVEST REFERENCE ANALYSIS**

		Year						
		2006	2016	2026	2036	2046	2056	2106
<b>Suitable Habitat</b>								
	PRMP	361,330	380,411	402,120	435,455	473,862	520,899	641,834
	No Harvest analysis	362,300	385,700	417,600	460,800	498,000	541,000	643,300
<b>Dispersal Habitat</b>								
	PRMP	585,052	621,415	636,323	641,198	644,562	646,332	647,123
	No Harvest analysis	587,200	624,800	639,900	645,300	648,900	649,100	649,900



## Marbled Murrelet Critical Habitat

There are 24 marbled murrelet critical habitat units that include BLM administered lands. Critical habitat was designated by the U.S. Fish and Wildlife Service in 1996 to encompass existing Late-successional Reserves, as defined in the Northwest Forest Plan. A proposed rule that revises designated critical habitat was published on July 31, 2008 (Federal Register, 2008b). The proposal removes approximately 250,000 acres of critical habitat in northern California and Oregon based on new information indicating these areas do not meet the definition of critical habitat.

Until the new rule is final, critical habitat remains as designated in 1996; therefore, the following analysis is based on the 1996 designation. The critical habitat units with BLM-administered lands in the planning area that would be affected by critical habitat designation under the proposed rule are noted in the table below.

Critical habitat units would be managed as late-successional reserves under the No Action Alternative and as late-successional management areas under Alternative 1. By 2106 under the No Action Alternative and Alternative 1, BLM administered lands in 13 and 11 of 24 critical habitat units would be comprised of more than 90 percent murrelet nesting habitat. It is assumed in this analysis that the marbled murrelet critical habitat which is designated as late-successional reserves on U.S. Forest Service lands would follow similar trends to those exhibited by habitat on BLM administered lands under the No Action Alternative and Alternative 1.

Marbled murrelet nesting habitat would increase under Alternative 2 from 218,000 acres to 287,000 acres, or from 47 to 63 percent of habitat capable forest in critical habitat units. The late-successional management areas under Alternative 2 would not completely encompass marbled murrelet critical habitat and as a result 3 of 24 critical habitat units would contain greater than 90 percent nesting habitat by 2106, compared to 13 critical habitat units under the No Action Alternative. Marbled murrelet nesting habitat would increase 10 percent, or more, in four critical habitat units from 2006 to 2016 while 11 critical habitat units would decrease in habitat during this time period. Nine of these 15 units would decrease in habitat more than 10 percent. Nesting habitat would decrease between 2006 and 2026 in 16 critical habitat units. Eleven of these 16 critical habitat units would decrease more than 10 percent. From 2006 to 2106, marbled murrelet nesting habitat would increase in 13 critical habitat units. Twelve of these 13 critical habitat units would increase in habitat more than 10 percent. Murrelet nesting habitat would decrease in 11 critical habitat units, 9 of these units would decrease more than 10 percent.

Marbled murrelet nesting habitat would increase under Alternative 3 from 217,000 acres to 269,000 acres, or from 47 to 59 percent of habitat-capable forest on BLM administered lands.

Under Alternative 3, with the exception of Congressionally-withdrawn lands and riparian management areas, almost all marbled murrelet critical habitat units would be subject to regeneration harvests and partial harvests that would remove marbled murrelet nesting habitat. Under Alternative 3, there would be 2 of 24 critical habitat units which would contain greater than 90 percent nesting habitat by 2106, compared to 13 units under the No Action Alternative and 11 units under Alternative 1 and 3 units under Alternative 2. Under Alternative 3, marbled murrelet nesting habitat would increase more than 10 percent in 3 critical habitat units from 2006 to 2106 while habitat would decrease in 9 critical habitat units in the first decade. Six of these 9 units would decrease more than 10 percent. Nesting habitat would decrease between 2006 and 2026 in 11 critical habitat units. Eight of these 11 units would decrease more than 10 percent. From 2006 to 2106, marbled murrelet nesting habitat would increase in 18 critical habitat units, in 12 of these units habitat would increase more than 10 percent, while habitat would decrease in 6 critical habitat units, habitat would decrease more than 10 percent in four of those size units. Although Alternative 3 opens almost all of the critical habitat units to vegetative management compared to Alternative 2, retention tree requirements in both the partial and regeneration harvests provide for much more rapid redevelopment of murrelet nesting habitat. Murrelet nesting habitat would develop up to 70 years sooner in Alternative 3 compared to Alternative 2, because of the role of retention trees in habitat development.





Marbled murrelet nesting habitat would increase under the PRMP from 217,000 acres to 363,000 acres, or from 47 to 82 percent of habitat-capable forest on BLM administered lands.

Twenty-one percent of marbled murrelet critical habitat units are protected in either LSMAs or Congressional Reserves under the PRMP. Under the PRMP, there would be 10 of 24 critical habitat units which would contain greater than 90 percent nesting habitat by 2106, compared to 13 units under the No Action Alternative and 11 units under Alternative 1 and 3 units under Alternative 2. Under the PRMP, marbled murrelet nesting habitat would increase more than 10 percent in 5 critical habitat units from 2006 to 2016 while habitat would decrease in 4 critical habitat units in the first decade. One of these 4 units would decrease more than 10 percent. Nesting habitat would decrease between 2006 and 2026 in 4 critical habitat units. Two of these 4 units would decrease more than 10 percent. From 2006 to 2106, marbled murrelet nesting habitat would increase in 23 critical habitat units, in 21 of these units habitat would increase more than 10 percent, while habitat would decrease less than 10 percent in 1 critical habitat unit.

**TABLE H-2. THE ALTERNATIVES AND MARBLED MURRELET CRITICAL HABITAT**

Critical Habitat Sub-Unit	Alternative	Marbled Murrelet Habitat (% of habitat-capable)				
		2006	2016	2026	2056	2106
OR-01-c	Alt 1	62	68	68	71	79
	Alt 2	62	60	55	41	43
	Alt 3	62	66	62	43	62
	No Action	62	68	68	71	73
	PRMP	64	69	70	72	93
OR-02-c	Alt 1	27	38	44	54	78
	Alt 2	27	28	34	38	61
	Alt 3	27	29	27	16	31
	No Action	27	38	44	54	60
	PRMP	29	31	41	51	82
OR-02-d	Alt 1	19	23	26	35	92
	Alt 2	19	25	28	43	91
	Alt 3	19	27	29	41	69
	No Action	19	27	32	56	91
	PRMP	19	25	27	38	96
OR-02-e	Alt 1	36	43	46	52	90
	Alt 2	36	40	43	48	82
	Alt 3	36	38	36	25	48
	No Action	36	43	46	52	79
	PRMP	36	42	45	52	94
OR-03-c*	Alt 1	37	47	45	49	93
	Alt 2	37	42	41	48	80
	Alt 3	37	42	43	37	61
	No Action	37	47	47	59	88
	PRMP	42	48	48	55	95
OR-04-a	Alt 1	55	56	57	62	90
	Alt 2	55	51	51	47	53
	Alt 3	55	48	47	23	41
	No Action	55	56	57	62	80
	PRMP	55	55	55	61	72
OR-04-b	Alt 1	83	89	99	99	100
	Alt 2	83	89	99	99	99
	Alt 3	83	89	99	67	99
	No Action	83	89	99	99	99
	PRMP	83	89	97	94	91



Critical Habitat Sub-Unit	Alternative	Marbled Murrelet Habitat (% of habitat-capable)				
		2006	2016	2026	2056	2106
OR-04-c	Alt 1	56	57	57	58	90
	Alt 2	56	56	56	56	82
	Alt 3	56	50	48	41	51
	No Action	56	57	57	58	83
	PRMP	53	53	53	60	89
OR-04-d	Alt 1	54	55	56	56	87
	Alt 2	54	39	33	20	28
	Alt 3	54	54	56	55	53
	No Action	54	55	56	57	82
	PRMP	54	55	57	58	90
OR-04-e*	Alt 1	53	54	55	59	93
	Alt 2	53	53	52	54	85
	Alt 3	53	49	42	35	60
	No Action	53	54	55	59	93
	PRMP	53	54	54	58	93
OR-04-f*	Alt 1	60	61	65	67	87
	Alt 2	60	47	39	16	17
	Alt 3	60	55	46	26	66
	No Action	60	61	65	68	92
	PRMP	62	55	48	43	56
OR-04-g*	Alt 1	48	47	47	48	83
	Alt 2	48	46	42	22	26
	Alt 3	48	41	32	22	55
	No Action	48	46	47	51	82
	PRMP	48	46	46	47	78
OR-04-i*	Alt 1	43	48	51	58	89
	Alt 2	43	43	43	41	59
	Alt 3	43	43	41	38	64
	No Action	43	48	52	62	88
	PRMP	45	48	46	47	62
OR-04-j*	Alt 1	44	49	52	57	92
	Alt 2	44	42	42	37	45
	Alt 3	44	45	43	36	60
	No Action	44	49	53	59	90
	PRMP	45	48	49	55	79
OR-04-k	Alt 1	52	56	59	63	91
	Alt 2	52	55	58	61	84
	Alt 3	52	53	52	33	55
	No Action	52	56	60	65	86
	PRMP	52	56	59	62	94
OR-06-a	Alt 1	67	67	67	67	94
	Alt 2	67	17	17	17	19
	Alt 3	67	11	11	11	67
	No Action	67	67	67	67	94
	PRMP	69	69	69	69	95
OR-06-b	Alt 1	52	55	57	60	88
	Alt 2	52	54	56	55	77
	Alt 3	52	54	53	52	45
	No Action	52	55	58	61	85
	PRMP	52	54	56	63	88



Critical Habitat Sub-Unit	Alternative	Marbled Murrelet Habitat (% of habitat-capable)				
		2006	2016	2026	2056	2106
OR-06-c	Alt 1	76	74	75	77	96
	Alt 2	76	33	27	26	33
	Alt 3	76	64	53	41	79
	No Action	76	76	76	77	95
	PRMP	76	74	74	74	82
OR-06-d*	Alt 1	52	52	53	60	96
	Alt 2	52	40	31	19	22
	Alt 3	52	39	31	24	55
	No Action	52	52	53	61	95
	PRMP	49	46	43	46	64
OR-07-a	Alt 1	62	52	52	74	90
	Alt 2	62	42	32	30	32
	Alt 3	62	65	67	39	54
	No Action	62	51	54	76	89
	PRMP	48	49	50	65	73
OR-07-b	Alt 1	49	60	60	94	94
	Alt 2	49	60	60	100	100
	Alt 3	49	60	60	100	100
	No Action	49	66	66	100	100
	PRMP	47	62	62	100	100
OR-07-d*	Alt 1	45	45	47	65	94
	Alt 2	45	28	24	55	80
	Alt 3	45	45	47	59	85
	No Action	45	45	48	67	95
	PRMP	46	46	48	66	71
OR-07-f*	Alt 1	55	61	62	71	95
	Alt 2	55	42	38	44	47
	Alt 3	55	55	50	47	68
	No Action	55	73	75	86	96
	PRMP	58	62	61	68	81
OR-07-g	Alt 1	47	52	52	53	70
	Alt 2	47	40	22	18	19
	Alt 3	47	50	48	60	40
	No Action	47	52	52	52	73
	PRMP	47	52	52	52	62

\* The critical habitat units affected by the proposed rule (July 31, 2008) for revision of critical habitat.

## Special Status Animal Species

The following table (H-3) shows the Bureau Special Status Animal Species in the planning area by their occurrence on districts and generalized association with habitat type and structural stage.

**TABLE H-3. DOCUMENTED AND SUSPECTED OCCURRENCE OF BUREAU SPECIAL STATUS ANIMAL SPECIES (AS OF DECEMBER 2007) WITHIN THE PLANNING AREA**

Scientific Name	Common Name	BLM Status <sup>1</sup>	District Occurrence <sup>2</sup>						Habitat Type <sup>3</sup>						Structural Stage <sup>3</sup>			
			Coos Bay	Eugene	Klamath Falls	Medford	Roseburg	Salem	Westside Forest Habitat	Eastside Management Land Habitat	Non-forest Habitat	Riparian Habitat	Forest Floor Habitat	Structurally Complex	Mature	Young	Stand Establishment	Noncommercial Areas <sup>4</sup>
<b>Amphibians and Reptiles</b>																		
<i>Actinemys marmorata marmorata</i>	Northwestern Pond Turtle	SEN	D	D	D	D	D	S			X						X	
<i>Aneides flavipunctatus</i>	Black Salamander	SEN				D			X					X	X			
<i>Ascaphus montanus</i>	Inland Tailed Frog	SEN			S					X				X	X			
<i>Batrachoseps attenuatus</i>	California Slender Salamander	SEN	D						X					X	X			
<i>Batrachoseps wrightorum</i>	Oregon Slender Salamander	SEN		D				D	X					X	X			
<i>Chrysemys picta</i>	Painted Turtle	SEN		S				S			X						X	
<i>Dicamptodon copei</i>	Cope's Giant Salamander	SEN						D			X			X	X			
<i>Plethodon stormi</i>	Siskiyou Mountains Salamander	SEN						D	X					X	X		X	
<i>Rana boylei</i>	Foothill Yellow-Legged Frog	SEN	D	D	S	D	D	S			X						X	
<i>Rana pretiosa</i>	Oregon Spotted Frog	SEN			D	D					X						X	
<b>Birds</b>																		
<i>Pelecanus occidentalis californicus</i>	California Brown Pelican	FE	D	S							X						X	
<i>Brachyramphus marmoratus</i>	Marbled Murrelet	FT	D	D		S	D	D						X				
<i>Charadrius alexandrinus (nivosus)</i>	Western Snowy Plover (Pacific Coast Population)	FT	D								X						X	
<i>Strix occidentalis caurina</i>	Northern Spotted Owl	FT	D	D	D	D	D	D						X	X			
<i>Agelaius tricolor</i>	Tricolored Blackbird	SEN			D	D								X			X	
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	SEN		D					X								X	
<i>Bartramia longicauda</i>	Upland Sandpiper	SEN	D						X						X		X	
<i>Brantha canadensis occidentalis</i>	Dusky Canada Goose	SEN	S	D					X		X						X	
<i>Brantha hutchinsii leucopareia</i>	Aleutian Canada Goose	SEN	D	S	S				X		X						X	
<i>Bucephala albeola</i>	Bufflehead	SEN	D		D						X						X	
<i>Centrocercus urophasianus</i>	Greater Sage-Grouse	SEN		D	D								X				X	
<i>Coturnicops moveboracensis</i>	Yellow Rail	SEN			D						X						X	
<i>Cygnus buccinator</i>	Trumpeter Swan	SEN	S		S						X						X	





Scientific Name	Common Name	BLM Status <sup>1</sup>	District Occurrence <sup>2</sup>						Habitat Type <sup>3</sup>					Structural Stage <sup>3</sup>				
			Coos Bay	Eugene	Klamath Falls	Medford	Roseburg	Salem	Westside Forest Habitat	Eastside Management Land Habitat	Non-forest Habitat	Riparian Habitat	Forest Floor Habitat	Structurally Complex	Mature	Young	Stand Establishment	Noncommercial Areas <sup>4</sup>
<i>Cypseloides niger</i>	Black Swift	SEN	S														X	
<i>Dolichonyx oryzivorus</i>	Bobolink	SEN	D														X	
<i>Egretta thula</i>	Snowy Egret	SEN	D														X	
<i>Elanus leucurus</i>	White-Tailed Kite	SEN	D	D	S	D	D										X	
<i>Eremophila alpestris strigata</i>	Streaked Horned Lark	SEN	D	S													X	
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	SEN	D	D	D	D	D	D	D								X	
<i>Fratercula cirrhata</i>	Tufted Puffin	SEN	S														X	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	SEN	D	D	D	D	D	D	D	X					X			
<i>Histrionicus histrionicus</i>	Harlequin Duck	SEN	D	D						X					X			
<i>Larus pipixcan</i>	Franklin's Gull	SEN	D	D						X							X	
<i>Melanerpes lewis</i>	Lewis' Woodpecker	SEN	D	D	D	D	D	D	D	X					X			
<i>Pelecanus erythrorhynchos</i>	American White Pelican	SEN															X	
<i>Picoides albolarvatus</i>	White-Headed Woodpecker	SEN													X			
<i>Podiceps auritus</i>	Horned Grebe	SEN	D		S												X	
<i>Podiceps grisegena</i>	Red-Necked Grebe	SEN	D		S												X	
<i>Poocetes gramineus affinis</i>	Oregon Vesper Sparrow	SEN	D	D	D	D	D	D	S	X							X	
<i>Progne subis</i>	Purple Martin	SEN	D	D	D	S	D	D	S	X							X	
<b>Invertebrates</b>																		
<i>Plebejus icarioides fenderi</i>	Fender's Blue Butterfly	FE		D													X	
<i>Branchinecta lynchi</i>	Vernal Pool Fairy Shrimp	FT				D											X	
<i>Algamorda newcombiana</i>	Newcomb's Littorine Snail	SEN	D														X	
<i>Allomyia scotti</i>	Scott's Apataman Caddisfly	SEN					S									X		
<i>Bombus franklini</i>	Franklin's Bumblebee	SEN		S			S										X	
<i>Callophrys johnsoni</i>	Johnson's Hairstreak	SEN		S	D											X		
<i>Callophrys polios maritima</i>	Hoary Elfin	SEN	S	S													X	
<i>Chioeatis aspasma</i>	Siskiyou Short-Horned Grasshopper	SEN		S	D												X	
<i>Cicindela hirticollis siuslawensis</i>	Siustlaw Sand Tiger Beetle	SEN	S														X	
<i>Colligyrus Sp. Nov. 1</i>	Columbia Dusksnail	SEN								X						X		
<i>Cryptomastix devia</i>	Puget Oregonian	SEN								X						X		
<i>Deroceras hesperium</i>	Evening Fieldslug	SEN		S	D	S										X		



Scientific Name	Common Name	BLM Status <sup>1</sup>	District Occurrence <sup>2</sup>						Habitat Type <sup>3</sup>					Structural Stage <sup>3</sup>			
			Coos Bay	Eugene	Klamath Falls	Medford	Roseburg	Salem	Westside Forest Habitat	Eastside Management Land Habitat	Non-forest Habitat	Riparian Habitat	Forest Floor Habitat	Structurally Complex	Mature	Young	Stand Establishment
<i>Euphydryas editha taylori</i>	Taylor's Checkerspot	SEN		S													X
<i>Fluminicola</i> Sp. Nov. 11	Nerite Pebblesnail	SEN			S	D											
<i>Fluminicola</i> Sp. Nov. 3	Klamath Rim Pebblesnail	SEN			D												
<i>Gilabates oregonius</i>	Salamander Slug	SEN	S	S													
<i>Gonidea angulata</i>	Western Ridged Mussel	SEN					D	S									
<i>Helisoma newberryi newberryi</i>	Great Basin Ramshorn	SEN															
<i>Helminthoglypta hertelini</i>	Oregon Shoulderband	SEN	S			D	D										
<i>Hemphillia glandulosa</i>	Warty Jumping-Slug	SEN															
<i>Hesperarion mariae</i>	Tillamook Westernslug	SEN	S	D													
<i>Lanx klamathensis</i>	Scale Lanx	SEN															
<i>Lanx subrotunda</i>	Rotund Lanx	SEN	S														
<i>Lygus oregonae</i>	Oregon Plant Bug	SEN		S													
<i>Monadenia chaceana</i>	Chase Sideband	SEN				D	D										
<i>Monadenia fidelis beryllica</i>	Green Sideband	SEN	S														
<i>Monadenia fidelis celeuthia</i>	Traveling Sideband	SEN															
<i>Monadenia fidelis</i> Ssp. Nov.	Modoc Rim Sideband	SEN															
<i>Ochlodes yuma</i>	Yuma Skipper	SEN															
<i>Pisidium ultramontanum</i>	Montane Peaclam	SEN															
<i>Plebejus saepiolus littoralis</i>	Insular Blue Butterfly	SEN	D														
<i>Polites mardon</i>	Mardon Skipper	SEN	S	S													
<i>Pomatopsis binneyi</i>	Robust Walker	SEN	S														
<i>Pomatopsis californica</i>	Pacific Walker	SEN	S														
<i>Pristioma arcticum crateris</i>	Crater Lake Tightcoil	SEN															
<i>Pristioma pilsbryi</i>	Crowned Tightcoil	SEN															
<i>Prophysaon vanattaee pardalis</i>	Spotted Tail-Dropper	SEN	D	S													
<i>Pterostichus rothi</i>	Roth's Blind Ground Beetle	SEN		S													
<i>Rhyacophila chandleri</i>	A Caddisfly	SEN	S														
<i>Rhyacophila haddocki</i>	Haddock's Rhyacophilan Caddisfly	SEN															
<i>Saldula villosa</i>	Hairy Shore Bug	SEN	D														
<i>Speyeria coronis coronis</i>	Coronis Fritillary	SEN															
<i>Vespericola sierranus</i>	Siskiyou Hesperian	SEN															



Scientific Name	Common Name	BLM Status <sup>1</sup>	District Occurrence <sup>2</sup>						Habitat Type <sup>3</sup>					Structural Stage <sup>3</sup>				Noncommercial Areas <sup>4</sup>
			Coos Bay	Eugene	Klamath Falls	Medford	Roseburg	Salem	Westside Forest Habitat	Eastside Management Land Habitat	Non-forest Habitat	Riparian Habitat	Forest Floor Habitat	Structurally Complex	Mature	Young	Stand Establishment	
<b>Mammals</b>																		
<i>Balaenoptera musculus</i>	Blue Whale	FE	S														X	
<i>Eschrichtius robustus</i>	Gray Whale	FE	S														X	
<i>Megaptera novaeangliae</i>	Humpback Whale	FE	S														X	
<i>Eumetopias jubatus</i>	Steller Sea Lion	FT	S														X	
<i>Arborimus longicaudus</i>	Oregon Red Tree Vole (Northwest OR Coast; N of Hwy 20)	SEN					D					X			X			
<i>Antrozous pallidus</i>	Pallid Bat	SEN		S	D	D	S					X		X	X		X	
<i>Brachylagus idahoensis</i>	Pygmy Rabbit	SEN			S							X			X		X	
<i>Corynorhinus townsendii</i>	Townsend's Big-Eared Bat	SEN	D	D	D	D	D					X		X	X		X	
<i>Enhydra lutris</i>	Sea Otter	SEN	S														X	
<i>Euderma maculatum</i>	Spotted Bat	SEN										X		X	X		X	
<i>Martes pennanti</i>	Fisher (West Coast distinct population segment)	SEN	D	D	S	D	S					X		X				
<i>Myotis thysanodes</i>	Fringed Myotis	SEN	D	S	D	D	S					X		X	X		X	
<i>Odocoileus virginianus leucurus</i>	Columbian White-Tailed Deer (Douglas County distinct population segment)	SEN					D										X	

<sup>1</sup> Status Codes: FE – Federally listed as endangered; FT – Federally listed as threatened; SEN – Bureau Sensitive

<sup>2</sup> Occurrence Codes: D – Documented to occur within the district; S – Suspected to occur in the district.

<sup>3</sup> Habitat Type and Structural Stage Codes: X – species is generally associated with the habitat type or structural stage, respectively.

<sup>4</sup> Examples of noncommercial areas include: noncommercial forests, oak woodlands, shrublands, grasslands, cliffs, rock outcrops, talus slopes, meadows, wetlands, springs, fens, ponds, vernal pools, coastal sand dunes, and coastal ocean waters.



# Land Birds

Table H-4 cross references the focal species identified in the Partners-in-Flight land bird conservation strategies that overlap the planning area and cross references them to the habitat and structural data that can be obtained from the vegetation data model for the plan revision.

**TABLE H-4. MATRIX RELATING PARTNERS-IN-FLIGHT FOCAL LAND BIRD SPECIES TO HABITAT ANALYSIS GROUPS**

Species	Westside Forested Habitat										Habitat on Eastside Management Lands								
	Habitat Association						Structural Stage				Habitat Association				Structural Stage				
	Western Conifer	Western Hardwood	Eastside Conifer	Eastside Hardwood	Eastside Ponderosa Pine	Legacy Components	Nonforest	Structurally Complex	Mature with Multilayered Canopy & Structurally Complex	Young	Stand Establishment	Sagebrush	Grassland	Juniper	Eastside Conifer	Young (0-30 years)	Medium (40-70 years)	Old (80+ years)	Open (no age)
Acorn Woodpecker		x						x	x										
Ash-Throated Flycatcher				x		x			x										
Ash-Throated Flycatcher		x						x	x										
Bewick's Wren		x								x	x								
Black-Backed Woodpecker							x												
Black-Capped Chickadee		x				x				x	x								
Black-Throated Gray Warbler	x								x	x									
Black-Throated Sparrow												x						x	
Blue-Gray Gnatcatcher		x								x	x								
Blue Grouse							x												
Boblink							x												
Brewer's Sparrow							x					x				x	x		
Brown Creeper	x		x			x		x	x										
Bullock's Oriole		x						x	x					x				x	
Burrowing Owl							x					x				x			
Bushtit		x							x										
California Towhee		x								x	x								
Chipping Sparrow		x			x			x	x										
Clark's Nutcracker							x												
Common Nighthawk							x												
Cooper's Hawk		x						x	x										
Downy Woodpecker		x				x		x	x	x									
Ferruginous Hawk													x					x	
Flammulated Owl			x					x	x										





Species	Westside Forested Habitat										Habitat on Eastside Management Lands								
	Habitat Association						Structural Stage				Habitat Association				Structural Stage				
	Western Conifer	Western Hardwood	Eastside Conifer	Eastside Hardwood	Eastside Ponderosa Pine	Legacy Components	Nonforest	Structurally Complex	Mature with Multilayered Canopy & Structurally Complex	Young	Stand Establishment	Sagebrush	Grassland	Juniper	Eastside Conifer	Young (0-30 years)	Medium (40-70 years)	Old (80+ years)	Open (no age)
Grasshopper Sparrow							x					x							x
Gray Flycatcher													x		x	x			
Green-Tailed Towhee		x							x	x									
Hammond's Flycatcher	x							x	x										
Hermit Thrush			x					x											
Hermit Warbler	x							x	x										
House Wren		x							x	x									
Hutton's Vireo	x							x	x										
Lark Sparrow											x	x			x	x	x	x	
Lazuli Bunting											x			x	x				
Lesser Goldfinch		x							x	x									
Lewis' Woodpecker				x	x	x	x	x						x					
Loggerhead Shrike							x				x					x	x		
Nashville Warbler		x		x					x	x									
Northern Harrier							x												
Oak Titmouse		x				x			x	x									
Olive-Sided Flycatcher	x		x			x				x									
Orange-Crowned Warbler	x									x									
Oregon Vesper Sparrow							x												
Pacific-Slope Flycatcher	x							x	x										
Pileated Woodpecker	x					x		x											
Prairie Falcon							x												
Purple Martin							x												
Pygmy Nuthatch					x	x		x											
Red Crossbill	x							x	x										
Red-Eyed Vireo		x						x	x										
Red-Naped Sapsucker							x												
Red-Shoulder Hawk		x						x	x										
Rufous Hummingbird	x									x									
Sage Grouse							x				x	x			x				x



Species	Westside Forested Habitat										Habitat on Eastside Management Lands								
	Habitat Association						Structural Stage				Habitat Association				Structural Stage				
	Western Conifer	Western Hardwood	Eastside Conifer	Eastside Hardwood	Eastside Ponderosa Pine	Legacy Components	Nonforest	Structurally Complex	Mature with Multilayered Canopy & Structurally Complex	Young	Stand Establishment	Sagebrush	Grassland	Juniper	Eastside Conifer	Young (0-30 years)	Medium (40-70 years)	Old (80+ years)	Open (no age)
Sage Sparrow							x					x					x	x	
Sage Thrasher							x					x					x	x	
Sandhill Crane							x												
Sharp-Tailed Grouse							x					x			x	x			
Streaked Horned Lark							x												
Swainson's Thrush		x								x									
Tree Swallow							x												
Varied Thrush	x								x										
Vaux's Swift	x					x		x											
Virginia's Warbler							x												
Western Bluebird	x					x					x								
Western Meadowlark							x												
Western Screech Owl							x												
Western Wood Peeweee		x						x	x										
White-Breasted Nuthatch		x				x													
White-Headed Woodpecker					x	x			x										
Williamson's Sapsucker			x			x		x	x										
Willow Flycatcher	x	x									x	x			x	x			
Wilson's Warbler	x								x	x									
Winter Wren	x								x	x									
Wrentit		x								x	x								
Yellow-Billed Cuckoo		x						x	x					x		x	x		
Yellow-Breasted Chat	x	x									x			x	x				
Yellow Warbler		x					x				x								

# Appendix I

## Water



---

This appendix provides supplemental material for the topics discussed within the chapters of this final environmental impact statement that are related to water resources and riparian areas on BLM-administrated lands.

**In this appendix:**

Water Planning Criteria . . . . .	226
Source Water Watersheds for Public Water Systems . . . . .	257
Best Management Practices . . . . .	268



# Water Planning Criteria

## Analytical Question # 1

How does timber harvest affect peak flow estimates, under the alternatives, that exceed detection limits within the rain-dominated hydroregion?

### Analytical Assumptions

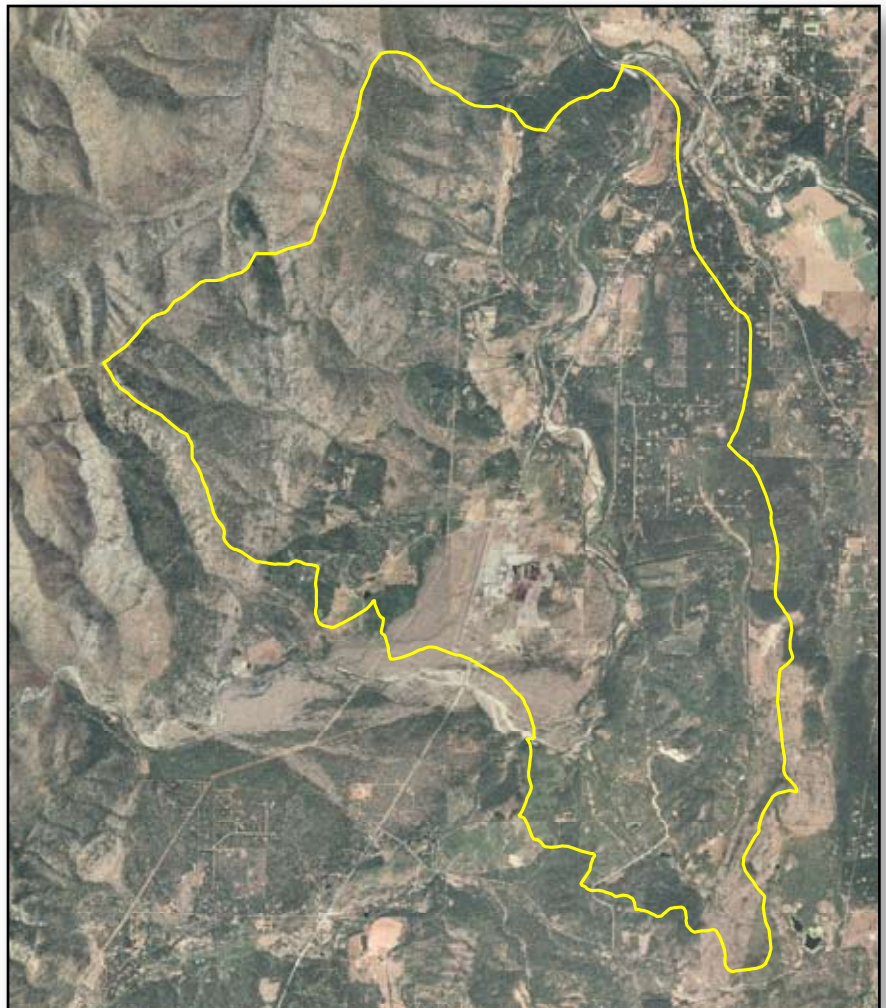
- The subwatershed level (USGS Sixth-field Hydrologic Unit Code (10,000 to 40,000 acres) will be used to report forest cover relationships for the susceptibility of peak flow increase.
- Hydroregions are a physical classification of landscapes based on the form of precipitation with elevation, as predominantly rain, rain and snow, or snow.
- Removal of forest basal area is used as a surrogate for reductions in leaf area in the rain-dominated hydroregion. The most consistent mechanism for producing peak flow changes is related to reduced evapotranspiration following harvest, resulting in higher soil moisture levels. Higher peak flows are seen during early fall storms, but the percent increase decreases rapidly with increasing event magnitude, and falls below detection levels at approximately a six year peak flow return interval runoff frequency. (Grant et al. 2008).
- The largest percent increases in peak flows are observed in 100 percent harvested watersheds in the rain-dominated hydroregion. The magnitude of peak flow increases represents the maximum potential increases for large canopy openings since the size of opening relates directly to the runoff processes (Grant et al. 2008).
- Within the rain-dominated hydroregion the effect of increased peakflow is roughly proportional to area cut (equivalent clearcut area). Patch size, stand age, or arrangement is not a factor in explaining greater flow volume or differences in timing, compared to the rain-on-snow dominated hydroregion (Harr and Coffin, 1992). Where variable reductions in basal area occur by thinning or partial cuts, the inter-relationships of forest tree size, stocking, distribution and age affect leaf area and evapotranspiration, but the effect on peak flow increase is less clear (Grant et al. 2008). Ziemer (1981, 1998) found a non-statistical increase (4%) in peak flow for 80-year-old conifer stands that were harvested where, 50% of the basal area was retained.
- Forest cover relationships on BLM-administered lands will use the 10-year projection derived data layers by alternative will be used as a surrogate to determine basal area removed or equivalent clearcut acreage, using the acres of the ecology description attributes of stand establishment. The stand establishment description includes total basal area removal, as well as forest stands where partial cuts are completed, leaving legacy trees in varying densities. A stand establishment forest may be up to 30 years in age where older trees are retained, and may be growing closed on some sites.
- Forest cover relationships on other lands (other federal, state and private) will use acres of less than 30% vegetative crown closure released from the 1996 Interagency Vegetation Mapping Project TM as a surrogate for removal of basal area or equivalent clearcut area. Any acre meeting this description is binned as basal area removed. Acres included are forest stands where the total basal area is removed as clearcuts and partial cuts with <30% canopy closure. There are variations of crown area on the IVMP datasets for a given timber stand species, age spacing, etc., when cross-walked with basal area removed for susceptibility of peak flow increase. The BLM looked at tree diameter/crown diameter; where ratios vary from 0.7 for mature trees to 2 for trees in young plantations. A normal forest density management treatment may remove 1/3 of the volume, 1/2 of the stem count, and result in 80-100 remaining trees per acre. For harvestable coniferous forest stands, vertical projections were made to determine the area of remaining crowns after this normal treatment. Stand summaries indicate that 40-50% canopy closure as a surrogate measure would



maintain 50% of the basal area which has been shown to have an inconsequential effect on peak flow increase. However, in some watersheds, there are large areas of low density unmanaged forest. These forests could not be reasonably separated in the analysis. This is because the GIS algorithms that process the IVMP satellite imagery raster (cell) datasets cannot distinguish between forest harvest and natural low density forest. The affected subwatersheds are more numerous in southern Oregon, particularly along ridgetops and sideslopes where higher fire frequency has occurred. Open forest also is present in some areas of tanoak forest or where open meadows are present. Refer to *Figure I-1 (Lower West Fork Illinois River low density forest)* and *Figure I-2 (IVMP mapping of <30% canopy cover on other lands within Lower West Fork Illinois River)* for a visual comparison. Modeling trials revealed that the false identification increases as the canopy closure is increased. From these trial optimizations, the BLM chose to use the <30% canopy closure as a surrogate for basal area removed for partial cut forest stands.

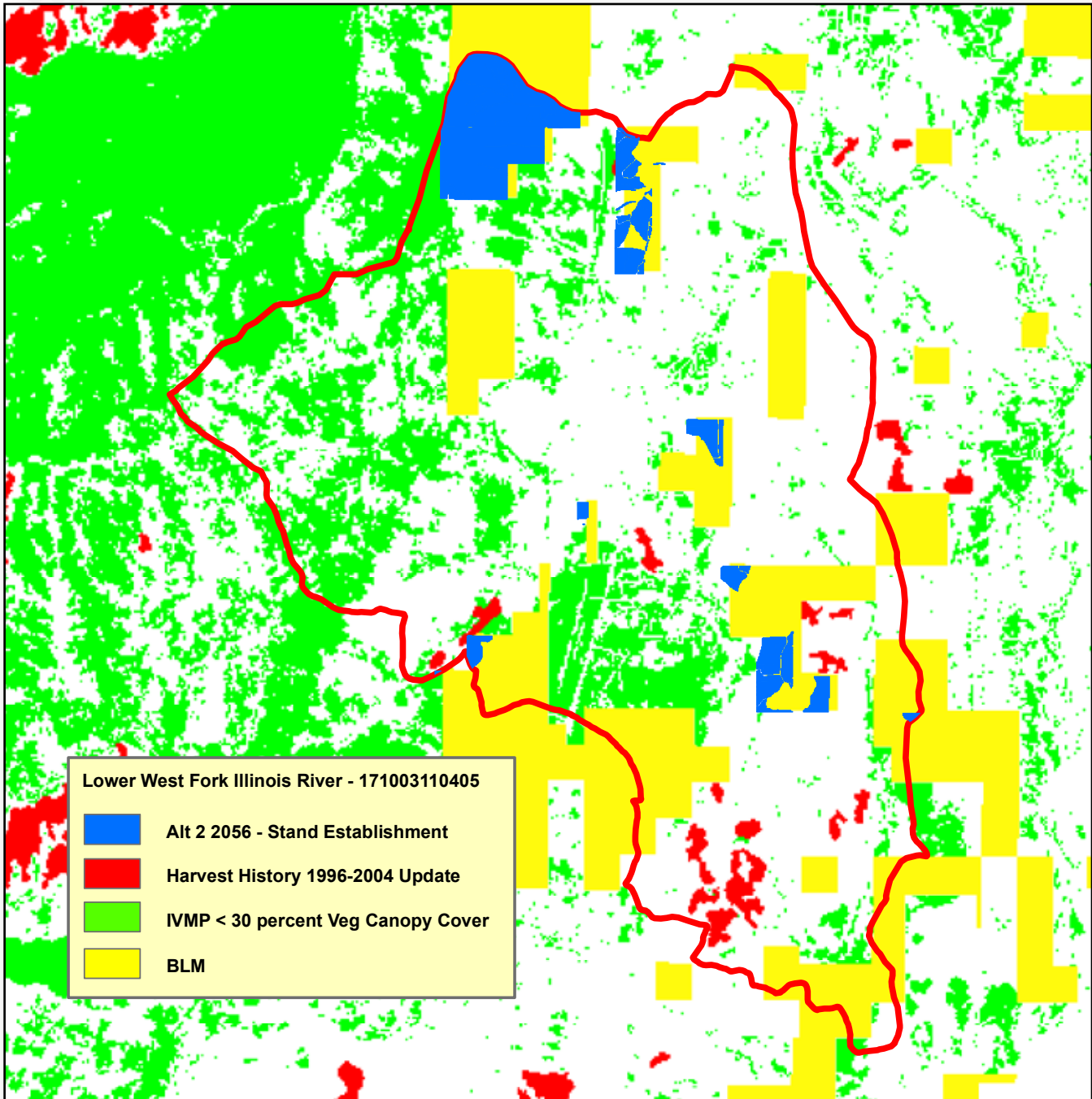
- Forest cover relationships on other lands assumed that the relative proportion of basal area removed or equivalent clearcut area by subwatershed is the same for all planning time periods. This is because the future management of forest stands for these land ownerships is unknown.
- The analytical procedure is a screening process to determine probable subwatersheds at risk for peak flow enhancement from removal of basal area in the precipitation dominated hydroregion. The output changes, depending upon the forest harvest intensity, current conditions and spatial distribution of harvest units within subwatersheds.

**FIGURE I-1.** LOWER WEST FORK ILLINOIS RIVER LOW DENSITY FOREST





**FIGURE I-2. IVMP MAPPING OF <30 PERCENT CANOPY COVER ON OTHER LANDS WITHIN LOWER WEST FORK ILLINOIS RIVER**





## Analytical Methodology and Technique

The technique relies on ARC GIS processes for analyzing spatial data. Logical and mathematical operations will be written as scripts, based on watershed analysis methodologies.

### Step 1 –

Using the Hydroregions derived data layer (Planning Criteria #2 step 3), exclude any subwatersheds from further analysis that contain < 70% rain-dominated areas. Mask the area of the remaining subwatersheds that are not rain dominated. Build a new selected set labeled “Rain Dominated.”

### Step 2 –

For other lands, determine “Existing Condition Hydrologic Maturity” for forest vegetation by reclassing the 1996 classified Interagency Vegetation Mapping Project TM (IVMP) imagery. *Table I-1 (Vegetation hydrologic maturity assignment for IVMP data layer)* will be used to construct the derived data layer.

### Step 3 –

Merge the “Current Condition Hydrologic Maturity” on other lands (step 2) with the rain-dominated subwatersheds selected set (step 1). Merge the BLM forest projections vegetation structural stages at 2006, 2016, 2026, 2056, and 2106 years, by alternative, with the rain-dominated subwatersheds selected set (step 1).

### Step 4 –

For BLM-administered lands, calculate the acres of basal area removed or equivalent clearcut area by alternative and forest projection at 2006, 2016, 2026, 2056, and 2106 years. Include the stand establishment ecology polygons (acres), with the attribute stand establishment for each rain-dominated subwatershed.

### Step 5 –

For other lands, calculate the acres of each rain-dominated subwatershed that is minimum hydrologic maturity (step #2, *Table I-1*).

### Step 6 –

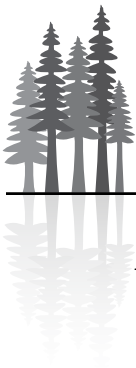
Sum the total basal area removed or equivalent clearcut area in acres, by each subwatershed, for the existing condition and each alternative and forest projection (steps 4 and 5). Calculate total subwatershed acres, and basal area removed as a percent of the total watershed acres.

### Step 7 –

Conduct reference analysis. Replace the BLM forest projections data layer by alternative with the same attributes in step 4 with “no harvest” and “maximum harvest” on commercial forest lands projections.

**TABLE I-1. VEGETATION HYDROLOGIC MATURITY ASSIGNMENT FOR IVMP DATA LAYER**

IVMP Data Layer	Hydrologic Maturity
Harvest History	<10% crown closure, 1996-2004
Vegetation Canopy Cover	<30% total crown closure



## Analytical Conclusions

Rank the precipitation dominated subwatersheds that exceed 29% basal area removed or equivalent clearcut area as sensitive for peak flow increase.

### Data Needs

- Classified 1996 imagery from the Interagency Vegetation Mapping Project TM (IVMP), including new openings under 10 years of age, current to 2005. This will include the Vegetation Canopy Cover and Harvest History data layers.
- GIS-derived data layer of hydroregions.
- GIS-derived data layer of vegetation hydrologic maturity.
- Watershed GIS coverage (for determining area and subwatersheds)
- By alternative, GIS-derived spatial data layer of forest projection stand establishment in acres at 2006, 2016, 2026, 2056 and 2106 years.

### Data Display

Figure showing subwatersheds with BLM-administered lands where basal area removed or equivalent clearcut area exceeds 29%, for the existing condition and with the application of each alternative's forest projections at 2006, 2016, 2026, 2056 and 2106 years.

## Analytical Question # 2

How does timber harvest affect peak flow estimates, under the alternatives, that exceed detection limits within the rain-on-snow dominated hydroregion?

### Analytical Assumptions

- Hydroregions are a physical classification of landscapes based on the form of precipitation with elevation, as predominantly rain, rain and snow, or snow. Rain-on-snow areas where shallow snow accumulations can come and go have been reported by Harr (1981, 1992) to be in the elevation range of 1200-3600 feet in western Oregon and from 2500 to 5000 feet in the southern Oregon Cascades (Lindell, pers.com.).
- The subwatershed level (USGS sixth-field Hydrologic Unit Code 10,000 to 40,000 acres) was chosen for the analysis, because it better approximates the BLM forest land pattern, and tributary streams are more sensitive to vegetation and runoff-related changes.
- Forest openings commonly receive greater snow accumulation (2 to 3 times more snow water equivalent) than adjacent forests (Harr 1992). These openings also receive greater wind speeds and twice the amount of heat during rain-on-snow events, which provides greater melt, compared to the mature forest (Harr 1981, 1992; Storck 1997). Regeneration harvest will provide additional melt contributions under rain-on-snow conditions (Harr 1981, Storck 1997).
- Elevated peakflow that can be measured in a managed experimental watershed when a rain-on-snow event occurs corresponds with a streamflow return period of 2 to 8 to years where pre-logging and post-logging regressions were significantly different (Harr 1992), and 1 to 6 years as reported by Grant et al. 2008.
- Basin characteristics regression analysis with gauged watersheds of long-term record is an appropriate method of describing peak flows of various exceedance probabilities for unregulated streams in ungauged watersheds. Harris and Hubbard (1979) flood frequency equations were chosen as reference points; because they cover the various hydrologic regions in the plan area and have long-term records (10-70 years). The base period of streamflow data collection for use in the analysis was prior to maximum forest conversion in many watersheds. Therefore the methodology would be more sensitive to the current intensity of forest management, because runoff at gauged sites





that was used in the equations was based on a greater proportion of hydrologically mature forest. The data set includes some rain-on-snow events including the 1964 flood.

- The 2-year, 24-hour precipitation intensity is assumed to coincide with the 2-year, 24-hour discharge.
- U.S. Army Corps of Engineers studies (USACE 1956, 1998) show that the principal melt component in a rain-on-snow event is convection/condensation melt. This component is far larger than long-wave and short-wave radiation melt, rain melt, and ground melt. In a typical USACE rain-on-snow example, convection/condensation melt accounts for 70 percent of daily snowmelt quantities. Ground wind speed, warm air temperatures and nearly equivalent dewpoint temperatures are the drivers in the convection/condensation melt term.
- For other lands, it is assumed that the percentage of basal area removed is the same for all planning time periods by subwatershed.
- This analytical procedure is viewed as a screening process to determine probable subwatersheds at risk for peak flow enhancement from rapid melt of shallow snowpacks, during heavy rainfall and windy weather. The output changes, depending upon forest harvest intensity, current conditions and spatial distribution of harvest units within subwatersheds, as well as climate, and elevation.

## Analytical Methodology and Technique

The technique relies on ARC GIS GRID processes for analyzing spatial data. Logical and mathematical operations were written as scripts, based on watershed analysis methodologies. The analytical technique is an empirical approach patterned in part from the Washington State Department of Natural Resources Standard Methodology for Conducting Watershed Analysis, 1997 (v. 4.0), Appendix C.

### Step 1 -

Construct "Flood-Frequency Precipitation" data layer. Obtain precipitation frequency data for the 2-year 24-hour storm for the plan area (NOAA 1973) in raster format available online: [<http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm>]

### Step 2 -

Merge the BLM watershed GIS theme with the "Flood-Frequency Precipitation" derived data layer at the subwatershed level.

### Step 3 -

Determine "Hydroregions." Construct a derived data layer to include elevation bands of rain-dominated areas that are below the rain-on-snow zone; rain-on-snow zone (also called transitional) and snow-dominated zone that are above the rain-on-snow zone. District hydrologists will assign lower and upper elevation bounds for the rain-on-snow zone for all subwatersheds wholly or partly contained in the plan area, based on the following criteria:

#### Lower Bounds of the Rain-On-Snow Zone

Use National Resources Conservation Service SNOWTEL data for January 1 snow accumulation elevation (Greenburg and Welch 1998), and local hydrologist observation, which may vary from 1200-2500 feet.

#### Upper Bounds of the Rain-On-Snow Zone

Use regionally established upper limit from hydrologist observation or -literature or the onset of frozen soils, which may vary from 3600-5000 feet.

### Step 4 -

Filter the "Hydroregions" derived data layer. Filter by subwatershed, and exclude any subwatersheds from further analysis that contain only rain areas or only permanent snow areas or <10% rain-on-snow (transitional) areas. Make a new derived data layer labeled "rain-on-snow" selected from the set.



**Step 5 –**

Using the rain-on-snow selected set, separate the subwatersheds by flood region (Harris and Hubbard 1979), online: [[http://water.usgs.gov/software/nff\\_manual/or/oregon\\_AFrame\\_3.gif](http://water.usgs.gov/software/nff_manual/or/oregon_AFrame_3.gif)]

**Step 6 -**

Calculate the 2-year 24-hour stream flow, and the 5-year 24-hour stream flow, using the USGS basin characteristics regression analysis method (Harris and Hubbard 1979) and GIS scripts.

2-Year 24-Hour Streamflow

Coast Region:  $Q_{0.5} = 4.59A^{0.96}(ST+1)^{-0.45}I^{1.91}$

Willamette Region:  $Q_{0.5} = 8.70A^{0.87}I^{1.71}$

Rogue-Umpqua Region:  $Q_{0.5} = 24.2A^{0.86}(ST+1)^{-1.16}I^{1.15}$

High Cascades:  $Q_{0.5} = 4.75A^{0.90}(ST+1)^{-0.62} (101-F)^{0.11} I^{1.17}$

where:

$Q_{0.5}$  = discharge in cubic feet per second (CFS) for a 2-year 24-hour recurrence interval event;

A = drainage area in square miles

ST = area of lakes and ponds in percent

F = forest cover in percent

I = 2-year 24-hour precipitation intensity in inches

5-Year 24-Hour Streamflow

Coast Region:  $Q_{0.2} = 6.27A^{0.95}(ST+1)^{-0.45}I^{1.95}$

Willamette Region:  $Q_{0.2} = 15.6A^{0.88}I^{1.55}$

Rogue-Umpqua Region:  $Q_{0.2} = 36A^{0.88}(ST+1)^{-1.25}I^{1.15}$

High Cascades:  $Q_{0.2} = 8.36A^{0.86}(ST+1)^{-0.81} (101-F)^{0.08} I^{1.30}$

where:

$Q_{0.2}$  = discharge in cubic feet per second (CFS) for a 5-year 24-hour recurrence interval event,

A = drainage area in square miles

ST = area of lakes and ponds in percent

F = forest cover in percent

I = 2-year 24-hour precipitation intensity in inches

Area of lakes and ponds include natural lakes, ponds, and impoundments.

Forest cover is the watershed area greater than 10% forest cover, and is the hydrologic maturity cover classes A and B (step 7).

**Step 7 –**

Determine “Existing Condition Hydrologic Maturity” for forest vegetation, by reclassing the 1996 classified Interagency Vegetation Mapping Project TM (IVMP) imagery. The Vegetation Canopy Cover and Harvest History (from 1996 to 2004) datasets will be used. The table below will be used to construct the derived data layer.

**Step 8 -**

Merge the “Existing Condition Hydrologic Maturity” with the “Rain-on-Snow” subwatersheds selected set (step 4).

**TABLE I-2. VEGETATION HYDROLOGIC MATURITY ASSIGNMENT TO LAND COVER CLASS**

	Hydrologic Maturity	Land Cover Classes
A	Hydrologically Mature	>70% total crown closure AND <75% of the crown in hardwoods or shrubs
B	Intermediate Hydrologic Maturity	10%-70% total crown closure AND <75% of the crown in hardwoods or shrubs
C	Minimum Hydrologic Maturity	<10% total crown closure AND/OR >75% of the crown in hardwoods or shrubs
D	Non-Forested	Agricultural and Grazing Lands Open Water Lakes, Ponds, Reservoirs Inundated Wetlands Other naturally occurring open areas

Source: Department of Natural Resources, Hydrologic Change Module

**Step 9 -**

Estimate snow depth and snow water equivalent to create an “Estimated Snow-water Equivalent” derived data layer.

Obtain the Topographic Data theme for Rain-on-Snow” subwatersheds selected set (step 4) and build a raster derived data layer.

Solve the following two snow water equivalent (SWE) equations for the topographic data theme by writing scripts (Greenburg and Welch 1998):

$$\text{Northwest Oregon SWE} = 0.009 * \text{Elevation} - 21.66 * R$$

$$\text{Southwest Oregon SWE} = 0.006 * \text{Elevation} - 19.53 * R$$

*where:* SWE = February 1 snow-water equivalent in inches.

Elevation = elevation in feet.

R = snowwater equivalent ratio to adjust for cover types

The division between northwest and southwest Oregon regions (for equations) will be determined by an eastward line following the southern edge of the Siuslaw sub-basin in the Coast Range to the southern edge of the Willamette sub-basin through the Willamette Valley and the Cascades. The line is formed by watersheds:

Lower Siuslaw River	1710020608
Upper Siuslaw River	1710020601
Upper Coast Fork Willamette	1709000203
Row River	709000201
Hills Creek Reservoir	1709000105
Upper Middle Fork Willamette	1709000101



Snow water equivalent (SWE) values calculated are assumed to represent snow accumulation in hydrologically mature forests; these must be modified to account for variations in accumulation between different land use/cover types.

Populate the two snow water equivalent scripts with the snow-water equivalent ratios (R) for the existing condition for the northwest and southwest Oregon areas using classified IVMP data (Step 7), in *Table I-3 (Vegetation hydrologic maturity and snow water equivalent ratios)*.

**Step 10 -**

Determine One-Day Snowmelt for a 24-hour design storm for the existing condition by writing scripts. This procedure uses equations from the U.S. Army Corp of Engineers (1998).

For heavily forested or partly forested areas (step 7 land cover classes A and B):

$$M = (0.074 + 0.007P)(T - 32) + 0.05$$

For minimum forest or open areas (step 7 land cover classes C and D):

$$M = (0.029 + 0.0084kv + 0.007P)(T - 32) + 0.09$$

*where:*

*M* = snowmelt, in./day

*v* = wind velocity, miles per hour

*P<sub>r</sub>* = rate of precipitation, in./day

*T<sub>a</sub>* = temperature of saturated air, at 10-foot level, °F

*k* = basin wind coefficient. Use 0.4 for heavily to partly forested areas (hydrologic maturity land cover classes A, and B), and 0.9 for open areas (hydrologic maturity land cover class C and D).

Calculate snowmelt in each hydrologic maturity land cover cell for the existing condition. If the calculated snowmelt (*M*) for a given scenario exceeds the estimated snow equivalent (SWE), set *M* = SWE; also, if *T* is ≤ 32 °F, *M* = 0.

**Temperature**

Storm temperature varies primarily with elevation. Determine the average storm temperature (*T<sub>a</sub>* °F) for each cell area based on generalized regional lapse-rate equations:

$$\text{Western Oregon} = 50 - (.0033 * E)$$

*where:*

*E* = elevation in feet

**TABLE I-3. VEGETATION HYDROLOGIC MATURITY AND SNOW WATER EQUIVALENT RATIOS**

	Vegetation Hydrologic Maturity (step 7)	Snow-water Equivalent Ratio (R)
A	Hydrologically Mature	1
B	Intermediate Hydrologic Maturity	1.5
C	Minimum Hydrologic Maturity	2
D	Non-Forested	2



### Wind speed

Local wind speed primarily depends on the vegetative cover, with mature forest canopies significantly reducing the wind speed at the interface between the snowpack and the air. Daily average windspeed (mph) with a 50% exceedance rate (% of days) for an average storm for western Oregon will be used. This corresponds to an estimated 15 mph.

### Precipitation

Rate of precipitation is calculated, using the 2 year 24 hour precipitation, in. (step 1).

#### Step 11

Calculate water available for runoff.

Perform a zonal mean for each subwatershed:

$$M = \frac{A_1M_1 + A_2M_2 + \dots + A_nM_n}{A_1 + A_2 + \dots + A_n}$$

where:

M = snowmelt, in.

A = area, acres

Calculate water available for runoff for the existing condition by:

$$\text{WAR} = M + P$$

where:

WAR = water available for runoff, in./day

M = snowmelt, in./day

P = 2-year 24-hour precipitation, in.

Add the snowmelt (M) to the 2-year 24-hour precipitation (P) and track for each subwatershed in the ‘Rain-on-Snow’ derived data layer (step 4).

#### Step 12 –

Estimate peak flow for the existing condition. Estimate peak flows for each subwatershed (filtered set, step 4) by substituting the water available for runoff value (step 11) for the existing condition into the 2-year 24-hour streamflow regression equations (step 6) for the precipitation term. Compare the result with the 5-year 24-hour streamflow and indicate where it is exceeded.

#### Step 13 –

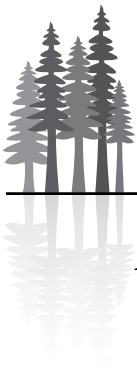
Estimate peak flow for the alternatives. Repeat steps 7 to 12 for the 10-year projection by re-classing the expected condition of vegetation (step 7). Merge the ecology stand establishment with attribute without legacy from the Options model derived data layer for the 10-year projection for each alternative with the “Existing Condition Hydrologic Maturity” for forest vegetation. Substitute cover class C for these areas.

#### Step 14 –

Conduct reference analysis. Replace the alternatives 10-year projections with the no harvest and maximum harvest on commercial forest lands reference analysis derived data layers. Order the analysis as in step 13.

#### Step 15 –

As a sensitivity analysis for the design storm, one standard error of the estimate will be applied to the USACE snowmelt equation for temperature and wind speed. For temperature, use  $55 - (.0033 * E)$ , where E = elevation in feet. For windspeed, use 25 mph. Modify scripts and rerun the analysis.



## Analytical Conclusions

Rank those subwatersheds that exceed the 5-year 24-hour peakflow as sensitive for estimated peak flow increase.

### Data Needs

- National Oceanic and Atmospheric Administration (NOAA) 2-year 24-hour Precipitation Frequency map of Oregon. Available in GIS raster format online: [<http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm>]
- USGS Flood Regions. Available in GIS raster format online: [[http://water.usgs.gov/software/nff\\_manual/or/oregon\\_AFrame\\_3.gif](http://water.usgs.gov/software/nff_manual/or/oregon_AFrame_3.gif)]
- U.S. Weather Service Windspeed Frequency
- Classified 1996 imagery from the Interagency Vegetation Mapping Project TM (IVMP), including datalayers: Vegetation Canopy Cover, and Harvest History from 1996 to 2004
- GIS-derived data layer of hydroregions
- GIS-derived data layer of vegetation hydrologic maturity
- GIS-derived data layer of snow-water equivalent
- GIS-derived data layer of snowmelt
- Topography GIS coverage
- Watershed GIS coverage
- Waterbodies GIS coverage
- By alternative, GIS-derived data layer of 10-year projection stand establishment

### Data Display

- Figure of hydroregions for the plan area
- Figure showing subwatersheds where the 2-year, 24-hour peak flow exceeds the 5-year, 24-hour peak flow for the existing condition, for each alternative's 10-year projection

## Analytical Question #3

How does the pattern and intensity of new BLM road construction, under the alternatives, create disturbance and sources of fine sediment that may deliver to stream channels?

### Analytical Assumptions

This analysis is based on use of a reference road. The analytical technique is an empirical approach patterned in part from the Washington State Department of Natural Resources Standard Methodology for Conducting Watershed Analysis, 1997 (v. 4.0), Appendix B.

The reference road will use the following assumptions: An in-sloped road with a ditch; moderate traffic (pickups sedans, and log haul <50% of the time); cut-slope gradient 1:1 (horizontal to vertical) and fill-slope gradient 1.5:1; initial ground cover density of zero on cut and fill slopes; sustained grade of 5-7 percent; and an average cross-drain spacing of 500 feet.



Proportions of the total long-term average road erosion rates attributed to the components of the standard road prism (Swift 1984, Burroughs and King 1989, Sullivan and Duncan 1980, Megahan unpub.) are:

- Road Tread 40%
- Cutslope and Ditch 40%
- Fillslope 20%

Roads differ in their inherent erodibility, or erosion potential, due to the geology, or parent material on which they are constructed as seen in *Table I-4 (Basic erosion rates)*. Sediment yields from older roads with undisturbed ditches are much smaller than sediment yields from newer roads or roads with disturbed ditches. Maintenance of ditchlines can increase sediment yields.

The basic erosion rate for road erodibility is decreased by vegetative cover and surface roughness on cut and fills slopes. *Table I-5 (Groundcover correction factor for cut and fill slopes)* shows reduction factors from the basic erosion rate.

The basic erosion rate for road erodibility is decreased by road tread surfacing. *Table I-6 (Factors for road tread surfacing)* shows reduction factors based on types of surfacing.

The basic erosion rate for road erodibility is increased by road traffic and wet weather haul on natural surface and gravel roads. *Table I-7 (Traffic and Precipitation Factors)* shows erodibility increase factors based on precipitation bands and traffic level.

**TABLE I-4. BASIC EROSION RATES IN TONS/ACRE OF ROAD PRISM/YEAR**

General Category	Geologic Parent Material	Road Age	
		New 0-2 Years	Old > 2 Years
High	Mica schist, Volcanic ash, Highly weathered sedimentary	110	60
High/Moderate	Quartzite, Course-grained granite	110	30
Moderate	Fine-grained granite Moderately weathered rock Sedimentary rocks	60	30
Low	Competent granite, Basalt, Metamorphic rocks, Relatively unweathered rocks	20	10

Sources: Kochendorfer, J. N. and J. D. Helvey 1984; Hayden et al. 1991; Megahan and Kidd 1972; Reid and Dunne 1984; Sullivan and Duncan, U.S. Forest Service unpublished data.

**TABLE I-5. GROUNDCOVER CORRECTION FACTOR FOR CUT AND FILL SLOPES**

Ground Cover Density Factor	Factor
>80%	0.18
50%	0.37
30%	0.53
20%	0.63
10%	0.77
0%	1.00

Sources: Megahan 1991, Burroughs and King 1989, Megahan unpublished data.



**TABLE I-6. FACTORS FOR ROAD TREAD SURFACING**

Surfacing Material Factor	Factor
Paved	0.03
Gravel, greater than 6 inches deep	0.2
Native soil/rock	1.00

**TABLE I-7. TRAFFIC AND PRECIPITATION FACTORS**

Traffic Use/Road Category	Annual Precipitation		
	<47 inches	47 inches – 118 inches	>118 inches
Heavy Traffic/Active Mainline	20	50	120
Moderate Traffic/Active Secondary	2	4	10
Light Traffic/Non Active	1	1	1

Sources: Reid and Dunne 1984; Sullivan and Duncan unpublished

### Sediment Delivery

- Sediment delivery to streams is affected by the road drainage system design, including road prism shape, proximity of the road to the stream channel, and length of road draining directly into a stream at crossings.
- Sediment delivery to streams by road segment: Assume that a road segment does not deliver if the road does not cross a stream channel.
- Sediment delivery to streams by ditches: Assume 100% delivery of sediment to streams from the road prism and cutslope before application of factors.
- Sediment delivery to streams by diffuse sources: Assume 10% delivery of sediment to streams from the fill slope before application of factors.
- Best Management Practices can substantially reduce sediment delivery from roads.

### Sediment Delivery Distance

- Roads near ridges have little direct effect on sediment delivery to streams.
- Generalized distances for sediment filtration effectiveness occur much sooner (25-100 feet) for diffuse sources of sediment delivery compared to concentrated sources (200 feet), such as road ditch lines draining into the riparian area (CH2MHill 1999).
- Wemple (1998 cited in Jones et al. 2000) found that road segments that have stream connection pathways such as roadside ditches have potential to deliver surface eroded sediment to streams. Road segments not connected to streams by ditch lines or gullies or having more than 25 to 100 feet of filtering forest floor duff and vegetation (depending on slope, soil properties, and surface roughness) between them and a stream are usually not at risk of delivering sediment to streams.
- Below culverts, sediment travel distance in streams decreases with increasing roughness, such as debris and obstructions (Brake et al. 1997).
- Concentrated and diffuse sources of sediment delivery in this analysis are assumed to be within 200 feet of stream channels.

### Road Traffic

- Frequent heavy truck traffic can grind resistant road surfacing such as gravels into smaller particles that can wash into ditchlines during rainstorms. Material type, and traffic level and rate determine the quantity of sediment available for transport, and the rainfall determines the transport capacity (Reid and Dunne 1984).





## Analytical Methodology and Technique

The technique relies on ARC GIS GRID processes for analyzing spatial data. Logical and mathematical operations were written as scripts, based on watershed analysis methodologies. The analysis is performed by fifth-field watersheds within the plan area.

### Step 1 -

Build a basic erosion rate (BER) data layer from the BLM GIS Geology theme by matching the parent materials in the *Table I-4 (Basic erosion rates)*, to the theme mapped designations with input from Geologist and Soil Scientist.

### Step 2 -

Build a derived data layer labeled “Streams” from the BLM GIS Watercourses data theme that includes all intermittent and perennial streams.

### Step 3 -

Buffer the Streams derived data layer (Step 2) to 200 feet and make a new derived data layer labeled “Sediment Delivery Buffer”.

### Step 4 -

Intersect and clip BLM GIS GTRN (roads) data theme with the sediment delivery buffer derived data layer (step 3) for all lands. Label new derived data layer “Stream Proximity Roads”.

### Step 5 -

Refine the stream proximity roads derived data layer (step 4) and exclude road segments that do not cross stream channels. Road segment origin must be further than 30 feet from streams to be excluded.

### Step 6 -

Build a table of specific vegetative correction factors by fifth-field watershed using *Table I-5 (Groundcover correction factor for cut and fill slopes)*. *Table I-12 (Groundcover correction factors for cut and fill slopes by fifth-field watershed)* shows the groundcover correction factors used (included at the end of this question).

### Step 7 -

Use selected Prism Climate Model outputs to build a derived data layer labeled “Average Annual Precipitation” by fifth-field watershed. From the Oregon Climate Service PRISM Products page, online: [<http://www.ocs.orst.edu/prism/products/>] select the 30-arcsec (800m) normal grids for precipitation for the period 1971-2000.

### Step 8 -

Calculate the traffic factor from *Table I-7 (Traffic and precipitation factors)* by merging the precipitation dominated and rain-on-snow hydro region (from peakflow planning criteria) with the average annual precipitation data layer (step 7) and develop a new data layer labeled “Traffic factors.” Classify into three precipitation bands: <47”, 47-118” and >118” from *Table I-7*. Assign traffic factors for moderate traffic where <47” equal 2, 47-118” equal 4, and >118” equal 10.

### Step 9 -

For each road segment, add attributes to the data tables for the stream proximity roads derived data layer selected set (step5). Calculate the road segment lengths by surface type within the BLM GIS GTRN roads data layer for BLM and other ownerships and add to the data tables. Assign BLM controlled roads in the planning area from BLM GIS GTRN (roads) theme to BLM.

### Step 10 -

For each road segment within the stream proximity roads derived data layer selected set (steps 5 and 9) build a logical calculation sequence as scripts to determine potential sediment delivery from the cut slope, road tread and fill slope (calculations 1, 2 and 3). Refer to *Table I-8 (Factor Definition Table)* for factor explanation:



**TABLE I-8. FACTOR DEFINITION TABLE**

Factor	Factor Definition
BER	Basic erosion rate in tons/acre/year
PCD	Proportion of cutslope and ditch erosion to the roaded cross section; 0.40
RT	Proportion of road tread erosion to the roaded cross section; 0.40
FS	Proportion of fill slope erosion to the roaded cross section; 0.20
GCD	Groundcover density factor (0.18-1.0)
RST	Road surface type factor; 0.03 paved, 0.2 gravel and 1.0 native surface
TF	Traffic factor within precipitation dominated area for annual precipitation: <47 inches equal 20, 47-118 inches equal 50, >118 inches equal 120
Cut slope width	Cut slope width in feet; generalized 15 feet
Ditch width	Ditch width in feet; generalized 3 feet
Road tread width	Road tread width in feet; generalized 14 feet
Road prism width	Road prism width in feet; generalized 20 feet
Fill slope width	Fill slope width in feet; generalized 10 feet
Road length	Road length in feet, up gradient of stream crossings to the buffer limit
43560	Factor to convert square feet to acres

**Existing Condition:**

Return basic erosion rate (BER) value from the basic erosion rate derived data layer of > two year old road age (step 1).

Return road surface type factor (RST) (from *Table I-6*).

Return ground cover density (GCD) factor from *Table I-12* (step 6).

Return traffic factor (TF) (step 8).

**Calculate:**

$$1 \quad [BER * PCD * GCD] * [((cutslope\ width) + (ditch\ width) + (road\ prism\ width - road\ tread\ width / 2)) * road\ length] / 43560$$

$$2 \quad where\ RST = 0.03$$

$$[BER * RT * road\ surface\ type\ factor * [road\ tread\ width * road\ length]] / 43560$$

else:

$$[BER * RT * RST] * [TF] * [road\ tread\ width * road\ length] / 43560$$

$$3 \quad [(BER * FS * GCD) * 0.10] * [((fillslope\ width) + (road\ prism\ width - road\ tread\ width / 2)) * road\ length] / 43560$$

$$3 \quad [(BER * 0.2 * GCD) * 0.10] * [((10) + (3) * road\ length)] / 43560$$

Sum 1, 2 and 3.

Next

**Alternative 10-Year Projection:**

Repeat existing condition calculation except for the following modifications in these steps:

**Step 1-**

Return basic erosion rate (BER) value from the basic erosion rate derived data layer of < 2 year old road age, and *Table I-4* (*Basic erosion rates*).

**Step 9-**

Calculate the road segment lengths for permanent aggregate and natural surface roads constructed by 2016. No paved roads are planned.

**Step 11 –**

Because the alternative roads 10 year projections are generated from a 1/3 sample of sections where harvest is projected to occur, the following adjustments will be made.

Develop ratio R1:

Length of road by surface type within the sediment delivery buffer in the watershed

Length of road by surface type in the watershed

Populate the denominator of the ratio by using *Table I-9 (Projected permanent roads by alternative by 2016)*.

Develop ratio R2:

R1

Proportion of existing road by surface type within the sediment delivery buffer to all roads of that type

Populate the denominator of ratio R2, by using *Table I-10 (Proportion of existing roads on BLM within the sediment delivery buffer to all roads by surface type)*.

For the PRMP, no spatial roads sampling was completed due to extensive sampling in the other alternatives. However road lengths were determined in each watershed based on expected miles of new permanent natural and aggregate road needed for regeneration volume and thinning volume.

For the PRMP, the numerator of R1 is determined by multiplying the expected new permanent miles of road by 2016 in each watershed by a factor of 0.068593174 for natural surface roads and 0.071248241 for aggregate roads. The factors result in expected length of road within the sediment delivery buffer based on an average of Alternative 1 and Alternative 3.

For the PRMP, the potential sediment delivery in tons/year attributed to the numerator in R1 is calculated by using 102.95 tons/year for natural surface roads and 34.74 tons/year for aggregate roads. The sediment yields are an average of Alternative 1 and Alternative 3 sediment delivery buffer yields.

**TABLE I-9. PROJECTED PERMANENT ROADS BY ALTERNATIVE BY 2016**

Alternative	Rocked Roads (miles)	Natural Roads (miles)
No Action	250.31	94.49
Alternative 1	384.98	128.44
Alternative 2	494.55	109.64
Alternative 3	393.66	131.95
Proposed RMP	449.06	249.96

Data is based on road construction 10 year scenario estimates for timber volume per foot of road for sum of regeneration harvests, thinning and partial cuts for all districts.

**TABLE I-10. PROPORTION OF EXISTING ROADS ON BLM WITHIN THE SEDIMENT DELIVERY BUFFER TO ALL ROADS BY SURFACE TYPE**

Natural	Aggregate	Paved	Total
12.18	18.15	5.37	35.70



### Step 12

Calculate data for the display table.

#### Existing Condition:

Sum miles of stream proximity roads (inside the sediment delivery buffer) by surface type; paved, aggregate and natural for BLM and other land ownerships for each watershed. Sum all watersheds.

Calculate potential sediment delivery in tons/year by surface type: paved, aggregate and natural for BLM and other land ownerships for each watershed. Sum the categories for all watersheds.

Calculate potential sediment delivery in tons mile<sup>2</sup>/year for BLM and other land ownerships for each watershed. Sum potential sediment delivery for all watersheds for BLM and other land ownerships and divide by the total landbase.

#### Alternatives:

Determine the expected road length within the sediment delivery buffer for each watershed, by dividing the alternative 1/3 sample results by R2. Sum miles of expected stream proximity roads (inside the sediment delivery buffer) for each alternative by surface type; aggregate and natural on BLM for each watershed. Sum all watersheds.

Determine the potential sediment delivery in tons/year for each watershed, by dividing the alternative 1/3 sample results within the sediment delivery buffer by R2. Calculate potential sediment delivery for each alternative in tons/year by surface type: aggregate and natural for BLM for each watershed. Sum the categories for all watersheds.

Calculate potential sediment delivery in tons mile<sup>2</sup>/year for BLM and other land ownerships for each watershed. Sum potential sediment delivery for all watersheds for BLM and other land ownerships and divide by the total landbase.

## Analytical Conclusions

- Rank of alternatives by their effect on road sources of potential fine sediment delivery to stream channels.
- Comparison of fine sediment delivery to that which occurs under the existing condition.

## Data Needs

- Proposed new road 10-year projection, by alternative.
- GIS-derived data layer of basic erosion rate.
- GIS-derived data layer of stream proximity roads derived data layer for the existing condition.
- GIS-derived data layer of stream proximity 10-year projection roads for each alternative.
- Prism model of average annual precipitation for the precipitation hydroregion.

## Data Display

Populate table I-11 (Potential Sediment Delivery, By Alternative From Roads)

**TABLE I-11. POTENTIAL SEDIMENT DELIVERY, BY ALTERNATIVE FROM ROADS**

Current Condition and Condition under the Alternatives by 2016	Roads Within Fine Sediment Delivery Distance (miles)		Potential Fine Sediment Delivery (tons/year <sup>3</sup> )		Watershed Average Potential Fine Sediment Delivery (tons/sq. mile/year <sup>3</sup> )	
	BLM	Other	BLM	Other	BLM	Other
<b>Current Condition</b>						
<b>Existing Roads<sup>1</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						
<b>No Action Alternative</b>						
<b>New Roads (by 2016)<sup>4</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						
<b>Proposed RMP</b>						
<b>New Roads (by 2016)<sup>4</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						
<b>Alternative 1</b>						
<b>New Roads (by 2016)<sup>4</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						
<b>Alternative 2</b>						
<b>New Roads (by 2016)<sup>4</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						
<b>Alternative 3</b>						
<b>New Roads (by 2016)<sup>4</sup></b>						
Natural						
Aggregate						
Paved						
<b>Totals</b>						

<sup>1</sup> Includes BLM and BLM-controlled roads and the private roads within the planning area from BLM GIS GTRN (roads) coverage.

<sup>2</sup> Delivery distances include the road segments within 200 feet of stream channels, where ditchflow carrying fine sediment could enter streams.

<sup>3</sup> The calculations for these planning criteria estimates were calculated by surface type for each fifth-field watershed and summed for the planning area.

<sup>4</sup> New roads include BLM new roads only. Information is not available to predict the number of miles of new roads on other lands.



**TABLE I-12. GROUNDCOVER CORRECTION FACTORS FOR CUT AND FILL SLOPES BY FIFTH FIELD WATERSHED**

<b>Watershed Name</b>	<b>Hydrologic Unit Code</b>	<b>Vegetation Correction Factor</b>
Abernethy Creek	1709000704	0.37
Abiqua Creek-Pudding River	1709000901	0.37
Althouse Creek	1710031102	0.37
Applegate River-McKee Bridge	1710030902	0.37
Bear Creek	1710030801	0.53
Beaver Creek	1801020609	0.37
Beaver Creek-Columbia River	1708000302	0.18
Beaver Creek-Waldport Bay	1710020505	0.18
Big Butte Creek	1710030704	0.28
Big Creek	1708000602	0.18
Big Creek-Vingie Creek	1710020508	0.18
Big Elk Creek	1710020402	0.18
Blue River	1709000404	0.37
Boulder Creek	1710030106	0.18
Briggs Creek	1710031107	0.37
Buck Creek	1712000501	0.53
Bull Run River	1708000105	0.18
Butte Creek-Pudding River	1709000902	0.37
Calapooia River	1709000303	0.37
Calapooya Creek	1710030302	0.37
Canton Creek	1710030109	0.37
Cape Ferrelo Frontal	1710031206	0.37
Chetco River	1710031201	0.37
China Peak	1801020901	0.37
Clatskanie River	1708000303	0.18
Clearwater River-North Umpqua River	1710030104	0.18
Collawash River	1709001101	0.37
Columbia Gorge Tributary	1708000107	0.18
Columbia River-Baker Bay	1708000605	0.18
Columbia River-Cathlamet Channel	1708000307	0.18
Columbia River-Hayden Island	1709001205	0.18
Columbia Slough-Willamette River	1709001203	0.18
Coos Bay Frontal	1710030403	0.18
Copic Bay	1801020411	0.63
Cottonwood Creek	1801020607	0.37
Crabtree Creek	1709000606	0.53
Dairy Creek	1709001001	0.18
Deadwood Creek	1710020605	0.18
Deer Creek	1710031105	0.37
Detroit Reservoir-Blow Out Divide Creek	1709000503	0.37
Devils Lake-Moolack Frontal	1710020409	0.18
Diamond Lake	1710030101	0.28
Drews Creek	1802000101	0.63



Watershed Name	Hydrologic Unit Code	Vegetation Correction Factor
Drift Creek	1710020503	0.18
Eagle Creek	1709001105	0.18
East Fork Coquille River	1710030503	0.18
East Fork Illinois River	1710031101	0.37
Elk Creek	1710030303	0.28
Elk Creek-Rogue River	1710030705	0.58
Elk Creek-South Umpqua	1710030204	0.37
Elk River	1710030603	0.37
Evans Creek	1710030803	0.58
Fall Creek	1709000109	0.37
Fish Creek	1710030105	0.18
Fishhole Creek	1801020206	0.58
Five Rivers-Lobster Creek	1710020502	0.18
Fourmile Creek	1801020303	0.28
Gales Creek	1709001002	0.18
Gerber Reservoir	1801020405	0.53
Grave Creek	1710031003	0.53
Hills Creek	1709000102	0.28
Hills Creek Reservoir	1709000105	0.28
Horse Creek	1709000402	0.37
Humbug Mountain-Nesika Beach Frontal	1710030604	0.37
Hunter Creek	1710031205	0.37
Illinois River-Josephine Creek	1710031106	0.37
Illinois River-Klondike Creek	1710031108	0.37
Illinois River-Lawson Creek	1710031111	0.37
Indian Creek	1801020902	0.37
Indian Creek-Lake Creek	1710020606	0.18
Indigo Creek	1710031110	0.37
ISLAND IN OCEAN	1000000000	0.77
Jackson Creek	1710030202	0.37
Jenny Creek	1801020604	0.37
Johnson Creek	1709001201	0.37
Jumpoff Joe Creek	1710031002	0.45
Kilchis River	1710020306	0.18
Klamath Lake	1801020302	0.45
Klamath Marsh-Crater Lake	1801020104	0.45
Klamath Marsh-Jack Creek	1801020102	0.37
Klamath River-Copco Reservoir	1801020603	0.63
Klamath River-Iron Gate Reservoir	1801020605	0.63
Klamath River-John C Boyle Reservoir	1801020602	0.63
Lake Creek	1710020604	0.18
Lake Ewauna-Upper Klamath River	1801020412	0.53
Lakeside Frontal	1710030404	0.18
Langell Valley	1801020406	0.53
Lemolo Lake	1710030102	0.28



<b>Watershed Name</b>	<b>Hydrologic Unit Code</b>	<b>Vegetation Correction Factor</b>
Little Applegate River	1710030903	0.28
Little Butte Creek	1710030708	0.45
Little Fall Creek	1709000108	0.37
Little Nestucca River	1710020301	0.18
Little North Santiam River	1709000505	0.18
Little River	1710030111	0.37
Lobster Creek	1710031007	0.37
Long Tom River	1709000301	0.28
Lower Alsea River	1710020504	0.18
Lower Applegate River	1710030906	0.45
Lower Clackamas River	1709001106	0.18
Lower Coast Fork Willamette River	1709000204	0.37
Lower Coquille River	1710030505	0.18
Lower Cow Creek	1710030209	0.37
Lower Klamath Lake	1801020414	0.53
Lower Lost River	1801020409	0.53
Lower McKenzie River	1709000407	0.37
Lower Middle Fork of Willamette River	1709000110	0.37
Lower Molalla River	1709000906	0.37
Lower Nehalem River	1710020203	0.18
Lower Nehalem River-Cook Creek	1710020206	0.18
Lower North Santiam River	1709000506	0.18
Lower North Umpqua River	1710030112	0.18
Lower Rogue River	1710031008	0.28
Lower Sandy River	1708000108	0.18
Lower Siletz River	1710020407	0.18
Lower Siuslaw River	1710020608	0.18
Lower Smith River	1801010104	0.37
Lower Smith River-Lower Umpqua River	1710030307	0.18
Lower South Umpqua River	1710030213	0.37
Lower South Yamhill River	1709000804	0.37
Lower Tualatin River	1709001005	0.18
Lower Umpqua River	1710030308	0.18
Lower Yaquina River	1710020403	0.18
Luckiamute River	1709000306	0.37
Marys River	1709000305	0.28
McKenzie River-Quartz Creek	1709000405	0.37
Meiss Lake	1801020503	0.63
Mercer Lake Frontal	1710020507	0.18
Miami River	1710020307	0.18
Middle Applegate River	1710030904	0.37
Middle Clackamas River	1709001104	0.18
Middle Columbia River-Eagle Creek	1707010513	0.18
Middle Cow Creek	1710030207	0.45





<b>Watershed Name</b>	<b>Hydrologic Unit Code</b>	<b>Vegetation Correction Factor</b>
Middle Fork Coquille River	1710030501	0.28
Middle Fork Smith River	1801010102	0.37
Middle Fork Willamette River-Lookout Point Reservoir	1709000107	0.37
Middle Nehalem River	1710020202	0.18
Middle North Santiam River	1709000504	0.18
Middle North Umpqua River	1710030107	0.18
Middle Sandy River	1708000104	0.18
Middle Santiam River	1709000601	0.18
Middle Siletz River	1710020405	0.18
Middle South Umpqua River	1710030210	0.37
Middle South Umpqua River-Dumont Creek	1710030203	0.37
Mill Creek-Lower Umpqua River	1710030305	0.18
Mill Creek-South Yamhill River	1709000803	0.37
Mill Creek-Willamette River	1709000701	0.37
Millicoma River	1710030402	0.18
Mohawk River	1709000406	0.28
Mosby Creek	1709000202	0.28
Muddy Creek	1709000302	0.28
Myrtle Creek	1710030211	0.37
Necanicum River	1710020101	0.18
Nestucca River	1710020302	0.18
New River Frontal	1710030601	0.18
North Fork Breitenbush River	1709000502	0.18
North Fork Coquille River	1710030504	0.18
North Fork of Middle Fork Willamette River	1709000106	0.37
North Fork of Nehalem River	1710020205	0.18
North Fork Siuslaw River	1710020607	0.18
North Fork Smith River	1801010101	0.37
North Fork Sprague River	1801020204	0.53
North Fork Willow Creek	1801020402	0.63
North Yamhill River	1709000806	0.53
Northwest of Klamath Lake	1801020103	0.37
Oak Creek	1709000304	0.37
Oak Grove Fork Clackamas River	1709001103	0.37
Olalla Creek-Lookingglass Creek	1710030212	0.37
Pistol River	1710031204	0.37
Plympton Creek	1708000306	0.18
Poe Valley-Yonna Valley	1801020407	0.53
Quartzville Creek	1709000602	0.63
Rickreall Creek	1709000702	0.53
Rock Creek-North Umpqua River	1710030110	0.37
Rock Creek-Pudding River	1709000903	0.37



Watershed Name	Hydrologic Unit Code	Vegetation Correction Factor
Rock Creek-Siletz River	1710020406	0.37
Rock Creek-Tualatin River	1709001004	0.18
Rogue River-Gold Hill	1710030802	0.45
Rogue River-Grants Pass	1710030804	0.45
Rogue River-Hellgate Canyon	1710031001	0.45
Rogue River-Horseshoe Bend	1710031004	0.45
Rogue River-Lost Creek	1710030703	0.37
Rogue River-Shady Cove	1710030707	0.58
Rogue River-Shasta Costa Creek	1710031006	0.37
Rogue River-Stair Creek	1710031005	0.37
Row River	1709000201	0.28
Salmon Creek	1709000104	0.37
Salmon River	1708000101	0.28
Salmon River-Siletz River	1710020408	0.18
Salmonberry River	1710020204	0.18
Salt Creek-South Yamhill River	1709000805	0.37
Salt Creek-Willamette River	1709000103	0.28
Scappoose Creek	1709001202	0.18
Scoggins Creek	1709001003	0.18
Senecal Creek-Mill Creek	1709000904	0.37
Siltcoos River-Tahkenitch Creek Frontal	1710020701	0.18
Silver Creek	1710031109	0.63
Sixes River	1710030602	0.37
South Fork Coos River	1710030401	0.18
South Fork Coquille River	1710030502	0.18
South Fork McKenzie River	1709000403	0.37
South Fork Rogue River	1710030702	0.28
South Fork Sprague River	1801020205	0.53
South Santiam River	1709000603	0.37
South Santiam River-Foster Reservoir	1709000604	0.37
South Santiam River-Hamilton Creek	1709000608	0.37
South Umpqua River	1710030205	0.37
Spencer Creek	1801020601	0.45
Sprague River above Williamson	1801020207	0.58
Sprague River Valley	1801020208	0.53
Spring Creek-Sand Lake-Neskowin Creek Frontal	1710020309	0.18
Steamboat Creek	1710030108	0.28
Sucker Creek	1710031103	0.18
Swan Lake Valley	1801020408	0.53
Sycan River above Sprague River	1801020203	0.53
Sycan River above Sycan Marsh	1801020201	0.53
Sycan River at Sycan Marsh	1801020202	0.53
Thomas Creek	1709000607	0.53
Tillamook Bay	1710020308	0.18



<b>Watershed Name</b>	<b>Hydrologic Unit Code</b>	<b>Vegetation Correction Factor</b>
Tillamook River	1710020303	0.18
Trail Creek	1710030706	0.58
Trask River	1710020304	0.18
Umpqua River-Sawyers Rapids	1710030304	0.18
Upper Alsea River	1710020501	0.18
Upper Applegate River	1710030901	0.37
Upper Clackamas River	1709001102	0.18
Upper Coast Fork Willamette River	1709000203	0.28
Upper Cow Creek	1710030206	0.58
Upper Lost River	1801020404	0.63
Upper McKenzie River	1709000401	0.37
Upper Middle Fork Willamette River	1709000101	0.18
Upper Molalla River	1709000905	0.63
Upper Nehalem River	1710020201	0.18
Upper North Santiam River	1709000501	0.37
Upper North Umpqua River	1710030103	0.18
Upper Rogue River	1710030701	0.28
Upper Sandy River	1708000103	0.37
Upper Siletz River	1710020404	0.53
Upper Siuslaw River	1710020601	0.18
Upper Smith River	1710030306	0.18
Upper South Umpqua River	1710030201	0.37
Upper South Yamhill River	1709000801	0.37
Upper Umpqua River	1710030301	0.18
Upper Yaquina River	1710020401	0.18
West Fork Cow Creek	1710030208	0.37
West Fork Illinois River	1710031104	0.37
Wildcat Creek	1710020603	0.18
Wiley Creek	1709000605	0.37
Willamette River-Chehalem Creek	1709000703	0.37
Willamina Creek	1709000802	0.37
Williams Creek	1710030905	0.45
Williamson River-Jackson Creek	1801020101	0.63
Williamson River below Klamath Marsh	1801020105	0.53
Wilson River	1710020305	0.18
Winchuck River	1710031207	0.37
Wolf Creek	1710020602	0.18
Wood River	1801020301	0.37
Yachats River	1710020506	0.18
Yamhill River	1709000807	0.37
Youngs River	1708000601	0.18
Zigzag River	1708000102	0.18



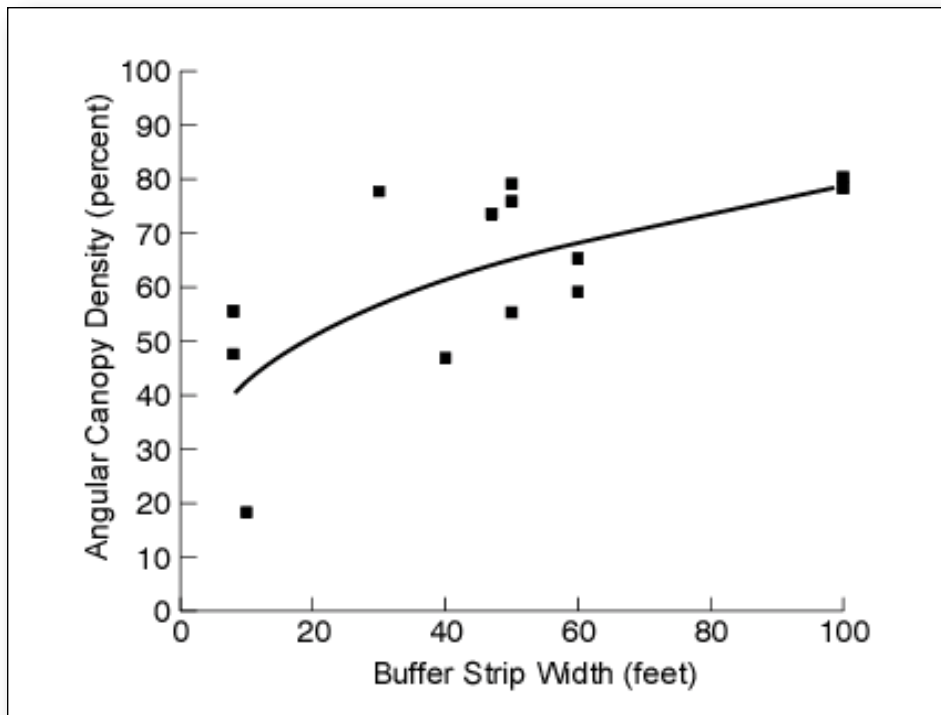
## Analytical Question # 4

To what extent will each alternative maintain effective shade along streams, lakes and wetlands?

### Analytical Assumptions

- Maintaining streamside shade is a surrogate for meeting the Department of Environmental Quality (DEQ) temperature standard. Northwest Forest Plan Temperature Total Maximum Daily Load (TMDL) Implementation Strategies (2005) demonstrate how retention and variable retention areas meet shade goals and the DEQ temperature standard. These are described as primary and secondary shade zones. The derivation of these zones is based on factors including seasonality of streams, topography, forest vegetation, and solar physics.
- Perennial streams are considered in this analysis, because of the influence that forest shade has on maintaining cool water temperatures during the summer.
- Mountainous topography can block solar radiation through parts of the day along many stream segments.
- Forest trees near stream channels and dense stands can block solar radiation and cast shadows across the stream. Angular canopy density (ACD) is the measure of canopy closure as projected in a straight line from the stream surface to the sun, as it varies through the day. The ACD value for a given buffer depends on the spacing of forest crowns. As vegetation becomes more open through wider spacing, more width of vegetation is needed to achieve the same ACD for the similar vegetation with closer spacing. Higher ACD is achieved with lower sun angles and higher canopy density. Figure I-3, *Angular Canopy Density (ACD) And Buffer Widths For Small Streams In Western Oregon* (Brazier and Brown 1972) illustrates that a buffer strip width of 60 feet will result in an angular canopy density of 65 percent.

**FIGURE I-3. ANGULAR CANOPY DENSITY (ACD) AND BUFFER WIDTHS FOR SMALL STREAMS IN WESTERN OREGON**

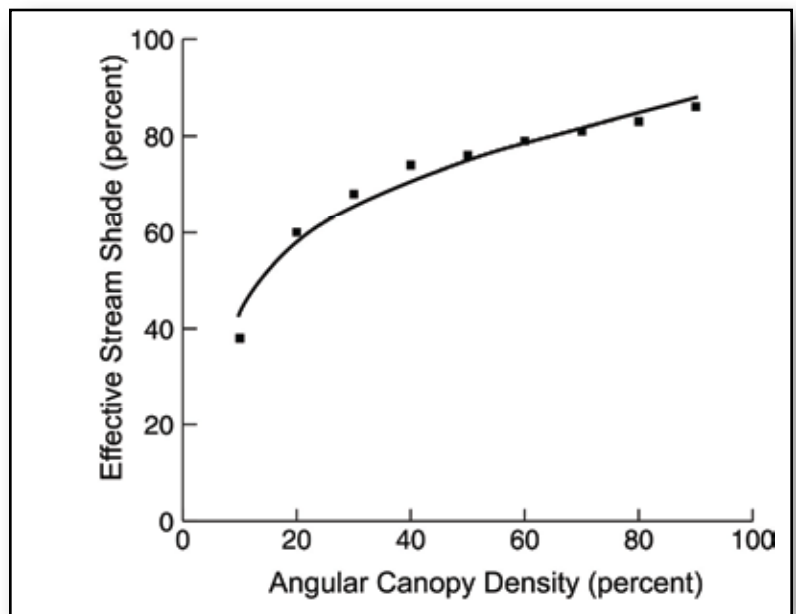




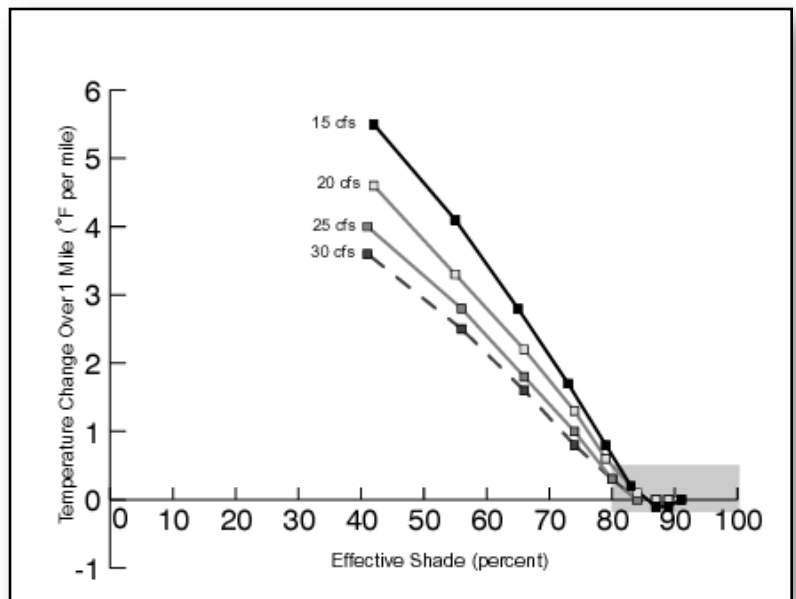
Effective shade is the total amount of radiant energy prevented from reaching a stream in a solar day. Because sun path and azimuth changes throughout the day forest vegetation has different efficiencies in blocking radiation for different time periods. As seen in Figure I-6 (*Solar Pathfinder*) for 43° to 49° N latitude (Boyd 1999), most solar heating occurs between 10:00 a.m. and 2:00 p.m. Park (1993) has shown that the width of primary riparian streamside areas will vary as a function of tree height and terrain slope as viewed in *Table I-13 (Primary shade zone distance of riparian trees)*.

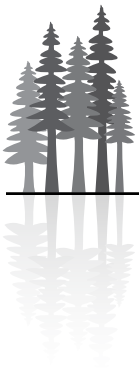
The planning criteria assume the secondary shade zone is defined as the outer edge of the primary shade zone to 100 feet. There is marginal improvement of ACD past 100 feet as shown in *Figure I-3*. Significant temperature rises do not occur when effective shade is  $\geq 80\%$  (*Figures I-4 and I-5*).

**FIGURE I-4.** ANGULAR CANOPY DENSITY (ACD) AND STREAM SHADE (PARK 1991)

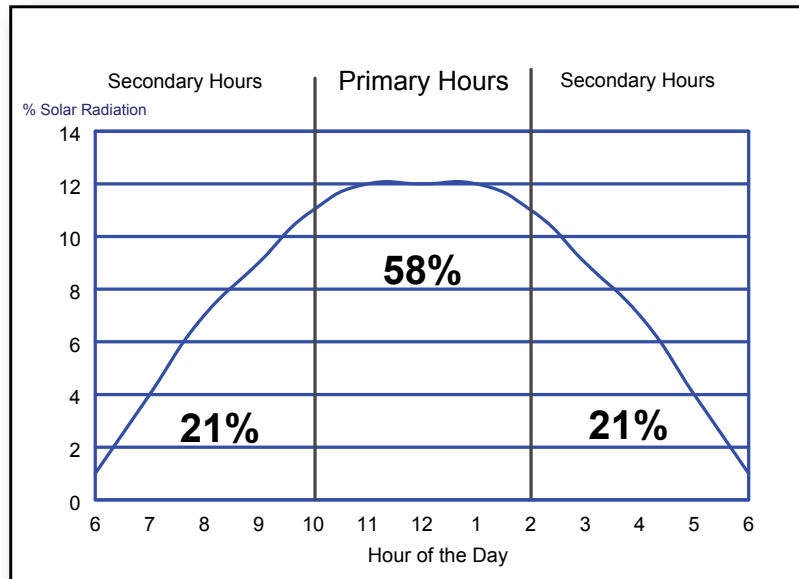


**FIGURE I-5.** EFFECTIVE STREAM SHADE AND CHANGE IN STREAM TEMPERATURE





**FIGURE I-6.**  
SOLAR PATHFINDER



**TABLE I-13. PRIMARY SHADE ZONE DISTANCE OF RIPARIAN TREES (IN FEET)**

Height of tree	Hill slope <30%	Hill slope 30 to 60%	Hill Slope >60%
Trees < 20 feet	12	14	15 feet
Trees 20 to 60 feet	28	33	55 feet
Trees >60 to 100 feet	50	55	60 feet

Source: Northwest Forest Plan Temperature TMDL Implementation Strategies, 2005.

Forest treatments are assumed to fully meet effective shade and water quality standards within primary and secondary shade zones along streams, lakes, and wetlands when the following criteria are met:

- *Table I-13 (Primary shade zone distance of riparian trees)* will be used to determine the width of the primary shade zone. Vegetation thinning in the primary shade zone will not result in less than 80% effective shade.
- Vegetation thinning in the secondary shade zone will not result in less than 50% canopy closure post harvest.

For modeling purposes, 60 feet width will be used to define the boundary of the primary shade zone for all combinations of topography and vegetation, and 100 feet will be used to define the boundary of the secondary shade zone.



## Analytical Methodology and Technique

### Step 1 -

Reclassify the watercourses GIS theme to derive a perennial stream data layer.

### Step 2 -

Buffer the perennial streams, lakes, and wetlands to 60 feet. Label this derived data layer Primary Shade Zone”.

### Step 3 -

Buffer the perennial streams, lakes, and wetlands to 100 feet.

### Step 4 -

Intersect the Primary Shade Zone derived data layer (step 2) with the derived data layer derived (step 3). Label the difference between the Primary Shade Zone and the boundary of 100 feet “Secondary Shade Zone”.

### Step 5 -

Intersect the Primary Shade Zone with each alternative’s primary riparian retention area. Calculate the miles of perennial stream not meeting the primary shade zone.

### Step 6 -

Intersect the Secondary Shade Zone with each alternative riparian variable management riparian area that meets 50% canopy closure post harvest. Calculate the miles of perennial stream not meeting the secondary shade zone.

## Analytical Conclusion

Rank alternatives by the extent that each alternative riparian area meets the primary and secondary shade zones on BLM-managed lands.

## Data Needs

- GIS watercourses data theme
- GIS-derived data layer or detailed description of each alternative’s full riparian retention and variable retention areas.

## Data Display

**TABLE I-14.** COMPARISON OF ALTERNATIVES NOT MEETING EFFECTIVE SHADE FOR PERENNIAL STREAMS

Alternative	Perennial Streams Not Meeting Primary Shade Zones (Miles)	% of Total Perennial Stream	Perennial Stream Not Meeting Secondary Shade Zones (Miles)	% of Total Perennial Stream
No Action				
Alternative 1				
Alternative 2				
Alternative 3				



## Analytical Question #5

How does the relative landslide density that would deliver to stream channels vary under the alternatives and between time periods within the harvest land base and all BLM-administered lands?

### Analytical Assumptions

Process uses concepts described in “Effects of forest cover, topography, and sampling extent on the measured density of shallow, translational landslides” (Miller and Burnett 2007).

Shallow translational landslides depend upon fragile topographic locations, forest cover and water availability in the soils surface and subsurface layers. Extreme storms are highly correlated with increased rates of landsliding on susceptible sites. Since it is not known when the few large storms occur, a relative landslide density is determined. This is based on the observed locations of shallow landslides from extreme storms. The 1996 storms in western Oregon were extreme, with recurrence intervals of generally 50->100 years depending on location. Observed landslides from these storms were used in the topographic weighting and land cover classes’ calibration datasets.

### Analytical Methodology and Technique

The analysis is part of the Large Wood Delivery Model, used to analyze the differences in wood recruitment between the alternatives. The analysis uses Geospatial Information System (GIS) data layers as developed by the BLM for the plan revision. Computer program scripts will be run in a batch analysis that compile and arrange information from the spatial data layers, calibration datasets, and perform mathematical and logic operations, as developed by Miller and Burnett (2007, 2008) to analyze the differences in relative landslide density.

#### Step 1-

The analysis will include all BLM-administered lands using fifth-field scale Hydrologic Unit code watersheds.

#### Step 2-

Prepare and run analysis as part of the Large Wood Delivery Model.

A topographic weighting term using ground slope and the degree of convergence will be used, which varies spatially to reflect local topographic influences on landslide locations. Topographic weighting functions are calibrated to landslide inventories for the Coast, Cascades, and Klamath Provinces.

Landslide density, from the effect of vegetative cover, will be calculated using the calibration dataset in *Table I-15 (1996 Siuslaw National Forest extreme storms)*.

**TABLE I-15. 1996 SIUSLAW NATIONAL FOREST EXTREME STORMS**

Forest Age Class, years	Landslide Density, number/mi <sup>2</sup>
0-9	21.76
10 -100	8.03
>100	6.47





Roadmask files, 164 feet in width, will be created to indicate proximity to roads. The landslide density for any digital elevation model (DEM) cell within the road mask is multiplied by a factor of 2.2 (Miller and Burnett 2007).

### Step 3-

Report the results for all alternatives and the No Harvest Reference Analysis for the 2006, 2016, 2026, 2056, and 2106 time periods, using the following:

- Report relative landslide density for those susceptible areas that could deliver to stream channels, based on the model calibration described in Miller and Burnett, 2008. All stream reaches will be included up to 20% gradient.
- Report results by the Oregon Coast Province, Cascades Province and Klamath Province. Include the Willamette Province and Klamath Falls Resource Area portion of the Basin and Range Province as the Cascades Province for reporting.
- Within provinces, categorize and report on the BLM land base as harvest land base, non-forest, riparian management area and late successional management area.
- Report as relative landslide density the numbers of landslides per square mile for each land area.
- Report the relative landslide densities as weighted averages.

## Analytical Conclusions

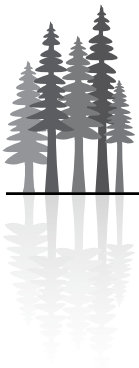
By province compare the results for each alternative and each time period in the harvest land base. By province, compare the results for each alternative and each time period for all BLM-administered lands and the No Harvest Reference Analysis.

## Data Needs

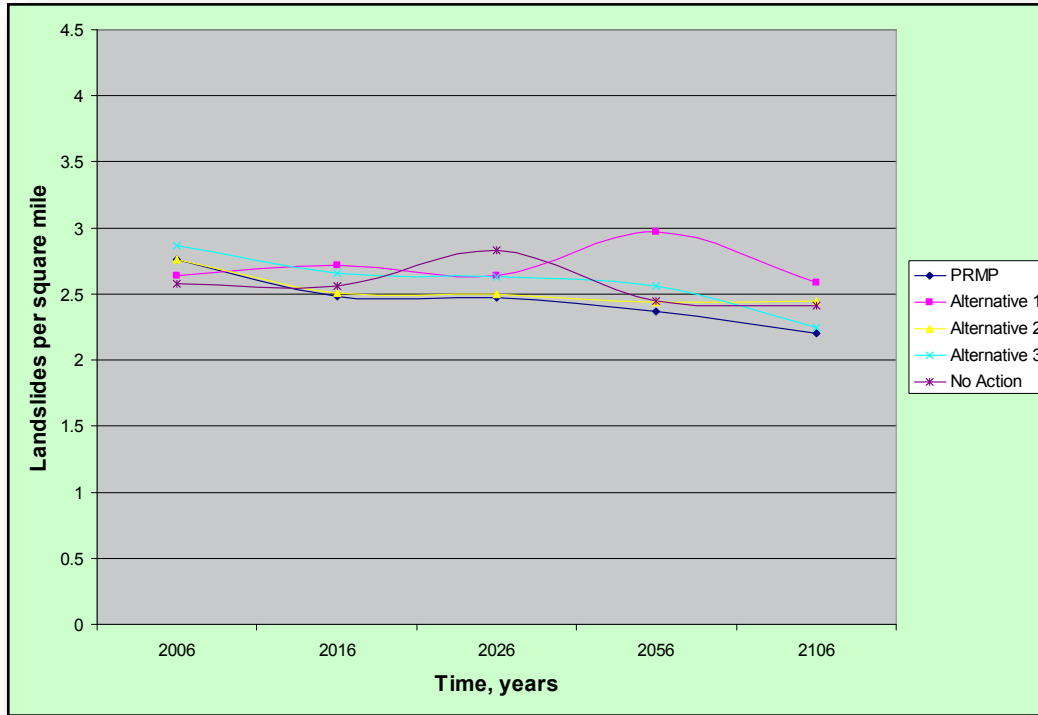
- GIS topography DEM's for the Plan Area
- GIS BLM roads data layer for the Plan Area
- GIS BLM forest inventory vegetation data layer
- BLM Options model structural stages by alternative and time period

## Data Display

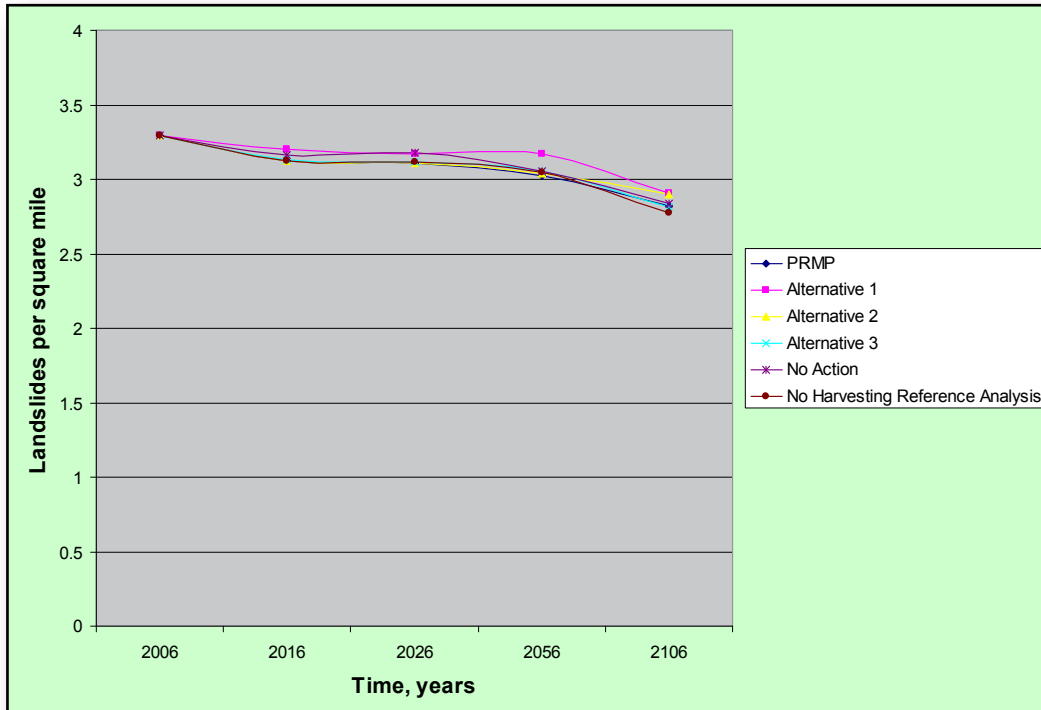
Show two comparison figures for the Oregon Coast, Cascades and Klamath Provinces, displaying how the relative landslide density varies over time under the alternatives. *Figure I-7 (Relative landslide density under the alternatives in the harvest land base that would deliver to stream channels)* will show the harvest land base and *Figure I-8 (Relative landslide density under the alternatives for all BLM-administered lands that would deliver to stream channels)* will show all BLM-administered lands (including non-forest, late successional management area, riparian management area and harvest land base). For each figure, the units of time will be shown along the x-axis, and relative landslide density as numbers per square mile will be shown along the y-axis.



**FIGURE I-7. RELATIVE LANDSLIDE DENSITY UNDER THE ALTERNATIVES IN THE HARVEST LAND BASE THAT WOULD DELIVER TO STREAM CHANNELS**



**FIGURE I-8. RELATIVE LANDSLIDE DENSITY UNDER THE ALTERNATIVES FOR ALL BLM-ADMINISTERED LANDS THAT WOULD DELIVER TO STREAM CHANNELS**





# Source Water Watersheds for Public Water Systems

The following table contains a list of source water watersheds for public water systems in the planning area. In many cases, the BLM administers a small portion of the watersheds.

**TABLE I-16. SOURCE WATER WATERSHEDS WITH BLM-ADMINISTERED LANDS IN THE PLANNING AREA**

PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100003	ADAIR VILLAGE WATER SYSTEM	WILLAMETTE RIVER		8144	
4100003	ADAIR VILLAGE WATER SYSTEM	WILLAMETTE RIVER			226461
<b>4100003</b>	<b>ADAIR VILLAGE WATER SYSTEM</b>	<b>SUBTOTAL</b>	<b>650</b>	<b>8144</b>	<b>226461</b>
4100152	CITY OF BROWNSVILLE	CALAPOOIA RIVER		5254	
4100152	CITY OF BROWNSVILLE	CALAPOOIA RIVER			94920
<b>4100152</b>	<b>CITY OF BROWNSVILLE</b>	<b>SUBTOTAL</b>	<b>1500</b>	<b>5254</b>	<b>94920</b>
4100157	CANBY UTILITY BOARD	MOLALLA RIVER		2892	
4100157	CANBY UTILITY BOARD	MOLALLA RIVER			84687
<b>4100157</b>	<b>CANBY UTILITY BOARD</b>	<b>SUBTOTAL</b>	<b>12000</b>	<b>2892</b>	<b>84687</b>
4100169	CITY OF CANYONVILLE	CANYON CREEK		13247	
4100169	CITY OF CANYONVILLE	CANYON CREEK			9408
<b>4100169</b>	<b>CITY OF CANYONVILLE</b>	<b>SUBTOTAL</b>	<b>1265</b>	<b>13247</b>	<b>9408</b>
4100171	CITY OF CARLTON	PANTHER CREEK		1070	
4100171	CITY OF CARLTON	PANTHER CREEK			1003
<b>4100171</b>	<b>CITY OF CARLTON</b>	<b>SUBTOTAL</b>	<b>1570</b>	<b>1070</b>	<b>1003</b>
4100187	CLACKAMAS RIVER WATER-CLACKAMAS	CLACKAMAS RIVER		8399	
4100187	CLACKAMAS RIVER WATER-CLACKAMAS	CLACKAMAS RIVER			159669
<b>4100187</b>	<b>CLACKAMAS RIVER WATER-CLACKAMAS</b>	<b>SUBTOTAL</b>	<b>90000</b>	<b>8399</b>	<b>159669</b>
4100199	BEAVER WATER DISTRICT	BEAVER CREEK		1649	
4100199	BEAVER WATER DISTRICT	BEAVER CREEK			17000
<b>4100199</b>	<b>BEAVER WATER DISTRICT</b>	<b>SUBTOTAL</b>	<b>500</b>	<b>1649</b>	<b>17000</b>
4100202	COLTON WATER DISTRICT	JACKSON CREEK		598	
4100202	COLTON WATER DISTRICT	JACKSON CREEK			1536
<b>4100202</b>	<b>COLTON WATER DISTRICT</b>	<b>SUBTOTAL</b>	<b>1200</b>	<b>598</b>	<b>1536</b>



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100213	CITY OF COQUILLE	COQUILLE RIVER		67076	
4100213	CITY OF COQUILLE	RINK CREEK		0	
4100213	CITY OF COQUILLE	COQUILLE RIVER			248930
4100213	CITY OF COQUILLE	RINK CREEK			429
<b>4100213</b>	<b>CITY OF COQUILLE</b>	<b>SUBTOTAL</b>	<b>4300</b>	<b>67076</b>	<b>249359</b>
4100225	CITY OF CORVALLIS	SOUTH FORK ROCK CREEK		52	
4100225	CITY OF CORVALLIS	GRIFFITH CREEK			1051
4100225	CITY OF CORVALLIS	NORTH FORK ROCK CREEK			2155
4100225	CITY OF CORVALLIS	SOUTH FORK ROCK CREEK			3177
4100225	CITY OF CORVALLIS	WILLAMETTE RIVER			40593
<b>4100225</b>	<b>CITY OF CORVALLIS</b>	<b>SUBTOTAL</b>	<b>50101</b>	<b>52</b>	<b>46975</b>
4100236	CITY OF COTTAGE GROVE	LAYING CREEK		80	
4100236	CITY OF COTTAGE GROVE	ROW RIVER		37205	
4100236	CITY OF COTTAGE GROVE	LAYING CREEK			36989
4100236	CITY OF COTTAGE GROVE	PRATHER CREEK			3482
4100236	CITY OF COTTAGE GROVE	ROW RIVER			160279
<b>4100236</b>	<b>CITY OF COTTAGE GROVE</b>	<b>SUBTOTAL</b>	<b>8500</b>	<b>37285</b>	<b>200750</b>
4100239	LONDON WATER CO-OP	BEAVER CREEK		253	
4100239	LONDON WATER CO-OP	BEAVER CREEK			615
<b>4100239</b>	<b>LONDON WATER CO-OP</b>	<b>SUBTOTAL</b>	<b>50</b>	<b>253</b>	<b>615</b>
4100246	CITY OF CRESWELL	COAST FORK WILLAMETTE RIVER		26141	
4100246	CITY OF CRESWELL	COAST FORK WILLAMETTE RIVER			96969
<b>4100246</b>	<b>CITY OF CRESWELL</b>	<b>SUBTOTAL</b>	<b>3380</b>	<b>26141</b>	<b>96969</b>
4100248	CITY OF DALLAS	RICKREAL CREEK		2874	
4100248	CITY OF DALLAS	RICKREAL CREEK			15092
<b>4100248</b>	<b>CITY OF DALLAS</b>	<b>SUBTOTAL</b>	<b>12900</b>	<b>2874</b>	<b>15092</b>
4100250	MILO ACADEMY	LICKEY CREEK		227	
4100250	MILO ACADEMY	SOUTH UMPQUA RIVER		10090	
4100250	MILO ACADEMY	LICKEY CREEK			251
4100250	MILO ACADEMY	SOUTH UMPQUA RIVER			11365
<b>4100250</b>	<b>MILO ACADEMY</b>	<b>SUBTOTAL</b>	<b>195</b>	<b>10317</b>	<b>11616</b>
4100254	CITY OF DEPOE BAY	NORTH DEPOE BAY CREEK		7	



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100254	CITY OF DEPOE BAY	SOUTH DEPOE BAY CREEK		29	
4100254	CITY OF DEPOE BAY	NORTH DEPOE BAY CREEK			521
4100254	CITY OF DEPOE BAY	ROCKY CREEK			3396
4100254	CITY OF DEPOE BAY	SOUTH DEPOE BAY CREEK			2736
<b>4100254</b>	<b>CITY OF DEPOE BAY</b>	<b>SUBTOTAL</b>	<b>1060</b>	<b>36</b>	<b>6653</b>
4100260	CITY OF DRAIN	ALAN CREEK		235	
4100260	CITY OF DRAIN	BEAR CREEK		1133	
4100260	CITY OF DRAIN	ALAN CREEK			415
4100260	CITY OF DRAIN	BEAR CREEK			2235
<b>4100260</b>	<b>CITY OF DRAIN</b>	<b>SUBTOTAL</b>	<b>1145</b>	<b>1368</b>	<b>2650</b>
4100276	CITY OF ELKTON	UMPQUA RIVER		64481	
4100276	CITY OF ELKTON	UMPQUA RIVER			251660
<b>4100276</b>	<b>CITY OF ELKTON</b>	<b>SUBTOTAL</b>	<b>170</b>	<b>64481</b>	<b>251660</b>
4100279	CITY OF ESTACADA	CLACKAMAS RIVER (ESTACADA)		5714	
4100279	CITY OF ESTACADA	CLACKAMAS RIVER (ESTACADA)			341992
<b>4100279</b>	<b>CITY OF ESTACADA</b>	<b>SUBTOTAL</b>	<b>1910</b>	<b>5714</b>	<b>341992</b>
4100287	EUGENE WATER & ELECTRIC BOARD	MCKENZIE RIVER		25805	
4100287	EUGENE WATER & ELECTRIC BOARD	MCKENZIE RIVER			708818
<b>4100287</b>	<b>EUGENE WATER &amp; ELECTRIC BOARD</b>	<b>SUBTOTAL</b>	<b>150,000</b>	<b>25805</b>	<b>708818</b>
4100297	FALLS CITY WATER DEPARTMENT	GLAZE CREEK		360	
4100297	FALLS CITY WATER DEPARTMENT	TEAL CREEK		186	
4100297	FALLS CITY WATER DEPARTMENT	GLAZE CREEK			288
4100297	FALLS CITY WATER DEPARTMENT	TEAL CREEK			2386
<b>4100297</b>	<b>FALLS CITY WATER DEPARTMENT</b>	<b>SUBTOTAL</b>	<b>1045</b>	<b>546</b>	<b>2674</b>
4100301	HECETA WATER DISTRICT	CLEAR LAKE			615
<b>4100301</b>	<b>HECETA WATER DISTRICT</b>	<b>SUBTOTAL</b>	<b>4500</b>		<b>615</b>
4100302	SILTCOOS HEIGHTS	SILTCOOS LAKE		825	
4100302	SILTCOOS HEIGHTS	SILTCOOS LAKE			38863
<b>4100302</b>	<b>SILTCOOS HEIGHTS</b>	<b>SUBTOTAL</b>	<b>125</b>	<b>825</b>	<b>38863</b>



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100317	CITY OF GATES	NORTH SANTIAM RIVER		2624	
4100317	CITY OF GATES	NORTH SANTIAM RIVER			238707
<b>4100317</b>	<b>CITY OF GATES</b>	<b>SUBTOTAL</b>	<b>535</b>	<b>2624</b>	<b>238707</b>
4100323	CITY OF GLENDALE	COW CREEK		37197	
4100323	CITY OF GLENDALE	MILL CREEK		42	
4100323	CITY OF GLENDALE	SECTION CREEK		426	
4100323	CITY OF GLENDALE	COW CREEK			80664
4100323	CITY OF GLENDALE	MILL CREEK			429
4100323	CITY OF GLENDALE	SECTION CREEK			575
<b>4100323</b>	<b>CITY OF GLENDALE</b>	<b>SUBTOTAL</b>		<b>37665</b>	<b>81669</b>
4100324	KERNVILLE-GLENEDEN-LINCOLN BCH W D	DRIFT CREEK		1861	
4100324	KERNVILLE-GLENEDEN-LINCOLN BCH W D	DRIFT CREEK			20376
<b>4100324</b>	<b>KERNVILLE-GLENEDEN-LINCOLN BCH W D</b>	<b>SUBTOTAL</b>		<b>1861</b>	<b>20376</b>
4100326	GLIDE WATER ASSOCIATION	NORTH UMPQUA RIVER		60943	
4100326	GLIDE WATER ASSOCIATION	NORTH UMPQUA RIVER			367586
<b>4100326</b>	<b>GLIDE WATER ASSOCIATION</b>	<b>SUBTOTAL</b>	<b>900</b>	<b>60943</b>	<b>367586</b>
4100333	CITY OF GOLD HILL	ROGUE RIVER		34045	
4100333	CITY OF GOLD HILL	ROGUE RIVER			249777
<b>4100333</b>	<b>CITY OF GOLD HILL</b>	<b>SUBTOTAL</b>	<b>1,115</b>	<b>34045</b>	<b>249777</b>
4100342	CITY OF GRANTS PASS	ROGUE RIVER		69042	
4100342	CITY OF GRANTS PASS	ROGUE RIVER			101888
<b>4100342</b>	<b>CITY OF GRANTS PASS</b>	<b>SUBTOTAL</b>	<b>26,000</b>	<b>69042</b>	<b>101888</b>
4100359	CORBETT WATER DISTRICT	NORTH FORK GORDON CREEK		324	
4100359	CORBETT WATER DISTRICT	SOUTH FORK GORDON CREEK		46	
4100359	CORBETT WATER DISTRICT	NORTH FORK GORDON CREEK			1773
4100359	CORBETT WATER DISTRICT	SOUTH FORK GORDON CREEK			1761
<b>4100359</b>	<b>CORBETT WATER DISTRICT</b>	<b>SUBTOTAL</b>	<b>2910</b>	<b>370</b>	<b>3534</b>
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	NORTH FORK TRASK RIVER (BARNEY RESERVOIR)		600	
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	TUALATIN RIVER		2817	



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	NORTH FORK TRASK RIVER (BARNEY RESERVOIR)			4681
4100379	HILLSBORO-FOREST GROVE-BEAVERTON	TUALATIN RIVER			112489
<b>4100379</b>	<b>HILLSBORO-FOREST GROVE-BEAVERTON</b>		<b>65100</b>	<b>3416</b>	<b>117170</b>
4100408	CITY OF JEFFERSON	NORTH SANTIAM RIVER		30953	
4100408	CITY OF JEFFERSON	NORTH SANTIAM RIVER			223196
<b>4100408</b>	<b>CITY OF JEFFERSON</b>		<b>2245</b>	<b>30953</b>	<b>223196</b>
4100466	LANGLOIS WATER DISTRICT	FLORAS CREEK		3099	
4100466	LANGLOIS WATER DISTRICT	FLORAS CREEK			35926
<b>4100466</b>	<b>LANGLOIS WATER DISTRICT</b>		<b>250</b>	<b>3099</b>	<b>35926</b>
4100473	CITY OF LEBANON	SOUTH SANTIAM CANAL		4508	
4100473	CITY OF LEBANON	SOUTH SANTIAM CANAL			73732
<b>4100473</b>	<b>CITY OF LEBANON</b>		<b>11000</b>	<b>4508</b>	<b>73732</b>
4100483	LINCOLN CITY WATER DISTRICT	SCHOONER CREEK		310	
4100483	LINCOLN CITY WATER DISTRICT	SCHOONER CREEK			9284
<b>4100483</b>	<b>LINCOLN CITY WATER DISTRICT</b>		<b>13527</b>	<b>310</b>	<b>9284</b>
4100493	LYONS MEHAMA WATER DISTRICT	NORTH SANTIAM RIVER		15262	
4100493	LYONS MEHAMA WATER DISTRICT	NORTH SANTIAM RIVER			73059
<b>4100493</b>	<b>LYONS MEHAMA WATER DISTRICT</b>		<b>1670</b>	<b>15262</b>	<b>73059</b>
4100497	MCMINNVILLE WATER AND LIGHT	HASKINS RESERVOIR		691	
4100497	MCMINNVILLE WATER AND LIGHT	MCGUIRE RESERVOIR		20	
4100497	MCMINNVILLE WATER AND LIGHT	HASKINS RESERVOIR			1235
4100497	MCMINNVILLE WATER AND LIGHT	MCGUIRE RESERVOIR			4259
<b>4100497</b>	<b>MCMINNVILLE WATER AND LIGHT</b>		<b>2100</b>	<b>711</b>	<b>5494</b>



FEIS for the Revision of the Western Oregon RMPs

PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100513	MEDFORD WATER COMMISSION	ROGUE RIVER		69729	
4100513	MEDFORD WATER COMMISSION	ROGUE RIVER			231481
<b>4100513</b>	<b>MEDFORD WATER COMMISSION</b>	<b>SUBTOTAL</b>	<b>83,454</b>	<b>69729</b>	<b>231481</b>
4100520	MILL CITY WATER DEPARTMENT	NORTH SANTIAM RIVER		1594	
4100520	MILL CITY WATER DEPARTMENT	NORTH SANTIAM RIVER			17810
<b>4100520</b>	<b>MILL CITY WATER DEPARTMENT</b>	<b>SUBTOTAL</b>	<b>1800</b>	<b>1594</b>	<b>17810</b>
4100534	CITY OF MOLALLA	MOLALLA RIVER		43125	
4100534	CITY OF MOLALLA	MOLALLA RIVER			86867
<b>4100534</b>	<b>CITY OF MOLALLA</b>	<b>SUBTOTAL</b>	<b>3100</b>	<b>43125</b>	<b>86867</b>
4100548	CLARKS BRANCH WTR. ASSOCIATION	SOUTH UMPQUA RIVER		31450	
4100548	CLARKS BRANCH WTR. ASSOCIATION	SOUTH UMPQUA RIVER			52653
<b>4100548</b>	<b>CLARKS BRANCH WTR. ASSOCIATION</b>	<b>SUBTOTAL</b>	<b>140</b>	<b>31450</b>	<b>52653</b>
4100549	TRI-CITY WATER DISTRICT	SOUTH UMPQUA RIVER		36492	
4100549	TRI-CITY WATER DISTRICT	SOUTH UMPQUA RIVER			70005
<b>4100549</b>	<b>TRI-CITY WATER DISTRICT</b>	<b>SUBTOTAL</b>	<b>3500</b>	<b>36492</b>	<b>70005</b>
4100550	CITY OF MYRTLE CREEK	SOUTH UMPQUA RIVER		424	
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS A		100	
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS B		67	
4100550	CITY OF MYRTLE CREEK	SOUTH UMPQUA RIVER			3804
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS A			187
4100550	CITY OF MYRTLE CREEK	SPRINGBROOK SPRINGS B			228
<b>4100550</b>	<b>CITY OF MYRTLE CREEK</b>	<b>SUBTOTAL</b>	<b>3,460</b>	<b>591</b>	<b>4219</b>
4100551	CITY OF MYRTLE POINT	NORTH FORK COQUILLE RIVER		81975	
4100551	CITY OF MYRTLE POINT	NORTH FORK COQUILLE RIVER			98932
<b>4100551</b>	<b>CITY OF MYRTLE POINT</b>	<b>SUBTOTAL</b>	<b>2715</b>	<b>81975</b>	<b>98932</b>
4100581	CITY OF OAKLAND	CALAPOOYA CREEK		5056	





PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100581	CITY OF OAKLAND	CALAPOOYA CREEK			59857
<b>4100581</b>	<b>CITY OF OAKLAND</b>		<b>954</b>	<b>5056</b>	<b>59857</b>
4100603	PANTHER CREEK WATER DISTRICT	PANTHER CREEK		35	
4100603	PANTHER CREEK WATER DISTRICT	PANTHER CREEK			1071
<b>4100603</b>	<b>PANTHER CREEK WATER DISTRICT</b>		<b>550</b>	<b>35</b>	<b>1071</b>
4100624	CITY OF PHILOMATH PUBLIC WORKS	MARY'S RIVER		1084	
4100624	CITY OF PHILOMATH PUBLIC WORKS	MARY'S RIVER			84926
<b>4100624</b>	<b>CITY OF PHILOMATH PUBLIC WORKS</b>		<b>4000</b>	<b>1084</b>	<b>84926</b>
4100657	PORTLAND BUREAU OF WATER WORKS	BULL RUN		60	
4100657	PORTLAND BUREAU OF WATER WORKS	BULL RUN			65523
<b>4100657</b>	<b>PORTLAND BUREAU OF WATER WORKS</b>		<b>831000</b>	<b>60</b>	<b>65523</b>
4100672	CITY OF POWERS	BINGHAM CREEK		16	
4100672	CITY OF POWERS	SOUTH FORK COQUILLE RIVER		234	
4100672	CITY OF POWERS	BINGHAM CREEK			163
4100672	CITY OF POWERS	SOUTH FORK COQUILLE RIVER			93877
<b>4100672</b>	<b>CITY OF POWERS</b>		<b>700</b>	<b>250</b>	<b>94039</b>
4100706	CITY OF RIDDLE	COW CREEK		83338	
4100706	CITY OF RIDDLE	COW CREEK			109130
<b>4100706</b>	<b>CITY OF RIDDLE</b>		<b>1,303</b>	<b>83338</b>	<b>109130</b>
4100707	LAWSON ACRES WATER ASSOCIATION	COW CREEK		2363	
4100707	LAWSON ACRES WATER ASSOCIATION	COW CREEK			4661
<b>4100707</b>	<b>LAWSON ACRES WATER ASSOCIATION</b>		<b>75</b>	<b>2363</b>	<b>4661</b>
4100712	CITY OF ROGUE RIVER	ROGUE RIVER		25273	
4100712	CITY OF ROGUE RIVER	ROGUE RIVER			43689
4100712	CITY OF ROGUE RIVER	SUBTOTAL	2000	25273	43689
4100717	ROBERTS CREEK WATER DISTRICT	SOUTH UMPQUA RIVER			3095



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
<b>4100717</b>	<b>ROBERTS CREEK WATER DISTRICT</b>		<b>6500</b>	<b>0</b>	<b>3095</b>
4100719	UMPQUA BASIN WATER ASSOCIATION	NORTH UMPQUA RIVER		1214	
4100719	UMPQUA BASIN WATER ASSOCIATION	NORTH UMPQUA RIVER			32269
<b>4100719</b>	<b>UMPQUA BASIN WATER ASSOCIATION</b>		<b>8500</b>	<b>1214</b>	<b>32269</b>
4100720	CITY OF ROSEBURG-WINCHESTER	NORTH UMPQUA RIVER		24682	
4100720	CITY OF ROSEBURG-WINCHESTER	NORTH UMPQUA RIVER			106472
<b>4100720</b>	<b>CITY OF ROSEBURG-WINCHESTER</b>		<b>30000</b>	<b>24682</b>	<b>106472</b>
4100731	SALEM PUBLIC WORKS	NORTH SANTIAM RIVER AND IG		934	
4100731	SALEM PUBLIC WORKS	NORTH SANTIAM RIVER AND IG			16221
<b>4100731</b>	<b>SALEM PUBLIC WORKS</b>		<b>170000</b>	<b>934</b>	<b>16221</b>
4100789	CITY OF SANDY	ALDER CREEK		633	
4100789	CITY OF SANDY	ALDER CREEK			3769
<b>4100789</b>	<b>CITY OF SANDY</b>		<b>5030</b>	<b>633</b>	<b>3769</b>
4100792	CITY OF SCAPPOOSE	GOURLAY		550	
4100792	CITY OF SCAPPOOSE	LAZY CREEK		377	
4100792	CITY OF SCAPPOOSE	SOUTH FORK SCAPPOOSE CREEK		1477	
4100792	CITY OF SCAPPOOSE	GOURLAY			879
4100792	CITY OF SCAPPOOSE	LAZY CREEK			337
4100792	CITY OF SCAPPOOSE	SOUTH FORK SCAPPOOSE CREEK			2413
<b>4100792</b>	<b>CITY OF SCAPPOOSE</b>		<b>3500</b>	<b>2404</b>	<b>3629</b>
4100808	COUNTRY VIEW MH ESTATES	ROGUE RIVER		94370	
4100808	COUNTRY VIEW MH ESTATES	ROGUE RIVER			639475
<b>4100808</b>	<b>COUNTRY VIEW MH ESTATES</b>		<b>112</b>	<b>94370</b>	<b>639475</b>
4100811	CITY OF SHERIDAN	SOUTH YAMHILL RIVER		14950	
4100811	CITY OF SHERIDAN	SOUTH YAMHILL RIVER			120465
<b>4100811</b>	<b>CITY OF SHERIDAN</b>		<b>5200</b>	<b>14950</b>	<b>120465</b>
4100821	CITY OF SILETZ	SILETZ RIVER		13670	



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
4100821	CITY OF SILETZ	TANGERMAN CREEK		1	
4100821	CITY OF SILETZ	SILETZ RIVER			117918
4100821	CITY OF SILETZ	TANGERMAN CREEK			296
<b>4100821</b>	<b>CITY OF SILETZ</b>	<b>SUBTOTAL</b>	<b>1100</b>	<b>13671</b>	<b>118214</b>
4100823	CITY OF SILVERTON	ABIQUA CREEK		1776	
4100823	CITY OF SILVERTON	ABIQUA CREEK			29894
<b>4100823</b>	<b>CITY OF SILVERTON</b>	<b>SUBTOTAL</b>	<b>5480</b>	<b>1776</b>	<b>29894</b>
4100843	STAYTON WATER SUPPLY	NORTH SANTIAM RIVER		0	
4100843	STAYTON WATER SUPPLY	NORTH SANTIAM RIVER			4537
<b>4100843</b>	<b>STAYTON WATER SUPPLY</b>	<b>SUBTOTAL</b>	<b>5630</b>	<b>0</b>	<b>4537</b>
4100847	CITY OF SUTHERLIN	CALAPOOYA CREEK NON-PAREIL		5055	
4100847	CITY OF SUTHERLIN	COOPER CREEK		480	
4100847	CITY OF SUTHERLIN	CALAPOOYA CREEK NON-PAREIL			49629
4100847	CITY OF SUTHERLIN	COOPER CREEK			2456
<b>4100847</b>	<b>CITY OF SUTHERLIN</b>	<b>SUBTOTAL</b>	<b>6360</b>	<b>5535</b>	<b>52086</b>
4100851	CITY OF SWEET HOME	SOUTH SANTIAM RIVER		31600	
4100851	CITY OF SWEET HOME	SOUTH SANTIAM RIVER			329872
<b>4100851</b>	<b>CITY OF SWEET HOME</b>	<b>SUBTOTAL</b>	<b>7235</b>	<b>31600</b>	<b>329872</b>
4100926	CITY OF WALDPORT	ECKMAN CREEK		40	
4100926	CITY OF WALDPORT	NORTH FORK WEIST CREEK		29	
4100926	CITY OF WALDPORT	ECKMAN CREEK			2756
4100926	CITY OF WALDPORT	NORTH FORK WEIST CREEK			169
4100926	CITY OF WALDPORT	SOUTH FORK WEIST CREEK			193
<b>4100926</b>	<b>CITY OF WALDPORT</b>	<b>SUBTOTAL</b>	<b>3000</b>	<b>69</b>	<b>3118</b>
4100953	CITY OF WILLAMINA WATER DEPARTMENT	WILLAMINA CREEK		15010	
4100953	CITY OF WILLAMINA WATER DEPARTMENT	WILLAMINA CREEK			37480
<b>4100953</b>	<b>CITY OF WILLAMINA WATER DEPARTMENT</b>	<b>SUBTOTAL</b>	<b>1760</b>	<b>15010</b>	<b>37480</b>
4100957	WINSTON-DILLARD WATER DISTRICT	SOUTH UMPQUA RIVER		28316	
4100957	WINSTON-DILLARD WATER DISTRICT	SOUTH UMPQUA RIVER			83243



PWS_ID <sup>1</sup>	PWS Name	Source	Population Served	BLM Acres	Other Acres
<b>4100957</b>	<b>WINSTON-DILLARD WATER DISTRICT</b>		<b>6500</b>	<b>28316</b>	<b>83243</b>
		<b>SUBTOTAL</b>			
4100958	CITY OF YONCALLA	ADAMS CREEK		494	
4100958	CITY OF YONCALLA	ADAMS CREEK			709
4100958	CITY OF YONCALLA	WILSON CREEK			474
<b>4100958</b>	<b>CITY OF YONCALLA</b>		<b>1095</b>	<b>494</b>	<b>1183</b>
		<b>SUBTOTAL</b>			
4100968	CITY OF YAMHILL	TURNER CREEK		963	
4100968	CITY OF YAMHILL	TURNER CREEK			1955
<b>4100968</b>	<b>CITY OF YAMHILL</b>		<b>1500</b>	<b>963</b>	<b>1955</b>
		<b>SUBTOTAL</b>			
4100971	CITY OF CAVE JUNCTION	EAST FORK ILLINOIS RIVER		15476	
4100971	CITY OF CAVE JUNCTION	EAST FORK ILLINOIS RIVER			107511
<b>4100971</b>	<b>CITY OF CAVE JUNCTION</b>		<b>1,440</b>	<b>15476</b>	<b>107511</b>
		<b>SUBTOTAL</b>			
4100985	HILLSBORO-CHERRY GROVE	TUALATIN RIVER		952	
4100985	HILLSBORO-CHERRY GROVE	TUALATIN RIVER			14613
<b>4100985</b>	<b>HILLSBORO-CHERRY GROVE</b>		<b>250</b>	<b>952</b>	<b>14613</b>
		<b>SUBTOTAL</b>			
4101092	USFS TILLER RANGER STATION	USFS TILLER RANGER STATION		10566	
4101092	USFS TILLER RANGER STATION	USFS TILLER RANGER STATION			277963
<b>4101092</b>	<b>USFS TILLER RANGER STATION</b>		<b>1092</b>	<b>10566</b>	<b>277963</b>
		<b>SUBTOTAL</b>			
4101095	USFS WOLF CREEK JOB CORPS	LITTLE RIVER		2405	
4101095	USFS WOLF CREEK JOB CORPS	LITTLE RIVER			55405
<b>4101095</b>	<b>USFS WOLF CREEK JOB CORPS</b>		<b>250</b>	<b>2405</b>	<b>55405</b>
		<b>SUBTOTAL</b>			
4101174	BUELL-RED PRAIRIE WATER ASSN	GOOSENECK CREEK		959	
4101174	BUELL-RED PRAIRIE WATER ASSN	GOOSENECK CREEK			98
<b>4101174</b>	<b>BUELL-RED PRAIRIE WATER ASSN</b>		<b>980</b>	<b>959</b>	<b>98</b>
		<b>SUBTOTAL</b>			
4190416	FORT JAMES OPERATING CO.	COLUMBIA RIVER		819	
4190416	FORT JAMES OPERATING CO.	COLUMBIA RIVER			86153
<b>4190416</b>	<b>FORT JAMES OPERATING CO.</b>		<b>750</b>	<b>819</b>	<b>86153</b>
		<b>SUBTOTAL</b>			



<b>PWS_ID<sup>1</sup></b>	<b>PWS Name</b>	<b>Source</b>	<b>Population Served</b>	<b>BLM Acres</b>	<b>Other Acres</b>
4192139	TILLER ELEMENTARY, SD #15	SOUTH UMPQUA RIVER		386	
4192139	TILLER ELEMENTARY, SD #15	SOUTH UMPQUA RIVER			54592
<b>4192139</b>	<b>TILLER ELEMENTARY, SD #15</b>	<b>SUBTOTAL</b>	<b>60</b>	<b>386</b>	<b>54592</b>
4192152	POPE & TALBOT, INC.,	WILLAMETTE RIVER		77011	
4192152	POPE & TALBOT, INC.,	WILLAMETTE RIVER			1167276
<b>4192152</b>	<b>POPE &amp; TALBOT, INC.,</b>	<b>SUBTOTAL</b>	<b>800</b>	<b>77011</b>	<b>1167276</b>
4192674	USFS STAR RANGER STATION	APPLEGATE RIVER		4402	
4192674	USFS STAR RANGER STATION	APPLEGATE RIVER			115722
<b>4192674</b>	<b>USFS STAR RANGER STATION</b>	<b>SUBTOTAL</b>	<b>25</b>	<b>4402</b>	<b>115722</b>
4194300	ROSEBURG FOREST PROD-DILLARD	SOUTH UMPQUA RIVER		3823	
4194300	ROSEBURG FOREST PROD-DILLARD	SOUTH UMPQUA RIVER			25041
<b>4194300</b>	<b>ROSEBURG FOREST PROD-DILLARD</b>	<b>SUBTOTAL</b>	<b>2000</b>	<b>3823</b>	<b>25041</b>

<sup>1</sup> Department of Environmental Quality Public Water System identification number for surface drinking water watersheds.



# Best Management Practices

## Introduction

A Best Management Practice or BMP is a practice, or combination of practices that have been determined to be the most effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals (40 CFR 130.2 [m]).

Best Management Practices are a type of water pollution control. This section defines the best management practices (i.e., methods and measures) that were developed for the lands within the western Oregon planning area to comply with the requirements of the Clean Water Act.

## Purpose

Best management practices (BMPs) are required by the federal Clean Water Act, as amended to reduce nonpoint source pollution to the maximum extent practicable. Nonpoint source pollution is pollutants detected in a concentrated water source such as a stream, or lake that come from a wide range of forest and range activities. The BMPs are considered the primary controls for achieving Oregon's water quality standards. Oregon's narrative criteria, which include numeric standards, are designed to protect designated beneficial uses (such as salmonid spawning and rearing, resident fish and aquatic life, domestic water supplies, and water-contact recreation).

The BMPs are methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. The BMPs include, but are not limited to, avoidance, structural and nonstructural treatments, operations, and maintenance procedures. Although normally preventative, BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation).

## Organization and Use

The BMPs in this appendix are organized by the following management activities:

- roads and landings
- timber harvest activities
- silvicultural activities
- fire and fuels management
- surface source water for drinking water
- recreation
- grazing
- minerals exploration and development
- spill prevention and abatement
- restoration

The tables that follow this introduction identify the input variables, causal mechanisms, and water quality standards (referenced by the Oregon Administrative Rules number) that are associated with each BMP.



Those BMPs that are necessary for typical situations have been included. When applied, BMPs are expected to prevent water quality degradation and to meet water quality standards.

Causal mechanisms help explain the outcomes or the process through which an outcome occurs.

Resource aspects of land management activities normally have many facets that require site-specific BMP design. Therefore, there may be some repetition of the BMPs between sections of the following tables. An activity may use an individual BMP, whereas another activity may involve BMPs in combination from several sections for water quality protection.

Management of locatable minerals is governed by regulations found in 43 CFR 3809. The BMPs for locatable minerals include language from 43 CFR 3809 that requires operators to prevent unnecessary and undue degradation from mining operations.

Some BMPs that relate to instream activities may coincidentally be similar to applicable practices specified in Army Corps of Engineers, Department of State Lands, and ODFW joint removal/fill permits, DEQ water quality permits and 401 certifications, or project design criteria contained in biological assessments. The BMPs in the following tables are not specific permit requirements, but rather demonstrate the process by which nonpoint source pollution from instream activities would be controlled.

The BMPs are practices, techniques, or management strategies that have been evaluated through common practice or studies, and shown to be an effective and practical means of preventing or reducing nonpoint source pollution. The BMPs are not intended to serve as detailed engineering specifications or design criteria. Such specifications are available for field use from various sources.

## Application of Best Management Practices

Selection of BMPs are made by soil, water, fisheries, geology and other professionals during project-level analyses. It is not intended that all of the BMPs listed will be selected for any specific management action. Each activity is unique, based on site-specific conditions, and the selection of an individual BMP or a combination of BMPs and measures becomes the BMP design.

The BMPs must be applied in a manner that is consistent with all Resource Management Plan objectives. The overall goal is not to adhere strictly to a particular set of BMPs, but to meet water quality objectives when implementing management actions. Describing non-point pollution causal mechanisms allows specialists to exercise discretion as to what will work best in a particular situation. An example is the need to respond to a wide range of geology, landform, soils, watershed characteristics and climate. Although this appendix does not provide an exhaustive list of BMPs, the included BMPs are believed to cover most project activity situations in the Plan area. Additional nonpoint source control measures may be identified during the interdisciplinary process when evaluating site-specific management actions.

Where found to be ineffective, BMPs may require modification to meet water quality objectives. Specialists may consider baseline environmental conditions, type of activity, proximity to water, disturbance level, direct, indirect, and cumulative effects and timing. They may also evaluate new technology and relevant implementation or effectiveness monitoring data, published studies or other sources of information, in refining existing BMPs or recommending new BMPs. This process involves continued learning and applying monitoring feedback.

Review and update of this appendix, including BMP corrections or additions that are derivatives of existing BMPs, would be completed through plan maintenance.



## Roads and Landings

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-17. BEST MANAGEMENT PRACTICES FOR ROADS AND LANDINGS**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 1	Locate roads and landings on stable locations that minimize sediment delivery potential to streams (e.g., ridge tops, stable benches or flats, and gentle-to-moderate side-slopes). To the extent workable, avoid unstable headwalls, and steep channel-adjacent side slopes.	Coarse and Fine Sediment, and Organic Debris: Failures from roads built across unstable landforms that may slide into stream channels Coarse and Fine Sediment: Alters channel form, which warms stream temperatures due to either increased widening or deepening (incising) channels becoming disconnected from the flood plain hyporheic zone	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Temp OAR 340-041-0028 Turbidity OAR 340-041-0036
R 2	Where practical to do so, plan routes to limit new road construction, including stream crossings, within riparian management areas.	Coarse and Fine Sediment: Surface erosion due to lack of adequate vegetative cover, or nearness to stream channels that may deliver. Temperature: Roads located adjacent to streams, causing opening in forest canopy that may reduce local stream shade.	Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
R 3	Considering topographic and safety constraints, locate roads so as to lower cutbank heights and cutbank slope angles, where ditchlines could deliver run-off directly to stream channels.	Coarse and Fine Sediment: Erosion from exposed soils on cut banks	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 4	Locate roads and landings outside of jurisdictional wetlands.	Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver	Antidegradation OAR 340-041-0004 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 5	To the extent workable, locate new landings outside of Riparian Management Areas. Avoid expanding existing landings in Riparian Management Areas where sediment delivery to stream channels could occur.	Coarse and Fine Sediment, and Temperature: Surface erosion or ravel, due to lack of adequate vegetative cover or nearness to stream channels that may deliver Temperature: Increase landing size or shape, causing opening in forest canopy that may reduce local stream shade	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
R 6	Locate landings in areas with low risk for landslides.	Coarse and Fine Sediment, and Organic Debris: Failures from landings sited on unstable landforms that may slide into stream channels	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 7	Locate excavated material disposal areas outside Riparian Management Areas, floodplains, and unstable areas that could transport sediment to waterbodies.	Coarse and Fine Sediment: Surface erosion or ravel, due to lack of adequate vegetative cover, or nearness to stream channels that may deliver	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>General Construction</b>			
R 8	Design roads no wider than needed for the specific use.	Coarse and Fine Sediment: Surface erosion from wet weather, due to lack of adequate vegetative cover that may deliver to a stream channel	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 9	Limit road and landing construction, reconstruction, or renovation activities to the dry season, generally from May into October. When conditions permit operations outside of the dry season, keep erosion control measures concurrent with ground disturbance to the extent that the affected area can be rapidly stormproofed if weather conditions deteriorate.	Coarse and Fine Sediment: Surface erosion from wet weather, due to lack of adequate vegetative cover that may deliver to a stream channel	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 10	End-haul excavated material to minimize side-casting of waste material if side slopes generally exceed 60 percent, or where side-cast material may enter waterbodies, wetlands, or floodplains.	Coarse and Fine Sediment, and Organic Debris: Fill run-out or failures from roads built across steep landforms that may slide into stream channels	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 11	Conduct pioneer road construction to avoid the deposition of materials in waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Pioneer road construction earthwork, with some downslope movement or drifting of unconsolidated soil medium towards waterbodies, floodplains, or wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 12	Use controlled blasting techniques.	Coarse and Fine Sediment: Blasting with radial movement of unconsolidated soil medium or rock fragments, towards waterbodies, floodplains, or wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 13	Use only soil and rock materials in permanent road fills. Build up fills by layering; (e.g. 6 inch lifts) compact between 85 and 95 percent maximum density using compaction equipment. Provide for additional fill drainage (e.g. use geo-textile fabrics, etc.) in landslide prone areas.	Coarse and Fine Sediment, and Organic Debris: Failures from roads with inadequate fill construction, or without proper drainage, that may slide into stream channels	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 14	Where deemed necessary, use temporary sediment containment structures to contain runoff from construction areas (e.g. silt fencing).	Coarse and Fine Sediment: New earthwork, lacking vegetative cover, that may erode and deliver to waterbodies, floodplains, or wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 15	Surface roads if they would be subject to traffic during prolonged wet weather.	Coarse and Fine Sediment: Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 16	Complete construction activities prior to fall rains. Prevent erosion in areas with direct connectivity to streams by stabilizing exposed soil materials.	Coarse and Fine Sediment: Vegetative and organic ground cover, decreasing soil detachment, transport and delivery to stream channels	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 17	Seed and mulch cut and fill slopes, ditchlines, and waste disposal upon construction completion. Where straw mulch or rice straw mulch is used; require certified weed free, if readily available. Mulch shall be applied at no less than 2000 lbs/acre	Coarse and Fine Sediment: Vegetative and organic ground cover, decreasing soil detachment, transport and delivery to stream channels	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 18	For new road construction, clear channels and ditches of excess sediment and debris above culvert inlets prior to fall rains.	Coarse and Fine Sediment: Culvert inlets becoming plugged with sediment or floatable organic debris, resulting in water ponding against the road fill, and headcutting and loss of the fill at the crossing or diversion and/or gulying down the road ditchline and loss of the road fill at another site, with sediment delivery to waterbodies, floodplains, or wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 19	Correct special drainage problems (e.g., high water table, seeps) that effect stability of the road subgrade through the use of perforated drains, geotextiles, or drainage bays.	Coarse and Fine Sediment: Saturated fills or wet areas that could fail or erode and deliver sediment to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 20	Conduct slope rounding on tops of cut slopes in clayey soils to reduce sloughing and surface ravel.	Coarse and Fine Sediment: Erosion from exposed soils on cut and fill slopes. Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007 (1)&(13) Turbidity OAR 340-041-0036
R 21	Where sediment would be transported to streams, consider windrowing slash at the base of newly constructed fill slopes to catch sediment.	Coarse and Fine Sediment: Erosion from exposed soils on cut and fill slopes. Road tread erosion, increased by traffic, especially during wet weather on susceptible soil types, causing rilling or rutting, and delivery to a stream channel.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007 (1)&(13) Turbidity OAR 340-041-0036
<b>Surface Drainage</b>			
R 22	Drain the road surface by using crowning, insloping or outsloping. Road surfaces, regardless of traffic volume, may use a combination of these methods for effective road drainage into nonerodible areas.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 23	Low traffic roads should be out-sloped, unless there is a traffic hazard from the road shape. Roads can be insloped for specific purposes, such as to drain unstable areas or where the underlying formation is very rocky and not erodible.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 24	Out-slope low traffic volume roads to provide surface drainage on road gradients up to 8 percent, where an inside ditch is not planned.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 25	Use rolling drainage dips and/or lead-off ditches as options in lieu of culverts for low traffic volume roads with less than 10 percent gradient.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 26	Locate surface water drainage measures (water bars, rolling dips, etc.) where they will drain the road surface without delivering sediment to a stream or waterbody, and at frequencies that are sufficient to prevent damage or serious erosion of the road surface. Install during the dry season.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 27	Outside road berms are discouraged. Where there is an outside berm that prevents water from exiting the roadway, it should be breached at intervals to prevent accumulation of water and delivery of sediment to streams and waterbodies.	Coarse and Fine Sediment: Concentrated water flows during storm events from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 28	Roll the grade in erodible and unstable soils to reduce surface water volume and velocities.	Coarse and Fine Sediment: Concentrated water flows from compacted road surfaces that may travel longer distances, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 29	Divert road and landing runoff water away from headwalls, unstable areas or stream channels.	Coarse and Fine Sediment: Water volume concentration resulting in headwall saturation with possible failures to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 30	Shape landings to spread surface water runoff to well- vegetated, stable ground.	Coarse and Fine Sediment: Concentrated water flows from compacted landing surfaces that may travel longer distances, entering waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 31	Prevent diversion of water from streams into road ditches or upon road surfaces.	Coarse and Fine Sediment: Concentrated water flow from streams causing ditch erosion, and sediment delivery to another stream channel. Dewatering of a stream channel with negative effects on fishes and aquatic life.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007 (1)&(13) Turbidity OAR 340-041-0036
R 32	For roads involving very erodible soils near streams: <ul style="list-style-type: none"> <li>Where possible, outsloping should be the preferred road drainage treatment.</li> <li>Construct lead-in ditch to catchbasins</li> <li>Require rock armoring of lead-in ditch for through fills greater than 6 feet in height</li> <li>Design catch basins in a manner that would settle out transported sediments. Maintain these catch basins.</li> </ul>	Coarse and Fine Sediment: Concentrated water flow from roads and subsequent soil movement to streams	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007 (1)&(13) Turbidity OAR 340-041-0036
<b>Cross Drains</b>			
R 33	Locate cross drains such that runoff and sediment is not discharged to a stream. Use measures such as ditchline settling basins, culvert endcaps and perforated flex pipes on the discharge end of stream relief culverts to disperse culvert discharge near streams and waterbodies.	Coarse and Fine Sediment: Road water and sediment draining directly into waterbodies, causing water quality degradation.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 34	Space cross drains at intervals sufficient to prevent water volume concentration and accelerated ditch erosion. Increase cross drain frequency through through erodible soils, steep grades, and unstable areas.	Coarse and Fine Sediment: Water volume concentration, resulting greater erosive energy, rilling and gullying road ditchlines and delivery to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 35	Cross drainage culverts should be a minimum of 18 inches in diameter. If flex pipes are used, care should be taken during installation so as to avoid reducing pipe diameter.	Coarse and Fine Sediment: Cross drain restricted size that can plug with sediments and debris, causing water flow volume concentration in ditchlines resulting in gullying with materials delivered to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 36	Construct cross drainage culverts or drainage dips at nearest and best available location upgrade of stream crossings to prevent ditchflow and sediment from entering the stream.	Coarse and Fine Sediment: Concentrated ditch flow from storm events or snowmelt, causing erosion of the ditchline or carrying sediment sloughed from the cutbank, that if left unchecked may deliver to a stream channel	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 37	Site cross drains to exit on convex slopes and avoid discharge onto erodible and/or unstable ground, (such as headwalls, slumps, or block failure zones), or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Water volume concentration, resulting in headwall saturation with possible failures to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 38	Armor drainage dips to maintain functionality in areas of erosive soils that are subject to rapid erosion by runoff.	Coarse and Fine Sediment: Concentrated water flows from compacted road surfaces that may erode and gully in susceptible soils, entering ditchlines, and waterbodies.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 39	Install downspout structures and/ or energy dissipators (e.g., rock material) at cross drain outlets or drain dips where water is discharged onto loose material or erodible soils, fills, or steep slopes.	Coarse and Fine Sediment: Concentrated ditch flow from storm events or snowmelt, causing erosion of the ditchline or carrying sediment sloughed from the cutbank that if left unchecked, may deliver to a stream channel	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 40	Extend culvert outlets or downspout structures onto undisturbed ground.	Surface water from compacted surfaces saturating road fills with possible slumping or mass failure and delivery to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 41	Cut protruding "cannon" culverts at the fill surface, install downspout and/or energy dissipators on erodible fills.	Coarse and Fine Sediment: Surface water from compacted surfaces saturating road fills with possible slumping or mass failure and delivery to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 42	Where erosion of road fill is occurring at cross-drain entrance, either add more cross-drains along ditchline to reduce flow, or angle cross-drains near 30 degree angle to the road.	Coarse and Fine Sediment: Scour of road fills from too much water volume concentration, causing erosion and sediment delivery to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 43	Where debris or sediments may plug cross-drains, use slotted risers, oversized culverts or build catch basins.	Coarse and Fine Sediment: Culvert plugging causing road fill failure and slug injections of sediments to waterbodies, floodplains and wetlands	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
<b>Stream Crossings (General)</b>			
R 44	Install all crossings during the low flow period, generally from June 15 to September 15.	Coarse and Fine Sediment: Turbidity and sediment movement downstream during periods of low turbidities with possible effects on aquatic life	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
<b>Permanent Stream Crossings</b>			
R 45	Size culverts, bridges, and other stream crossings for the 100-year flood event including allowance for bed load and small floatable debris without exceeding capacity or diversion. Match culvert width with bankfull channel width.	Coarse and Fine Sediment, and Organic Debris: Floodwaters exceeding pipe capacity, causing overtopping of pipe and fills, with ensuing headcutting and loss of road fill.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 46	To the extent workable, limit the number of new stream crossings, by evaluating practical upland alternatives.	Coarse and Fine Sediment: Turbidity and sediment entry of road run-off to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 47	Construct the stream crossing approach to minimize fill volumes and sediment delivery potential.	Coarse and Fine Sediment: Earthwork near waterbodies, floodplains and wetlands causing sediment delivery.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 48	Locate culvert placement on a well defined, unobstructed, and straight reach of stream. Where a bend in the channel cannot be avoided, or would have less impact than moving the road elsewhere, place the alignment of the culvert with the upstream channel and armor the discharge side of the culvert into an erodible bank.	Coarse and Fine Sediment: Earthwork near waterbodies, floodplains and wetlands causing sediment delivery.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 49	Where workable, install culverts in intermittent channels at the natural stream grade.	Coarse and Fine Sediment: Floodwater piping or eroding unconsolidated road fill, causing failures with sediment delivery to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 50	When installing stream culverts, divert the stream around the work area with coffer dams, pumping etc.. Maintain diversion until all instream work is completed. Pump seepage water that may escape the containment to an off-stream filtration area.	Coarse and Fine Sediment: Erosion at the instream construction site causing sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 51	Use containment and filtering techniques such as bladder barriers, silt curtains etc if diversion is not possible. Place sediment controls along and immediately downstream of the instream work.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 52	To the extent workable, limit activities of mechanized equipment to streambank areas or temporary platforms when installing or removing structures.	Coarse and Fine Sediment, Oil, and Toxins:  Erosion at the instream construction site causing turbidity and sediment movement downstream	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 53	Use stream crossing protection such as hardened crossing, fill armoring, grade dipping, etc. where high debris loads are expected (such as debris torrent channels) to allow overflow without loss of the fill or diversion of streamflow.	Coarse and Fine Sediment, and Organic Debris: Debris flows plugging culverts or removing road fills with high delivery of sediments and materials to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 54	Provide adequate stream bank protection using bioengineering techniques e.g., live plants or cuttings, dead plant material, rock or other inert structure where bank erosion would occur.	Coarse and Fine Sediment: Stream scour of road fill, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 55	Provide structural erosion control measures e.g., riprap, wing walls, etc. on erosion-prone fills, inlets, and outlets.	Coarse and Fine Sediment: Scour of streambed at culvert outlet, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 56	Where channels are not naturally armored, place energy dissipators e.g., large rock at the outlet of culverts on streams.	Coarse and Fine Sediment: Stream scour of road fill, causing entrainment of sediment in flowing water and delivery to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 57	Stabilize fill material over stream crossing structures immediately after construction has been completed, normally before October 15. Exposed soils would be seeded and mulched. Temporarily suspend construction activity if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream. Soils must be covered or temporarily stabilized during work suspension.	Coarse and Fine Sediment: Surface erosion with sediment delivery to waterbodies, floodplains and wetlands.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 58	Incorporate additional design criteria (e.g., rock blankets, buttressing, relief pipes higher in the fill, etc.) for deep fills to lessen the susceptibility of fill failures.	Coarse and Fine Sediment, and Organic Debris: Floodwaters exceeding pipe capacity, causing overtopping of pipe, possible piping through fills with possible collapse or overtopping, with ensuing headcutting, loss of road fill, and possible dam break flood scouring downstream reaches.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 59	Use beveled culvert inlets, wingwalls, over-sized culverts, trash racks or in some cases slotted risers to prevent culvert plugging and failure in areas of active debris movement.	Coarse and fine Sediment, and Organic Debris: Mobile debris and materials plugging culverts with overtopping and failure of the road fill, and possible dam break flood, scouring downstream reaches.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 60	Install permanent stream crossing structures before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Temporary Stream Crossings for Roads and Skid Trails</b>			
R 61	To the extent workable, limit the use of mechanized equipment to streambank areas or temporary platforms when installing or removing structures. Avoid driving of mechanized equipment in the stream channel except in the area that is necessary for installation and removal operations.	Coarse and fine Sediment, Oil, and Toxins: Vehicles wheel tracks breaking down banks, to access stream channel bottoms, driving through stream water column, disturbing fish habitat, with possible release of oil, and asbestos from brake linings and similar toxins.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Statewide Narrative Criteria Toxics OAR 340-041-0007 Turbidity OAR 340-041-0036
R 62	Limit the number of new temporary crossings on a stream.	Coarse and Fine Sediment: Sediment movement downstream during periods of low turbidities with possible effects on aquatic life.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 63	Use washed river rock or crushed rock over geo-textile fabric, as s backfill material over temporary culverts, except where excessive displacement would occur from vehicle travel.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 64	Use the least amount of fill possible to facilitate the temporary stream crossing structure if a non- fill structure is not possible.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 65	Limit the installation and removal of temporary crossing structures within the prescribed work period where possible. Follow practices under the Closure/ Decommissioning section for removing stream crossing drainage structures and reestablishing natural drainage configuration.	Coarse and Fine Sediment: Fall or winter streamflows washing over temporary road and high stream energies washing a portion or all of the crossing downstream.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
<b>Low-Water Ford Stream Crossings</b>			
R 66	Use structures that would withstand 100-year flow events e.g., concrete, well anchored concrete mats, etc. on permanent crossings.	Coarse and Fine Sediment, and Toxins: High streamflow undermining or twisting structure, with possible channel shifts, and partial collapse or loss of structure.	Statewide Narrative Criteria Toxics OAR 340-041-0007 Turbidity OAR 340-041-0036
R 67	Harden approaches with non-erodible materials on permanent crossings. Provide relief drainage on approaches.	Coarse and Fine Sediment, and Toxins: Loose road surfacing, washing into the stream during storms.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 68	Use washed rock or gravel in temporary crossings, where a non-fill structure is not possible.	Coarse and Fine Sediment: Higher than anticipated streamflows, washing over or through temporary road crossing.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 69	Restrict unauthorized access to low-water ford stream crossings.	Coarse and Fine Sediment, Bacteria and Pathogens, Oil, and Toxins: Vehicular traffic, breaking down banks, disturbing stream substrate, causing turbidity and stream sedimentation. Driving through water column with possible contamination of waters with oils and toxics, bacteria and noxious weeds, washed from vehicle or tires.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Statewide Narrative Criteria Toxics OAR 340-041-0007 Turbidity OAR 340-041-0036
R 70	Use ramped low water fords in debris flow susceptible streams.	Coarse and Fine Sediment: Debris flows piling against road fills, plugging culverts and overtopping and loss of road prism, or dam break flood wave scouring downstream habitat.	Turbidity OAR 340-041-0036
<b>Road Use and Dust Abatement</b>			
R 71	Apply durable rock surfacing to withstand expected loads and traffic volume, and season of use.	Coarse and Fine Sediment: Road rock breaking down to fines, and washing from roads to ditchlines to stream channels.	Turbidity OAR 340-041-0036
R 72	For winter hauling implement structural treatments such as: adjust frequency of cross-drain spacing, install sediment barriers or catch basins, apply gravel lifts or asphalt road surfacing at stream crossing approaches, and clean and armor ditchlines.	Coarse and Fine Sediment: Road ditchlines gaining water volume concentration, transporting soil material to stream channels, or sediment sources near channels that can flow overland during storms by sheetwash or rill erosion, depositing soil material into stream channels.	Turbidity OAR 340-041-0036
R 73	Suspend timber hauling during wet weather when road run-off delivers sediment at higher concentrations than existing conditions in the receiving stream. Hauling could resume when ditch flow subsides, or when conditions allow turbidity standards to be met.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
R 74	Remove snow on haul roads in a manner that will protect roads and adjacent resources. Remove or place snow berms to prevent water concentration on the roadway or on erodible side-slopes or soils.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
R 75	Wash equipment at sites with no potential for runoff into waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 76	Use water or approved surface stabilizers/dust palliatives to reduce surfacing material loss and buildup of fine sediment that may wash off into waterbodies, floodplains, or wetlands.	Coarse and Fine Sediment: Road surfacing becoming detached and blowing or washing from roadways to ditchlines to stream channels.	Turbidity OAR 340-041-0036
<b>Maintenance</b>			
R 77	Avoid routine machine cleaning of ditches during the wet season, generally, November through May.	Coarse and Fine Sediment: Removing vegetation or fill material from ditches in the wet season would increase bare soils susceptible to erosion, with potential delivery to stream channels.	Turbidity OAR 340-041-0036
R 78	Avoid undercutting of cut-slopes when cleaning ditchlines. Seed and mulch bare soils including cleaned ditchlines that are hydrologically connected to stream channels.	Coarse and Fine Sediment: Removing vegetation or fill material from ditches or undercutting backslopes would increase bare soils susceptible to erosion, with potential delivery to stream channels.	Turbidity OAR 340-041-0036
R 79	Remove slide material when it is obstructing road surface and ditchline drainage.	Coarse and Fine Sediment: Slide material, being eroded by ditch streamflow and routing to stream channels, especially during storms.	Turbidity OAR 340-041-0036
R 80	End-haul sloughed or excavated materials to a stable site outside Riparian Management Areas with no potential to reach waterbodies, wetlands and floodplains. Avoid wasting loose ditch or surface material over the shoulder where it can cause stream sedimentation or weaken slump prone areas.	Coarse and Fine Sediment: Wasting soil material on steep slopes, may trigger a debris avalanche that could enter a stream channel, delivering sediment and debris.	Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Turbidity OAR 340-041-0036
R 81	Keep road inlet and outlet ditches, catch basins, and culverts free of obstructions, particularly before and during winter precipitation and spring run-off.	Coarse and Fine Sediment: Plugged culverts by sediment and debris, leading to loss of road fill and movement of road sediment downstream.	Turbidity OAR 340-041-0036
R 82	Repair damaged inlets and downspouts to maintain drainage design capacity.	Coarse and Fine Sediment: Culverts plugged by sediment and debris, leading to loss of road fill and movement of road sediment downstream.	Turbidity OAR 340-041-0036
R 83	Avoid blading and shaping of road surfaces during the wet season, generally November through May).	Coarse and Fine Sediment: Loose aggregate and fines susceptible to erosion, with potential delivery to stream channels.	Turbidity OAR 340-041-0036
R 84	Blade and shape roads to conserve existing aggregate surface material, retain the original crowned or out-sloped self-draining cross section, prevent or remove eroding berms except those designed for slope protection, and other irregularities that retard normal surface runoff.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036
R 85	Eliminate undesirable berms that retard surface runoff.	Coarse and Fine Sediment: Road erosion with potential transport to the channel and floodplain.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 86	Retain low-growing, herbaceous ground cover and brush on cut-and-fill slopes. Where workable, retain ground cover in ditchlines, except where sediment deposition or obstructions require maintenance.	Coarse and Fine Sediment: Increased vegetative cover rapidly diminishes surface erosion potential, and delivery of sediment to stream channels.	Turbidity OAR 340-041-0036
<b>Road Stormproofing</b>			
R 87	<p>Stormproof open or older roads with continued use, but infrequent maintenance. Stormproof new temporary roads, if over-winter.</p> <p>Stormproofing may involve:</p> <ul style="list-style-type: none"> <li>• Relieving inboard ditches more frequently.</li> <li>• Rocking road surfaces.</li> <li>• Seeding, mulching and re-vegetating erosion prone surfaces, where sediment delivery to stream channels may result.</li> <li>• Using erosion control/ vegetative treatments under road decommissioning section.</li> <li>• Applying site-specific measures to alleviate concentration of road drainage causing erosion and sediment delivery to streams. Measures include: <ul style="list-style-type: none"> <li>- Lowering risk of stream diversion potential at stream crossings</li> <li>- Upgrading stream crossing to pass the 100 year flood with allowance for debris and bedload</li> <li>- Removing or lowering unstable fills</li> <li>- Outsloping insloped ditch roads</li> <li>- Road drainage control to stable dissipation areas.</li> </ul> </li> </ul>	Coarse and Fine Sediment: Chronic surface erosion with delivery to waterbodies, floodplains and wetlands. Lower the risk of future large storm-related erosion, failures and sedimentation.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 88	Suspend stormproofing work if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.	Coarse and Fine Sediment: Surface erosion with delivery to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Road Closure and Decommissioning</b>			
R 89	<p>Decommission new roads not included in the permanent road system upon completion of use</p> <p>Decommission older, under used roads that require high maintenance.</p> <p>Road decommissioning may include any combination of the following measures:</p>		
R 90	<p><b>Closure:</b></p> <p>Close roads not needed, but not recommended to be fully decommissioned. When this measure is used by itself, it applies only to roads that do not significantly reroute hillslope drainage, involve stream channels, or present slope stability hazards.</p> <p>Close roads using methods such as gates, guard rails, earth/log barricades, etc. to reduce or eliminate erosion and sedimentation due to traffic on roads.</p>	Coarse and Fine Sediment: Wheel track formation and rilling/gullying with delivery to waterbodies, floodplains and wetlands.	<p>Biocriteria OAR 340-041-0011</p> <p>Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007</p> <p>Turbidity OAR 340-041-0036</p>
R 91	Place woody material or other appropriate barriers to discourage off-highway vehicle use on decommissioned roads, unless specifically designated for this use.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	<p>Biocriteria OAR 340-041-0011</p> <p>Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007</p> <p>Turbidity OAR 340-041-0036</p>
R 92	<p>Restore natural stream crossings and maintenance free drainage:</p> <p>Convert existing drainage structures such as ditches and cross drain culverts to a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars.</p>	Coarse and Fine Sediment: Sediment accumulation or debris plugging cross drains causing road erosion.	<p>Biocriteria OAR 340-041-0011</p> <p>Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007</p> <p>Turbidity OAR 340-041-0036</p>
R 93	Remove stream crossing culverts and entire in-channel fill material during low flow (generally, June 15 to September 15) prior to fall rains.	Coarse and Fine Sediment: Sediment accumulation or debris plugging stream culverts, causing road gully erosion or stream crossing failure. Stream channels readjusting to active channel width, entraining road fill materials.	<p>Biocriteria OAR 340-041-0011</p> <p>Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007</p> <p>Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007</p> <p>Turbidity OAR 340-041-0036</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 94	Place excavated material from removed stream crossings in a stable location where it would not reenter the stream. If necessary, place sediment and erosion controls around all stockpiled material.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 95	Reestablish stream crossings to the natural stream gradient. Excavate sideslopes back to a straight or slightly concave profile, generally less than 50% gradient. Reestablish floodplains at bankfull height.	Coarse and Fine Sediment: Streambed nickpoints traveling upstream, scouring below the armor layer in gravel bed streams causing excessive channel erosion. Surface erosion delivering to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 96	Construct oversized waterbars or cross ditches that will remain functional on each side of stream crossings.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
R 97	<p><b>Erosion control and vegetative treatments:</b></p> <p>Apply erosion control, such as seeding and mulching, to all hydrologically connected road related bare soil surfaces, where erosion could occur, including streambanks and stream-adjacent side slopes following culvert removal.</p> <p>Place sediment trapping materials such as straw bales and jute netting at the toe of stream-adjacent side slopes following culvert removal.</p> <p>Complete seeding and mulching erosion control work by October 15 of each year.</p> <p>When straw mulch or rice straw mulch is used; require certified weed free, if readily available. Mulch shall be applied at no less than 2000 lbs/acre.</p> <p>Vegetative cuttings, shrubs and trees may be considered as needed for erosion control. Planting of shrubs and trees should occur during the winter dormant season.</p>	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 98	<p><b>Decompaction:</b></p> <p>Implement decompaction measures, including ripping or subsoiling to an effective depth; generally to 24-36 inches. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites.</p>	Coarse and Fine Sediment: Water concentration eroding compacted surfaces resulting to sediment delivery to waterbodies, floodplains and wetlands.	<p>Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036</p>
R 99	<p><b>Pull back/Obliteration</b></p> <p>Pull back unstable road fill and either end-haul or recontour to the natural slopes.</p>	Coarse and Fine Sediment: Mass wasting resulting in sediment delivery to waterbodies, floodplains and wetlands.	<p>Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036</p>
R 100	Suspend decommissioning activities if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.	Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.	<p>Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036</p>
Water Source Development and Use			
R 101	Construct water sources during the lowest flows (generally, August through October).	Coarse and Fine Sediment, and Aquatic Habitat: Changing or removing stream habitat and associated stream turbidity.	<p>Biocriteria OAR 340-041-0011 Turbidity OAR 340-041-0036</p>
R 102	Locate road approaches to in-stream water source developments so as to limit disturbance to vegetation and modification of streambanks. Surface these approaches with rock.	Coarse and Fine Sediment, and Toxins: Road surfacing, washing into the stream during storms.	<p>Turbidity OAR 340-041-0036</p>
R 103	Avoid use of road fills for water impoundment dams unless specifically designed for that purpose. Existing road fill impoundments are required to pass 100-year flood events without failure. Upgrade existing impoundments when economical to do so.	Coarse and Fine Sediment, and Toxins: Road fill washout, leading to stream sedimentation	<p>Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Road Building Waste Materials OAR 340-041-0007 Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036</p>
R 104	Direct pass through flow and/or overflow from in-channel and off-channel water developments back into the stream .	Low Flows: Decreasing low flows, potentially causing increased stream water temperatures, and decreased stream oxygen levels.	<p>Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028</p>
R 105	Overflow from water harvesting ponds should be directed to a safe non-eroding dissipation area, and not into a stream channel.	Augmenting Streamflow: Detained water, potentially causing increased stream water temperatures, and decreased stream oxygen levels.	<p>Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 106	Limit the construction of temporary pump chances. When intermittently pumping , use a temporary liner to create and remove these water drafting sites.. Avoid interfering with fish passage or adverse effects on aquatic life.	Low Flows: Decreasing low flows, potentially causing increased stream water temperatures, and decreased stream oxygen levels.	Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028
R 107	Do not place pump intakes on the substrate or edges of the stream channel.	Coarse and Fine Sediment, and Stream Habitat: Changing or removing stream habitat and associated stream turbidity.	Biocriteria OAR 340-041-0011 Turbidity OAR 340-041-0036





## Timber Harvest Activities

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-18. BEST MANAGEMENT PRACTICES FOR TIMBER HARVEST ACTIVITIES**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Cable Yarding</b>			
TH 1	Remove slash introduced into waterbodies that may be floatable e.g. limbs, tops, before the next precipitation and runoff event.	Coarse and Fine Sediment:  Debris jams can form damming the stream and directing streamflow against banks, leading to bank erosion or a dam break flood.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and(13) Turbidity OAR 340-041-0036
TH 2	Design yarding corridors so as to limit canopy loss in riparian management areas and to meet shade targets. Techniques include limiting the number of such corridors, using narrow widths, and using a perpendicular orientation to the stream.	Water Temperature: Yarding corridors in RMA's can result in vegetation canopy loss due to removal for safety and yarding operations. Decreases in canopy can result in losses of effective shade and exposure of stream channel to solar radiation, resulting in heating of the waterbody.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and(13) Temperature OAR 340-041-0028
TH 3	Where workable, require full suspension over flowing streams, non-flowing streams with erodible bed and bank, and jurisdictional wetlands.	Coarse and Fine Sediment: Log yarding through waterbodies can cause direct introduction of sediment into water or channels resulting in accumulation of sediment and turbidity. Displacement of stream and wetland bed and banks exposing soil to erosion resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Turbidity OAR 340-041-0036
TH 4	Limit downhill logging into riparian management areas where yarding trails can converge, and potentially intersect the stream network.	Coarse and Fine Sediment: Downhill logging into RMA's could result in converging skid paths intersecting stream channels, With less than full suspension, which could result in sediment accumulation, delivery and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and(13) Turbidity OAR 340-041-0036
TH 5	Where slopes exceed 60 percent along stream channels, yard with full suspension, or one-end suspension using seasonal restrictions. Yard remaining areas using one-end suspension.	Coarse and Fine Sediment: Slopes greater than 60% present a high risk of soil displacement and transport downslope to RMA's due to gravitational forces. Increased displacement from lack of log suspension can cause excessive displacement, exposure of sediment sources and delivery to waterbodies and wetlands.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and(13) Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
TH 6	Implement erosion control measures such as waterbars, slash placement and seeding in cable yarding corridors where the potential for erosion and delivery to waterbodies, floodplains and wetlands exists.	Coarse and Fine Sediment: Exposure of soils to erosive forces of water with potential delivery to waterbodies and wetlands.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and(13) Turbidity OAR 340-041-0036
<b>Ground-Based Harvesting</b>			
TH 7	Exclude equipment from riparian management area retention areas (60 from the edge of the active stream channel for fishbearing and perennial streams, lakes and ponds, and 35 feet for intermittent streams), except for road crossings, restoration, wildfire, or similar operational reasons.	Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity Temperature: Loss of vegetation canopy due to removal during yarding operations. Decreased shade and exposure of stream channel to solar radiation and increased heating.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Temperature OAR 340-041-002 Turbidity OAR 340-041-0036
TH 8	Exclude ground-based equipment on hydric soils.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 9	Plan use on existing and new skid trails, to be less than 12 percent of the harvest area.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 10	Limit width of skid roads to what is operationally necessary for the equipment.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 11	Ensure one-end suspension of logs; e.g. integral arch on all conventional ground-base yarding equipment.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 12	Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have resistance to compaction and displacement.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
TH 13	As a first priority, use ground-based equipment on existing compacted surfaces.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 14	Limit conventional ground-based equipment to slopes less than 35 percent.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 15	When specialized ground-based mechanized equipment is used on slopes greater than 35%, monitor use, and restrict where water and sediment could channel overland.	Coarse and Fine Sediment: Compaction, displacement, and exposure of soils through equipment operation with potential for increased runoff and delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 16	Designate skid trails where water from trail surface would not be channeled into unstable areas adjacent to waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Compaction of skid trails resulting in additional surface flow to unstable areas. Increases in water to unstable areas can elevate pore pressure and weight of unstable area causing mass wasting and delivery of sediment and turbidity to waterbodies and wetlands.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 17	When hand falling, directionally fall trees towards skid trails. When mechanically harvesting, directionally fall and bunch trees to facilitate skidding.	Coarse and Fine Sediment: Minimize compaction of skid trails resulting in loss of infiltration, surface water flow and erosion of exposed soils. Potential delivery to waterbodies and wetlands resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 18	Apply erosion control practices to skid roads and other disturbed areas with potential for erosion and subsequent sediment delivery to waterbodies, floodplains, or wetlands. These practices could include seeding, mulching, water barring, tillage, and woody debris placement. Use guidelines from the road decommissioning section.	Coarse and Fine Sediment: Exposure of soils to erosive forces of water with potential delivery to waterbodies and wetlands.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 19	Construct waterbars on skid trails using guidelines in Table I-21.	Coarse and Fine Sediment: Exposure of soils to erosive forces of water with potential delivery to waterbodies and wetlands.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
TH 20	Allow logging on snow when snow depth is greater than 18 inches or over frozen ground.	Coarse and Fine Sediment: Displacement, compaction, and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1)&(13) Turbidity OAR 340-041-0036
TH 21	Block skid roads that intersect haul roads at the end of seasonal use.	Coarse and Fine Sediment: Displacement, compaction, and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1)&(13) Turbidity OAR 340-041-0036
TH 22	Where feasible in dry forest types, plan one entry operations, by combining ground-based timber harvesting with pre-commercial thinning, and/or biomass opportunities, or reducing fuel loading.	Coarse and Fine Sediment: Displacement, compaction, and exposure of soils through multiple-entry equipment operations with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007 (1)&(13) Turbidity OAR 340-041-0036
<b>Helicopter</b>			
TH 23	Consider the use of helicopter or aerial logging systems for unavoidable water quality impacts from road construction or ground-based timber yarding, where other BMPs would be more costly or have limited effectiveness.	Coarse and Fine Sediment: Soil exposure due to road construction or yarding operations resulting in soil erosion with potential transport to the waterbody resulting in sedimentation and turbidity. Temperature: Loss of vegetation canopy due to removal during yarding operations. Decreased shade and exposure of stream channel to solar radiation and increased heating.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
<b>Horse</b>			
TH 24	Within riparian management areas, limit horse logging to slopes less than 20 percent.	Coarse and Fine Sediment: Soil on skid trails exposed to water erosion with potential delivery to waterbodies, floodplains, and wetlands resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036
TH 25	Construct waterbars on horse skid trails when there is potential for soil erosion and delivery to waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Soil on skid trails exposed to water erosion with potential delivery to waterbodies, floodplains, and wetlands resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Turbidity OAR 340-041-0036



## Silvicultural Activities

See *Summary of Oregon Water Quality Standards* additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-19. BEST MANAGEMENT PRACTICES FOR PLANTING, PRE-COMMERCIAL THINNING, FERTILIZATION, AND STAND CONVERSION**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Planting</b>			
S 1	Limit the crossing of stream channels with motorized support vehicles (e.g., ATV's) and mechanized equipment to existing road crossings.	Coarse and Fine Sediment: Vehicle and equipment crossing streams can cause breakdown of bed and banks exposing soil to water erosion and resulting turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
<b>Pre-Commercial Thinning</b>			
S 2	Limit the crossing of stream channels with motorized support vehicles (e.g., ATV's) and mechanized equipment to existing road crossings.	Coarse and Fine Sediment: Vehicle and equipment crossing streams can cause breakdown of bed and banks exposing soil to water erosion and resulting turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
S 3	Fell thinned trees away from stream channels when possible.	Coarse and Fine Sediment: Accumulation of slash in channels can redirect flows out of the stream channel, increasing stress on banks and resulting in streambank and floodplain erosion and increases in local turbidity	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
S 4	Scatter treatment debris on disturbed soils and water bar any yarding trails that could erode and deposit sediment in water bodies, floodplains, and wetlands	Coarse and Fine Sediment: Erosion of exposed soil and delivery to waterbodies and wetlands resulting in turbidity increases.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
<b>Fertilization</b>			
S 5	For streams and waterbodies that support domestic use, apply fertilizer further than 100 feet from the edge of the active channel or shoreline.	Nitrate leaching to surface and groundwater affecting domestic water use.	10 mg/L nitrate nitrogen for domestic water supply EPA 440/5-86-001
S 6	Locate storage, transfer, and loading sites outside riparian management areas and separated from hydrological connections: eg road ditches that are linked to stream channels.	Nutrient Enrichment: Spilling of fertilizer with potential delivery of nutrients to waterbodies and wetlands through leaching or direct surface water transport.	0.5 mg/L toxic to rainbow trout Biocriteria OAR 340-041-0011
S 7	When aerially applying fertilizer, avoid drift of fertilizer into waterbodies	Nutrient Enrichment: Application of Nitrate to potentially nitrogen rich riparian areas, leading to leaching and delivery of nitrates through local groundwater to and water bodies.	0.5 mg/L toxic to rainbow trout Biocriteria OAR 340-041-0011



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
S 8	When aerially applying fertilizer, suspend fertilizer application when heavy precipitation is expected at the time of application.	Nutrient Enrichment: Application of Nitrate to potentially nitrogen rich riparian areas, leading to leaching and delivery of nitrates through local groundwater to and water bodies.	0.5 mg/L toxic to rainbow trout Biocriteria OAR 340-041-0011
<b>Stand Conversion Restoration</b>			
S 9	Within riparian management areas, design size, shape and placement of restoration areas, to maintain as much effective shade as possible.	Water Temperature: Decreases in canopy can result in losses of effective shade and exposure of stream channel to solar radiation, resulting in heating of the waterbody.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Temperature OAR 340-041-0028
S 10	Within riparian management areas, limit mechanical ground-based equipment to slopes less than 35% and beyond 35 feet from the edge of the active stream channel.	Coarse and Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Temperature OAR 340-041-0028



## Fire and Fuels Management

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-20. BEST MANAGEMENT PRACTICES FOR FIRE AND FUELS MANAGEMENT**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Underburn, Concentration Burn, and Broadcast Burn</b>			
F 1	Allow low intensity underburns to back into riparian management areas; however no ignition would occur within riparian management areas, unless prescribed for restoration purposes. Keep broadcast burns and concentration burns out of riparian management areas, unless prescribed for restoration purposes, e.g. sudden oak death sanitation. Locate ignition lines above large open meadows associated with stream channels, unless prescribed for restoration.	Coarse and Fine Sediment, and Temperature: Bare soil in RMA is subject to surface erosion and potential sediment delivery to adjacent waterbody. Loss of riparian vegetation due to wildfire could reduce shade and increase water temperature.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
F 2	Avoid underburning in dry forest types, where fuel loads are elevated, by encouraging whole tree yarding.	Coarse and Fine Sediment: Underburning in dry forest types with heavy fuel loading could result in soil exposure and tree mortality resulting in soil erosion with potential transport to the waterbody resulting in sedimentation and turbidity.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007 (1) and (13) Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
F 3	Avoid ignition of large woody material that is touching the high water mark of a waterbody or that may be affected by high flows.	Coarse and Fine Sediment: Large wood provides channel stabilization and energy dissipation, thus reducing channel erosion and subsequent sedimentation.	Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
F 4	Avoid delivery of foam or additives to waterbodies, floodplains, or wetlands. Store and dispose of ignition devices/ materials (e.g., flares, plastic spheres, etc.) outside riparian management areas or a minimum of 100 feet from waterbodies, floodplains, and wetlands. Maintain and refuel equipment (e.g., drip torches, chainsaws, and ) a minimum of 100 feet from waterbodies, floodplains, and wetlands. Portable pumps can be refueled on-site within a spill containment system.	Chemicals: Direct contamination of waterbodies.	Toxic Substances OAR 340-041-0033



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
F 5	<p>Limit firelines inside riparian management areas.            Construct firelines by hand on all slopes greater than 35 percent.            Use erosion control techniques such as tilling, waterbarring, or debris placement on firelines. Construct waterbars on tractor and hand firelines.            Avoid placement of any fireline where water would be directed into waterbodies, floodplains, wetlands, headwalls, or areas of instability.</p>	<p>Coarse and Fine Sediment: Firelines can channel water and sediment into waterbodies.</p>	<p>Antidegradation            OAR 340-041-0004(1)            Biocriteria            OAR 340-041-0011            Statewide Narrative OAR 340-041-0007(1) and (13)            Turbidity            OAR 340-041-0036</p>
<b>Pile and Burn</b>			
F 6	<p>Avoid mechanical piling in areas that could deliver sediment to waterbodies, floodplains, wetlands.</p>	<p>Coarse and Fine Sediment: Ground disturbance reduces infiltration and increases surface runoff with subsequent soil movement. Erosion more likely on steeper slopes.</p>	<p>Antidegradation            OAR 340-041-0004(1)            Biocriteria            OAR 340-041-0011            Statewide Narrative OAR 340-041-0007(1) and (13)            Turbidity            OAR 340-041-0036</p>
<b>Mechanical and Manual Fuel Treatments</b>			
F 7	<p>No mechanical fuel reduction equipment within 60' of streams, unless prescribed for restoration.            Limit mechanical fuel reduction equipment to slopes less than 35 percent. Restrict non-track mechanized equipment to slopes less than 20 percent.</p>	<p>Coarse and Fine Sediment: Ground-based equipment reduces infiltration and increases surface runoff with subsequent soil movement.</p>	<p>Antidegradation            OAR 340-041-0004(1)            Biocriteria            OAR 340-041-0011            Statewide Narrative OAR 340-041-0007(1) and (13)            Turbidity            OAR 340-041-0036</p>
F 8	<p>Use temporary stream crossings if necessary to access the opposite side with any equipment or vehicles (including ATVs). Follow Temporary Stream Crossing practices under Roads section.</p>	<p>Coarse and Fine Sediment: Stream crossings subject to streambank damage and erosion.</p>	<p>Antidegradation            OAR 340-041-0004(1)            Biocriteria            OAR 340-041-0011            Statewide Narrative OAR 340-041-0007(1) and (13)            Turbidity            OAR 340-041-0036</p>
F 9	<p>Place residual slash on disturbed areas.</p>	<p>Coarse and Fine Sediment: Bare soil areas are subject to erosion and subsequent sediment delivery to waterbody.</p>	<p>Antidegradation            OAR 340-041-0004(1)            Biocriteria            OAR 340-041-0011            Statewide Narrative OAR 340-041-0007(1) and (13)            Turbidity            OAR 340-041-0036</p>
F 10	<p>Maintain and refuel equipment (e.g., drip torches, chainsaws, and a minimum of 100 feet from waterbodies, floodplains, and wetlands. Portable pumps can be refueled on-site within a spill containment system.</p>	<p>Petroleum Products: Direct contamination of waterbodies.</p>	<p>Toxic Substances            OAR 340-041-0033</p>





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Wildfire Suppression</b>			
F 11	<p>Limit firelines inside riparian management areas.</p> <p>Where hand constructed firelines are necessary in riparian management areas, angle the approach, where feasible, rather than have it perpendicular to the riparian management area.</p> <p>Limit use of heavy equipment on slopes greater than 35 percent.</p>	<p>Coarse and Fine Sediment: Ground-based equipment reduces infiltration and increases surface runoff with subsequent soil movement. Soil disturbance causes soil erosion and potential for soil movement to waterbody.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
F 12	<p>Prevent cutting of logs or woody material if any portion of that material extends into the stream channel, unless for restoration.</p> <p>Fall snags in the riparian management area towards the stream channel when felling is necessary for safety or fire suppression activities.</p>	<p>Coarse and Fine Sediment: Stream bank or channel erosion, caused by destabilizing banks and affecting water flow against debris, diminishing stream complexity with possible effects on aquatic life.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
F13	<p>Avoid locating incident bases, camps helibases, staging areas, constructed helispots, and other centers for incident activities in riparian management areas or within 200 feet of any waterbody, floodplain, or wetland.</p>	<p>Coarse and Fine Sediment, , Temperature, and Petroleum Products: Riparian disturbance from equipment and people could increase sediment. Removal of riparian vegetation could cause water temperature increases. Accidental spillage of fuel and other chemicals could enter waterways.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) Temperature OAR 340-041-0028 Toxic Substances OAR 340-041-0033 Turbidity OAR 340-041-0036</p>
F 14	<p>Locate and maintain portable sanitation facilities at incident bases, camps (including spike/ remote camps), helibases, staging areas, constructed helispots, and other centers for incident activities in accordance with state and local regulations.</p>	<p>Bacteria: Contamination from human waste.</p>	<p>Bacteria OAR 340-041-0009</p>
F 15	<p>Keep chemical retardant, foam, or additives out of waterbodies, floodplains, or wetlands.</p> <p>Avoid use of chemical retardants within the riparian management area.</p> <p>Apply aerial retardant adjacent to riparian management areas by making parallel passes.</p>	<p>Chemical Retardants: Contamination of waterbodies from chemical retardant.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) Toxic Substances OAR 340-041-0033</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Rehabilitation</b>			
F 16	<p>Implement emergency fire rehabilitation treatments to accomplish erosion control as quickly as possible and before the wet season.</p> <p>Soil and water conservation practices may include:</p> <p>Native or other ecologically appropriate vegetation for short-term cover development and long-term recovery, unless not available in quantities necessary for the emergency response.</p> <p>Mulch with straw, wood chips ,or other suitable material. To avoid contamination when mulching, use certified weed-free straw mulch or rice straw where available.</p> <p>Straw wattles.</p> <p>Log erosion barriers.</p> <p>Spreading slash on bare soils.</p> <p>Placing channel stabilization structures.</p> <p>Placing sediment retention structures in channel.</p> <p>Placing trash racks above road drainage structures.</p> <p>Installing drainage structures, such as water bars or drainage dips, on firelines, fire roads, and other cleared areas according to guidelines in <i>Table 5</i> (Waterbar spacing by gradient and erosion class).</p> <p>Repairing damaged road drainage facilities.</p> <p>Blocking or decommission roads and trails.</p>	<p>Coarse and Fine Sediment:</p> <p>Bare soil areas are subject to erosion and subsequent sediment delivery to streams and waterbodies. Sediment transfer hazard within channels, if sediment appreciably moves off-site to important downstream waters.</p>	<p>Antidegradation OAR 340-041-0004(1)</p> <p>Biocriteria OAR 340-041-0011</p> <p>Statewide Narrative OAR 340-041-0007(1) and (13)</p> <p>Turbidity OAR 340-041-0036</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Post-Fire Road Improvement</b>			
F 17	<p>Implement emergency fire rehabilitation treatments to accomplish erosion control as quickly as possible and before the wet season.</p> <p>Soil and water conservation practices may include:</p> <p>Reduce road system hydrologic conductivity.</p> <p>Increase peak flow capacity of stream crossing culverts to accommodate the 100-year design flood.</p> <p>Prevent culvert plugging.</p> <p>Correct stream diversions.</p> <p>Excavate potential fillslope failures.</p>	<p>Coarse and Fine Sediment: Erosion and runoff from bare soil areas onto roads and increased truck traffic from salvage logging causing sediment delivery to streams and waterbodies. Sediment and debris reducing stream crossing drainage structures capacity, increasing risk for failure with flooding.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Fuel/Retardant Transport</b>			
F 18	<p>If more than 42 gallons of fuel or combined quantity of petroleum product and chemical substances, as project materials, would be transported to a project site, the following precautions would be implemented.</p> <ol style="list-style-type: none"> <li>1. Plan a safe route and transfer sites that could contain the transported volume.</li> <li>2. Plan an active dispatch system that can relay the information to appropriate resources.</li> <li>3. Ensure a spill containment kit that can adsorb and contain 55 gallons of petroleum product and chemical substances is readily available.</li> <li>4. Provide for immediate notification in the event of a spill. Have a radio equipped vehicle lead the chemical or fuel truck to the project site.</li> <li>5. Assemble a spill notification list that includes the district hazardous materials coordinator, DEQ, and spill clean-up contractors.</li> <li>6. Construct a water user contact list with address and phone numbers.</li> <li>7. When operating within Source Water Watersheds, pre-estimate travel times through the watershed to predict downstream arrival times.</li> <li>8. Be prepared to sample water and carry sample containers.</li> </ol>	<p>Petroleum and Chemical Substances: Spillage into waterbodies with chemical contamination of waterbodies.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Toxic Substances OAR 340-041-0033</p>



**TABLE I-21. WATERBAR SPACING BY GRADIENT AND EROSION CLASS**

Gradient	Waterbar Spacing (feet) <sup>1</sup> Per Erosion Class <sup>2</sup>		
	High Class	Moderate Class	Low Class
2 to 5%	200 ft.	300 ft.	400 ft.
6 to 10%	150 ft.	200 ft.	300 ft.
11 to 15%	100 ft.	150 ft.	200 ft.
16 to 20%	75 ft.	100 ft.	150 ft.
21 to 35%	50 ft.	75 ft.	100 ft.
36+%	50 ft.	50 ft.	50 ft.

<sup>1</sup>Spacing is determined by slope distance and is the maximum allowed for the grade.

<sup>2</sup>The erosion classes include the following rock types:

High: granite, sandstone, andesite porphyry, glacial or alluvial deposits, soft matrix conglomerate, volcanic ash, and pyroclastics

Moderate: basalt, andesite, quartzite, hard matrix conglomerate, and rhyolite

Low: metasediments, metavolcanics, and hard shale



## Surface Source Water for Drinking Water

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-22. BEST MANAGEMENT PRACTICES FOR SURFACE SOURCE WATER FOR DRINKING WATER**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
SW 1	Sanitary facilities would be planned, located, designed, constructed, operated, inspected, and maintained to minimize possibilities of water contamination.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13)
SW 2	Locate contractor camps outside Oregon Department of Environmental Quality sensitive zones in surface source water watersheds. If this is not possible, require self-contained sanitary facilities.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13)
SW 3	Require self-contained sanitary facilities in surface source water watersheds, when long-term camping (greater than 14 days) is involved with contract implementation.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13)
SW 4	Provide self-contained sanitary facilities when there is high recreational use (almost continuous occupancy) within Oregon Department of Environmental Quality sensitive zones or along streams above domestic water diversions of record.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13)
SW 5	Locate pack, riding, restoration, and logging stock facilities 200 feet away from watercourses upstream of source drinking diversions.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13)
SW 6	Do not allow surface occupancy within 200 feet of a recorded domestic or public drinking water diversion.	Bacteria: Fecal Coliform enrichment of local groundwater and surface water with delivery to downstream drinking water diversion.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13) Toxic Substances OAR 340-041-0033



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
SW 7	Do not apply sewage sludge as a soil amendment in surface source water watersheds, above Domestic Water diversions of record, or within riparian management areas.	Toxic Pollutants: Leaching and surface water movement can transport toxics and bacteria downstream to water supply diversions. Some domestic supplies have no ability to detect or treat this pollution.	Antidegradation OAR 340-041-0004(1) Bacteria OAR 340-041-0009 Statewide Narrative OAR 340-041-0007(1) and (13) Toxic Substances OAR 340-041-0033
SW 8	Avoid loading, or storing chemical, fuel, or fertilizer in sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, Gas, and Nutrients: Leaks, spills, and improper handling of pesticides, herbicides and petroleum products can leach or be transported by surface water to drinking water diversion points.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Toxic Substances OAR 340-041-0033
SW 9	Conduct equipment maintenance outside site- specific sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leaks, spills, and improper handling petroleum products can leach or be transported by surface water to drinking water diversion points.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Toxic Substances OAR 340-041-0033
SW 10	Use non-oil-based dust suppressants in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leaks, spills, and improper application of oil based dust control products can introduce petroleum products to surface water and to drinking water diversion points.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Toxic Substances OAR 340-041-0033
SW 11	Avoid mineral lease surface occupancy within sensitive zones in surface source water watersheds.	Toxic Pollutants, Oil, and Gas: Leachate from mineral operations or equipment use may contain chemicals and wastes that are transported and delivered to drinking water diversion points.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Toxic Substances OAR 340-041-0033
SW 12	Use fire retardant and surfactants as a last resort in fire suppression activities in surface source water watersheds.	Toxic Pollutants: Direct application of fire retardant and surfactants to waterbodies above drinking water intakes can cause delivery of Nitrate reaching concentrations as high as 33 mg/L, well above the primary water quality standard of 1 mg/L. The main chemical of concern in streams 24 hours after a retardant drop is un-ionized ammonia (NH3) is the principal toxic component to aquatic species.	Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and(13) Toxic Substances OAR 340-041-0033



## Recreation

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-23. BEST MANAGEMENT PRACTICES FOR RECREATION**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>All Recreation Facilities</b>			
REC 1	Implement erosion control measures on all recreation sites to stabilize exposed soils.	Coarse and Fine Sediment: Minimize sediment delivery to wetlands, floodplains, and waterbodies.	Turbidity OAR 340-041-0036
REC 2	Locate new recreational facilities, developed and dispersed sites, outside of the water influence area. Low impact uses, such as hiking trails, picnic sites, or water dependant facilities (e.g., boat ramps or docks), are excluded.	Coarse and Fine Sediment: Minimize sediment delivery resulting from surface erosion.	Bacteria OAR 340-041-0009 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
<b>Developed Recreation Sites</b>			
REC 3	Sealed vault toilets will be used at all developed recreational facilities, unless a sewage system and drainfield is approved by the Department of Environmental Quality.	Bacteria: Bacterial pollution from improperly constructed sanitation facilities could be injurious to the health of humans and aquatic organisms.	Bacteria OAR 340-041-0009
REC 4	Construct and maintain refuse disposal sites to avoid water contamination.	Bacteria: Bacteria could enter surface and groundwater if garbage is not disposed of properly.	Bacteria OAR 340-041-0009
REC 5	When conducting recreation site maintenance, do not cut logs or coarse woody debris if any portion of that material extends in the active stream channel.	Coarse and Fine Sediment: Sediment storage, streambank stability, and reduction of turbidity.	Antidegradation OAR 340-041-004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
<b>Water Dependent Facilities</b>			
REC 6	Construct boat ramps and approaches with hardened surfaces.	Coarse and Fine Sediment: Impacts to streambanks, turbidity	Turbidity OAR 340-041-0036
<b>Off-Highway Vehicle (OHV) Trails</b>			
REC 7	Use existing hardened stream crossings to the extent possible when constructing trails through Riparian Management Areas.	Coarse and Fine Sediment, Bacteria and Pathogens, Oil, and Toxins:  OHVs accessing streams at multiple points, breaking down banks, disturbing stream substrate, causing turbidity and stream sedimentation. Driving through water column with possible contamination of waters with oils and toxics, bacteria and noxious weeds, washed from OHV or tires.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Statewide Narrative Criteria Toxics OAR 340-041-0007 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
REC 8	When constructing or maintaining trails within Riparian Management Areas, do not cut logs or coarse woody debris if any portion of that material extends into the active stream channel.	Coarse and Fine Sediment:  Stream bank or channel erosion, caused by destabilizing banks and affecting water flow against debris, diminishing stream complexity with possible effects on aquatic life.	Antidegradation OAR 340-041-004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
REC 9	Avoid vehicle and off-highway vehicle use in streams, ponds, wetlands, and other waters.	Coarse and Fine Sediment, and Toxic Pollutants: Direct delivery of sediment and/or petroleum based fluids from vehicles is unnecessary degradation of waters of the State.	Toxic substances OAR 430-041-0033 Turbidity OAR 340-041-0036
REC 10	Stream crossings would be designed to accommodate active channel width, bed load, and fish passage without exceeding capacity or diversion for the 100-year flood event.	Coarse and Fine Sediment: Floodwaters exceeding crossing capacity, causing overtopping of fills, with ensuing headcutting and loss of trail fill.	Statewide Narrative Criteria Sediment, Adverse Deposits OAR 340-041-0007 Turbidity OAR 340-041-0036
REC 11	Suspend construction or maintenance of trails, where erosion and runoff into waterbodies would occur.	Coarse and Fine Sediment: Sediment from trail related run-off causing stream turbidity.	Turbidity OAR 340-041-0036
REC 12	Locate staging areas outside riparian management areas. Design or upgrade staging areas to prevent sediment/pollutant delivery to wetlands, floodplains, and waterbodies (e.g., rocking or hardening)	Coarse and Fine Sediment, and Toxic Pollutants: Sediment or petroleum products reaching streams with effects on aquatic life.	Biocriteria OAR 340-041-0011 Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Statewide Narrative Criteria Toxics OAR 340-041-0007 Turbidity OAR 340-041-0036
REC 13	Harden trail approaches to stream crossings using materials such as geotextile fabric and crushed rock aggregate.	Coarse and Fine Sediment: Sediment reaching waterbodies from trail run-off.	Turbidity OAR 340-041-0036
REC 14	Drain dips will be installed on approaches to stream crossings and reinforced with rock for longevity..	Coarse and Fine Sediment: Sediment from trail related run-off, run-off from trail surfaces with delivery to waterbodies, floodplains, and wetlands resulting in turbidity and sedimentation.	Turbidity OAR 340-041-0036
REC 15	Do not use chemically treated wood that would cause water quality degradation in construction of bridges over streams, where materials are in contact with the stream or may leach into the soil or water.	Toxic Pollutants: Leaching of harmful chemicals from treated wood into waterbodies, floodplains and wetlands.	Toxic substances OAR 430-041-0033
REC 16	During construction, perennial stream crossings may require a temporary flow diversion structure through the work area. (See Roads Section for Stream Crossing BMPs.)	Coarse and Fine Sediment: Exposed soils may be vulnerable to erosion and sediment deposition into streams.	Turbidity OAR 340-041-0036





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
REC 17	Prevent vehicle access to nearby wetlands by using suitable barriers.	Coarse and Fine Sediment: Defining trail route may prevent development of new trails into fragile areas susceptible to compaction and sediment transport to water resources.	Turbidity OAR 340-041-0036
REC 18	Where trails intersect road ditches, provide hardened crossings. Divert water from the trail to keep from reaching wetlands, floodplains, and waterbodies.	Coarse and Fine Sediment Exposed soils may be vulnerable to erosion, resulting in deposition to road ditches that could flow into nearby streams.	Turbidity OAR 340-041-0036
REC 19	If trail width is too wide for the designated use (such as old roads converted to trails) consider tilling one side of the trail, covering with brush, and seeding or planting.	Coarse and Fine Sediment: Wider trails are more prone to erosion and sediment delivery to waterbodies.	Turbidity OAR 340-041-0036
REC 20	Repair rills and gullies using appropriately sized equipment or by hand.	Coarse and Fine Sediment: Unless tread erosion is maintained regularly, erosion escalates and can route sediment to waterbodies	Turbidity OAR 340-041-0036
REC 21	Waterbars, drain dips, and lead off ditches will be constructed or repaired as needed. These features may need rock reinforcement to promote longevity. Drain dips or lead-off features are the preferred design.	Coarse and Fine Sediment: Drainage features can erode and gully and route run-off into streams resulting in sediment delivery to waterbodies, floodplains and wetlands.	Turbidity OAR 340-041-0036
REC 22	Drain dips or lead off ditches will be constructed on steeper gradient trails and approaches to stream crossings.	Coarse and Fine Sediment:  Water volume concentration can occur, where there are insufficient drain dips or lead off ditches, with erosion and gullying, resulting in sediment delivery to waterbodies, floodplains and wetlands.	Turbidity OAR 340-041-0036
<b>Trails (Hiking)</b>			
REC 23	When constructing or maintaining trails within riparian management areas, do not cut logs or coarse woody debris if any portion of that material extends into the active stream channel. Use alternative passage options, such as earthen ramps, small notch steps, or slight trail realignments, to facilitate maintenance of intact logs.	Coarse and Fine Sediment: Stream bank or channel erosion, caused by destabilizing banks and affecting water flow against debris, diminishing stream complexity with possible effects on aquatic life.	Antidegradation OAR 340-041-004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036
<b>Trail Closure</b>			
REC 24	Remove existing stream crossings or bridges. (See Road Decommissioning. BMPs.)	Coarse and Fine Sediment: Unmaintained crossings can plug, with debris, fail and deliver sediment to streams.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
REC 25	Position fill or waste material in a location that would avoid direct or indirect sediment discharges to streams or wetlands.	Coarse and Fine Sediment: Waste material is vulnerable to erosion until vegetation is established, or erosion control measures are taken, resulting in sediment delivery to waterbodies, floodplains and wetlands.	Turbidity OAR 340-041-0036
REC 26	Restored stream banks would be planted with native vegetation, mulched, and planted with water tolerant species where appropriate.	Coarse and Fine Sediment: Exposed soils are vulnerable to erosion in storm events and/or periods of high stream flows, resulting in sediment delivery to waterbodies, floodplains and wetlands.	Turbidity OAR 340-041-0036
REC 27	Barricade and brush in closed trails with nearby vegetation.	Coarse and Fine Sediment: Unrestricted access to unmaintained or abandoned trails can result in rill and gully erosion and sediment delivery to waterbodies, floodplains, and wetlands.	Turbidity OAR 340-041-0036
<b>Dispersed Recreation</b>			
REC 28	Site camps for permitted group overnight camping would be greater than 100 feet from surface water.	Coarse and Fine Sediment: Soil disturbance close to streams can result in sedimentation. Lack of developed and maintained sanitation facilities poses a risk of fecal coliform contamination to waterbodies by direct contact or leaching.	Bacteria OAR 340-041-0009 Turbidity OAR 340-041-0036



## Grazing

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-24. BEST MANAGEMENT PRACTICES FOR GRAZING**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
G 1	Fence water developments, including springs and seeps, unless other methods are available. Pipe overflow away from the developed source area.	Coarse and Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities.	Antidegradation OAR 340-041-0004 Bacteria OAR 340-041-0009 Biocriteria OAR 340-041-0011 Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
G 2	Do not locate salting areas within ¼ mile of permanent water sources or riparian management areas.	Coarse and Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	Antidegradation OAR 340-041-0004 Bacteria OAR 340-041-0009 Biocriteria OAR 340-041-0011 Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
G 3	Locate new livestock handling or management facilities (corrals, pens, or holding pastures) outside riparian management areas or 200 feet from waterbodies and on level ground where drainage would not enter surface waters. If existing livestock handling facilities inside riparian management areas do not meet water quality through use of BMPs, relocate or remove such facilities away from riparian management areas.	Coarse and Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities	Antidegradation OAR 340-041-0004 Bacteria OAR 340-041-0009 Biocriteria OAR 340-041-0011 Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
G 4	<p>Apply specific grazing strategies for riparian wetland areas, including timing, intensity, or exclusion for maintenance of proper functioning condition. Use one or more of the following features:</p> <p>Inclusion of the waterbodies, floodplains, and wetlands within a separate pasture.</p> <p>Fence or herd livestock out of waterbodies, floodplains, and wetlands for as long as necessary to allow vegetation to recover.</p> <p>Control the timing and intensity of grazing to keep livestock off streambanks when they are most vulnerable to damage and to coincide with the physiological needs of target plant species.</p> <p>Add more rest to the grazing cycle to increase plant vigor, allow streambanks to revegetate, or encourage more desirable plant species composition.</p> <p>Limit grazing intensity to a level that will maintain desired species composition and vigor.</p> <p>Permanently exclude livestock from those waterbodies, floodplains, and wetlands areas that are at high risk and have poor recovery potential, and when there is no practical way to protect them while grazing adjacent uplands.</p>	<p>Coarse and Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities</p>	<p>Antidegradation OAR 340-041-0004 Bacteria OAR 340-041-0009 Biocriteria OAR 340-041-0011 Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036</p>
G 5	<p>Recover degraded waterbodies through adjustments to forage utilization levels, improved livestock distribution, and management through fencing, vegetation treatments, water source developments, or changes in season of use or livestock numbers.</p>	<p>Coarse and Fine Sediment, Bacteria, Dissolved Oxygen, Temperature, and Biocriteria: Concentrated livestock use near/ within spring, seep areas resulting in overgrazing and subsequent loss of riparian vegetation, soil erosion, loss of shade and increases in summer stream water temperature, reduction in summer dissolved oxygen, delivery of bacteria and nutrients, with potential effects upon aquatic communities</p>	<p>Antidegradation OAR 340-041-0004 Bacteria OAR 340-041-0009 Biocriteria OAR 340-041-0011 Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036</p>



## Minerals Exploration and Development

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

TABLE I-25. BEST MANAGEMENT PRACTICES FOR MINERALS EXPLORATION AND DEVELOPMENT

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>All Minerals</b>			
M 1	Locate, design, operate, and maintain settling ponds to contain sediment discharges.	Coarse and Fine Sediment: Sediment could be transported to nearby streams from improperly designed or overflowing settling ponds.	Turbidity OAR 340-041-0036
M 2	Where practical, use existing roads, skid trails, and stream crossings.	Coarse and Fine Sediment: New soil disturbance near streams and waterbodies may increase sediment delivery.	Turbidity OAR 340-041-0036
M 3	Storm proof all natural surface roads and trails when an operation halts for the wet season. See Roads and Landings section for guidelines.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to waterbodies, floodplains, and wetlands.	Turbidity OAR 340-041-0036
M 4	Locate and maintain sanitation facilities where overflow or discharges would not enter surface water. Where possible, locate these facilities outside of riparian management areas.	Bacteria: Bacterial pollution into waterbodies from improperly constructed sanitation facilities could be injurious to the health of humans and aquatic organisms.	Bacteria OAR 340-041-0009
M 5	If possible, locate structures and support facilities, at least 200 feet from water bodies, floodplains, and wetlands.	Coarse and Fine Sediment, and Temperature: Developed sites can channel water and sediment into nearby waterbodies. Loss of riparian vegetation due to development could reduce shade and increase water temperature.	Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
M 6	Design, locate, and construct stream crossings in conformance with practices described in Roads and Landings section.	Coarse and Fine Sediment: Earthwork near streams can expose erodible soils and result in sedimentation to streams.	Turbidity OAR 340-041-0036
M 7	If roads are used during wet seasons with potential for sediment delivery to stream channels, rock aggregate would be used to surface those roads, or other measures will be taken to prevent undue and unnecessary degradation	Coarse and Fine Sediment: Use of native surfaced roads during wet weather could result in unnecessary and undue degradation of water quality in nearby streams.	Turbidity OAR 340-041-0036
M 8	Prior to fall rains, reclaim all roads and trails constructed for exploratory purposes that are unnecessary for the mineral access.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to waterbodies, floodplains, and wetlands.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
M 9	If possible, retain an undisturbed riparian buffer strip between mineral operations and water bodies, floodplains, and wetlands.	Coarse and Fine Sediment, and Temperature: Lack of a vegetative filter strip can destabilize streambanks and increase sediment delivery; lesser stream shade can elevate temperatures of streams and wetlands.	Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
M 10	Stockpile available topsoil for use during reclamation of the site. Stockpiled topsoil would be stabilized to prevent erosion and contamination of other resources in the area.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
M 11	On access roads to mineral sites where no future entry is planned, reclaim these access roads. This may include tilling, water barring, blocking, re-contouring, fertilization, planting, mulching, and seeding.	Coarse and Fine Sediment: Soil erosion of exposed surfaces with potential transport to the channel, floodplain, or wetlands.	Turbidity OAR 340-041-0036
M 12	Reclaim depleted or closed mineral sites by stabilizing and contouring the mining area. Replace topsoil and mulch, seed, and plant.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
<b>Locatable Minerals</b>			
M 13	Comply with seasonal restrictions on suction dredging identified in Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources when discharging to Oregon's surface waters.	Coarse and Fine Sediment: Suction dredging can deposit fine sediment in gravelsand is deleterious to fish and aquatic life.	Biocriteria OAR 340-041-0011 Turbidity OAR 340-041-0036
M 14	Plans of Operations and Notices, should contain waste products and prevent leaching contaminants from entering surface and ground water.	Toxic Substances: Mine generated waste and runoff can negatively impact surface or groundwater quality and impair aquatic habitat.	Biocriteria OAR 340-041-0011 Toxic substances OAR 430-041-0033
M 15	Reclaim mine waste after operations to ensure chemical and physical stability according to the BLM approved reclamation plan for the Plan of Operations or Notice requirements.	Toxic Substances: Mine generated waste and runoff can negatively impact surface or groundwater quality and impair aquatic habitat.	Toxic substances OAR 430-041-0033 Turbidity OAR 340-041-0036
M 16	Stabilize exposed soils by seeding, mulching, and planting with tree or brush species and provide for non- erosive drainage from disturbed areas that were constructed or renovated for mining activities.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
M 17	When operating during the wet season, stabilize disturbed areas that will not be mined or used for at least 30 days, if needed to prevent undue and unnecessary degradation.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
<b>Salable Minerals</b>			
M 18	Locate stockpile sites on stable ground where the material would not move into waterbodies, floodplains, and wetlands.	Coarse and Fine Sediment: Placement of soil and rock stockpiles on unstable landforms can result in landslides with drainage of sediment-laden water to streams.	Turbidity OAR 340-041-0036
M 19	Locate, design, and construct salable mineral sites to minimize sedimentation to streams. Close roads, excavations and crusher pads in accordance with Roads and Landings section when the salable mineral site is depleted.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
M 20	Avoid development of new quarries within Riparian Management Areas, unless water quality can be maintained. Expansion of existing quarries would be designed and implemented to maintain water quality.	Coarse and Fine Sediment, and Temperature: Developed sites can channel water and sediment into nearby waterbodies. Loss of riparian vegetation due to development could reduce shade and increase water temperature. Sedimentation in streams from road related runoff can impair aquatic habitat.	Biocriteria OAR 340-041-0011 Temperature OAR 340-041-0028 Turbidity OAR 340-041-0036
M 21	Use culverts and rip-rap for crusher pad drainage when necessary.	Coarse and Fine Sediment: Soil erosion of exposed surfaces with potential transport to the channel, floodplain, or wetlands.	Turbidity OAR 340-041-0036
M 22	Use erosion-reduction practices, such as seeding, mulching, silt fences, and woody debris placement, to limit erosion and transport of sediment to streams from quarries. Provide drainage from stockpiles and mineral sites that is dispersed over stable vegetated areas rather than directly into stream channels.	Coarse and Fine Sediment: Soil erosion of exposed surfaces with potential transport to the channel, floodplain, or wetlands.	Turbidity OAR 340-041-0036
<b>Leasable Minerals</b>			
M 23	Stabilize roads, drill sites, and excavation areas to a free draining and noneroding condition from disturbed areas that are constructed or renovated for leasable mineral activities (e.g., roads, drill sites, and excavation areas).	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
M 24	When operating during the wet season, stabilize disturbed areas that will remain inactive for at least 30 days.	Coarse and Fine Sediment: Bare soil is subject to surface erosion and potential sediment delivery to adjacent waterbodies.	Turbidity OAR 340-041-0036
M 25	Line all mud pits that contain drilling fluid to prevent leaking.	Coarse and Fine Sediment: Drilling fluid can leak from unlined pits to surface and groundwater resources.	Toxic substances OAR 430-041-0033 Turbidity OAR 340-041-0036
M 26	Limit drill site construction and access through riparian management areas to established roadways unless the operator submits a plan that demonstrates that impacts to water quality from the proposed action can be adequately mitigated.	Coarse and Fine Sediment: Vegetative removal in near stream areas of riparian management areas can decrease shade increasing stream temperatures, and increase sediment delivery by overland flow and disturbance to streambanks. Drilling and equipment fluids can negatively impact surface or groundwater quality and impair aquatic habitat.	Temperature OAR 340-041-0028 Toxic substances OAR 430-041-0033 Turbidity OAR 340-041-0036





# Spill Prevention and Abatement

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-26. BEST MANAGEMENT PRACTICES FOR SPILL PREVENTION AND ABATEMENT**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Heavy Equipment Use</b>			
<p>SP 1</p>	<p>Inspect and clean heavy equipment as necessary prior to moving on to the project site, in order to remove oil and grease, noxious weeds, and excessive soil.</p> <p>Inspect hydraulic fluid and fuel lines on heavy-mechanized equipment for proper working condition.</p> <p>Where possible, maintain and refuel equipment a minimum of 100 feet away from streams and other waterbodies.</p> <p>In the event of a spill or release, all reasonable and safe actions to contain the material will be taken. Specific actions are dependent on the nature of the material spilled.</p> <p>Use spill containment booms or as required by DEQ. Have access to booms and other absorbent containment materials.</p> <p>Immediately remove waste or spilled hazardous materials (including but not limited to diesel, oil, hydraulic fluid) and contaminated soils near any stream or other waterbody, and dispose of it/them in accordance with the applicable regulatory standard. Notify Oregon Emergency Response System of any spill over the material reportable quantity, and any spill not totally cleaned up after 24 hours.</p> <p>Store equipment containing reportable quantities of toxic fluids outside of riparian management areas.</p>	<p>Toxic Substances: Contamination of waterbodies from equipment leakage.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Toxic Substances OAR 340-041-0033</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Fuel and Chemical Transport</b>			
SP 2	<p>If more than 42 gallons of fuel or combined quantity of petroleum product and chemical substances, as project materials, would be transported to a project site, the following precautions will be implemented.</p> <ol style="list-style-type: none"> <li>1. Plan a safe route and material transfer sites so that all spilled material will be contained easily at that designated location.</li> <li>2. Plan an active dispatch system that can relay the information to appropriate resources.</li> <li>3. Ensure a spill containment kit that can adsorb and contain 55 gallons of petroleum product and chemical substances is readily available.</li> <li>4. Provide for immediate notification to OERS in the event of a spill. Have a radio-equipped vehicle lead the chemical or fuel truck to the project site.</li> <li>5. Assemble a spill notification list that includes the district hazardous materials coordinator, DEQ, and spill clean-up contractors.</li> <li>6. Construct a downstream water user contact list with addresses and phone numbers.</li> <li>7. When operating within Source Water watersheds, pre-estimate water flow travel times through the watershed to predict downstream arrival times.</li> <li>8. Be prepared to sample water and carry sample containers.</li> </ol> <p>Be prepared to assist OSP and ODFW assess wildlife impacts of any material spilled.</p>	<p>Toxic Substances: Chemical contamination of waterbodies.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Toxic Substances OAR 340-041-0033</p>
<b>Spill Abatement</b>			
SP 3	<p>Spill Prevention, Control, and Countermeasure Plan (SPCC): All operators shall develop a modified SPCC plan prior to initiating project work if there is a potential risk of chemical or petroleum spills near water bodies. The SPCC plan will include the appropriate containers to be used and design of the material transfer locations. No interim fuel depot or storage location other than a manned transport vehicle.</p>	<p>Toxic Substances: Chemical or petroleum product routing to water bodies.</p>	<p>[40 CFR 112]  42 U.S. Gallons for reportable quantities not involving waterways, a visible sheen where waterways are involved</p>



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
SP 4	Spill Containment Kit (SCK): All operators shall have a SCK as described in the SPCC plan on-site during any operation with potential for run-off to adjacent water bodies. The SCK will be appropriate in size and type for the oil or hazardous material carried by the operator.	Toxic Substances: Chemical or petroleum product routing to water bodies.	OAR-340-142-[0030]
SP 5	Operators shall be responsible for the clean-up, removal, and proper disposal of contaminated materials from the site.	Toxic Substances: Chemical or petroleum product routing to water bodies.	OAR-340-102-[inclusive] OAR-340-122-[inclusive]



# Restoration

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

**TABLE I-27. BEST MANAGEMENT PRACTICES FOR RESTORATION**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
RST 1	Confine work in the stream channels to the low flow period unless a waiver is obtained from the permitting agencies.	Coarse and Fine Sediment: Concentrated turbidity and sedimentation potential due to channel disturbance during low flow conditions.	Accumulation of bottom deposits OAR-340-041-0007 Turbidity OAR-340-041-0036
RST 2	In stream channels that are sensitive to disturbance (e.g., meadow streams), do not drive heavy equipment in flowing channels and floodplains.	Coarse and Fine Sediment: Disturbance of stream channel and streambanks resulting in erosion, sedimentation, turbidity, and loss of channel stability.	Accumulation of bottom deposits OAR-340-041-0007 Turbidity OAR-340-041-0036
RST 3	In well armored channels that are resistant to damage (e.g., bedrock, small boulder, or cobble dominated), consider conducting the majority of heavy-equipment work from within the channel, during low streamflow, to minimize damage to sensitive riparian areas.	Coarse and Fine Sediment, and Temperature: Disturbance of floodplain and streambanks resulting in erosion, sedimentation, turbidity, and loss of stream shade, resulting in a potential increase of stream temperature.	Turbidity OAR-340-041-0036 Water Temperature OAR-340-041-0028
RST 4	Design access routes for individual work sites to reduce exposure of bare soil and extensive streambank shaping.	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR-340-041-0036
RST 5	Limit the number and length of equipment access points through riparian management areas.	Coarse and Fine Sediment, and Temperature: Disturbance of floodplain and streambanks resulting in erosion, sedimentation, turbidity, and loss of stream shade, resulting in a potential increase of stream temperature.	Turbidity OAR-340-041-0036 Water Temperature OAR-340-041-0028
RST 6	Limit the amount of streambank excavation to the minimum necessary to ensure stability of enhancement structures. Provide isolation from flowing water during excavation. Place excavated material above the flood prone area and cover or place a berm to avoid its reentry into the stream during high flow events.	Coarse and Fine Sediment: Sedimentation during high flow events resulting in erosion, sedimentation and turbidity.	Accumulation of bottom deposits OAR-340-041-0007 Turbidity OAR-340-041-0036
RST 7	Inspect all mechanized equipment daily for leaks and clean as necessary to help ensure that toxic materials, such as fuel and hydraulic fluid, do not enter the stream.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody, resulting in effects on aquatic life	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Biocriteria OAR 340-041-0011



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
RST 8	Equipment will not be stored in stream channels when not in use.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody resulting in effects on aquatic life	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Biocriteria OAR 340-041-0011
RST 9	When using heavy equipment in or adjacent to stream channels during restoration activities, develop and implement an approved spill containment plan that includes having a spill containment kit on-site and at previously identified containment locations.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody resulting in effects on aquatic life	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Biocriteria OAR 340-041-0011
RST 10	Refuel equipment, including chainsaws and other hand power tools, at least 100 feet from water bodies (or as far as possible from the water body where local site conditions do not allow a 150-foot setback) to prevent direct delivery of contaminants into a water body.	Oil, Gas, and Chemical Fluids: Direct entry of oil and gas into waterbody resulting in effects on aquatic life	Statewide Narrative Criteria Oil and Floating Solids OAR 340-041-0007 Biocriteria OAR 340-041-0011
RST 11	Use waterbars, barricades, seeding, and mulching to stabilize bare soil areas along project access routes prior to the wet season.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of disturbed soils.	Turbidity OAR-340-041-0036
RST 12	Rehabilitate and stabilize disturbed areas where soil will support seed growth by seeding and planting with native seed mixes or plants, or using erosion control matting.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of disturbed soils.	Turbidity OAR-340-041-0036
RST 13	When replacing culverts, install grade control structures (e.g., boulder vortex weirs or boulder step weirs) where excessive scour would occur.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of upstream sand/gravel/cobble deposits.	Accumulation of bottom deposits OAR-340-041-0007 Turbidity OAR-340-041-0036
RST 14	Rehabilitate headcuts and gullies.	Coarse and Fine Sediment: Excessive turbidity and sedimentation to downstream areas due to erosion of upstream sand/gravel/cobble deposits.	Accumulation of bottom deposits OAR-340-041-0007 Turbidity OAR-340-041-0036
RST 15	Install turbidity control structures (e.g., isolation, diversion, or silt curtains) immediately downstream of in-stream restoration work areas. Remove these structures following completion of turbidity generating activities.	Coarse and Fine Sediment: Excessive turbidity to downstream areas generated during instream structure placement.	Turbidity OAR-340-041-0036



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
RST 16	<p>Klamath Falls:            During restoration projects involving juniper control or prescribed burns, design projects so that adequate soil cover remains (either by leaving cut trees in place for many years or by lopping and scattering branches); and adequate herbaceous seed source or seed bed is available (either naturally or through seeding), and ensure that subsequent management of the site addresses other limiting factors caused by management (e.g., livestock use or recreation).</p>	<p>Coarse and Fine Sediment:            Soil erosion with potential transport to the channel and floodplain.</p>	<p>Turbidity            OAR-340-041-0036</p>



## Medford District-Specific BMPs

See *Summary of Oregon Water Quality Standards* for additional details about the standards and regulations that are associated with the best management practices.

Soils of concern highlighted in the Medford-specific BMPs have a high potential for surface erosion and landslides. They include granitic, schist, and pyroclastic soils. These soils are scattered throughout the Medford District; however, the largest concentration of soils formed from decomposed schist and/or granite parent material occurs in Evans, Snow, Sugar, and Meadow Creeks, upper portions of Williams Creek, and headwaters of Birdseye Creek. Soils formed in highly weathered pyroclastic parent materials are predominantly in the foothills of the Cascades.

**TABLE I-28. SOIL CATEGORIES OF CONCERN FOR THE MEDFORD DISTRICT**

Category	Description Of Soil Categories
Mass Movement	These sites consist of deep seated, slump, or earth flow types of landslides with undulating topography and slope gradients generally less than 60 percent. Soils are derived from volcanic tuffs or breccias.
Surface Erosion	These sites have soil surface horizons that are highly erodible. Soils are derived from granite or schist bedrock.

**TABLE I-29. ADDITIONAL MEDFORD BEST MANAGEMENT PRACTICES**

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Timber Harvest: Cable Yarding</b>			
MFO 1	<p>Use full suspension whenever possible on soils identified in the surface erosion category. Use partial suspension on these soils if full suspension is not possible.</p> <p>Restrict yarding to the dry season on soils identified in the mass movement category and on soils in the surface erosion category if full suspension is not possible.</p>	<p>Fine Sediment: Yarding corridors on soils of concern can result in soil exposure with potential for transport and delivery of sediment to waterbodies. Yarding corridors can channel water and sediment into waterbodies.</p>	<p>Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Timber Harvest: Ground-Based Yarding</b>			
MFO 2	<p>Prohibit ground-based yarding equipment on soils identified in the surface erosion and mass movement categories.</p> <p>Exclude tilling on soils identified in the surface erosion and mass movement categories.</p>	<p>Fine Sediment: Displacement and exposure of soils through equipment operation with potential delivery of sediment to waterbodies resulting in sedimentation and turbidity.</p>	<p>Antidegradation OAR 340-041-0004(1) Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Fire and Fuels Management: Pile and Burn</b>			



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
MFO 3	<p>Prohibit mechanical piling on soils identified in the surface erosion and mass movement categories.</p> <p>Burn handpiles on soils identified in the surface erosion categories only if they interfere with silvicultural operations.</p>	<p>Fine sediment: Ground disturbance reduces infiltration and increases surface runoff with subsequent soil movement. Bare soil is subject to surface erosion.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Fire Fuels Management: Mechanical and Manual Fuel Treatments</b>			
MFO 4	<p>Prohibit ground-based equipment on soils identified in the surface erosion and mass movement categories.</p>	<p>Coarse and Fine Sediment: Ground-based equipment reduces infiltration and increases surface runoff with subsequent soil movement.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Wildfire: Suppression</b>			
MFO 5	<p>Limit the use of tractors and other major surface-disturbing activities on all soils identified in the surface erosion and mass movement categories.</p>	<p>Fine Sediment: Soils of concern are highly susceptible to surface erosion when disturbed.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>
<b>Rights-of-Way</b>			
MFO 6	<p>Avoid facility construction on soils identified in the surface erosion and mass movement categories unless water quality can be maintained.</p> <p>Locate rights-of-ways to minimize surface disturbance on soils identified in the surface erosion and mass movement categories.</p>	<p>Fine Sediment: Soils of concern are highly susceptible to surface erosion when disturbed.</p>	<p>Antidegradation OAR 340-041-0004(1) Biocriteria OAR 340-041-0011 Statewide Narrative OAR 340-041-0007(1) and (13) Turbidity OAR 340-041-0036</p>





## Summary of Oregon Water Quality Standards

This section summarizes the Oregon standards and regulations for water quality that are associated with the best management practices.

### Statewide Narrative Criteria

The following are the Oregon administrative rules (OARs) for the statewide narrative criteria for water quality by name, number, and descriptive excerpt.

#### **Antidegradation (OAR 340-041-0004)**

“The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary further degradation from new or increased point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to ensure the full protection of all existing beneficial uses.”

**Note:** The antidegradation policy applies to all 303(d) listed waterbodies when a project could further degrade the water quality.

#### **Statewide Narrative Criteria Biological Criteria (OAR 340-041-0007)**

“(11) The development of fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or that are injurious to health, recreation, or industry may not be allowed.”

#### **Statewide Narrative Criteria Oil and Floating Solids (OAR 340-041-0007)**

“(14) Objectionable discoloration, scum, oily sheens, or floating solids, or coating of aquatic life with oil films may not be allowed.”

#### **Statewide Narrative Criteria Road Building Waste Materials (OAR 340-041-0007)**

“(9) Road building and maintenance activities must be conducted in a manner so as to keep waste materials out of public waters and minimize erosion of cut banks, fills, and road surfaces.”

#### **Statewide Narrative Criteria Sediment, Adverse Deposits(OAR 340- 041-0007)**

“(13) The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry may not be allowed.”

#### **Statewide Narrative Criteria Summary (OAR 340-041-0007)**

“(1) Notwithstanding the water quality standards contained in this Division, the highest and best practicable treatment and/or control of wastes, activities, and flows must in every case be provided so as to maintain dissolved oxygen and overall water quality at the highest possible levels and water temperatures, coliform bacteria concentrations, dissolved chemical substances, toxic materials, radioactivity, turbidities, color, odor, and other deleterious factors at the lowest possible levels.”



## Statewide Narrative Criteria Toxics (OAR 340-041-0007)

“(12) The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish may not be allowed.”

## Statewide Numeric Criteria

The following are the Oregon administrative rules (OARs) for the statewide numeric criteria for water quality by name, number, and descriptive excerpt.

### Bacteria (OAR 340-041-0009)

“(1) Numeric Criteria: Organisms of the coliform group commonly associated with fecal sources (MPN or equivalent membrane filtration using a representative number of samples) may not exceed the criteria described in paragraphs (a) and (b) of this paragraph: (a) Freshwaters and Estuarine Waters Other than Shellfish Growing Waters:

- (A) A 30-day log mean of 126 *E. coli* organisms per 100 milliliters, based on a minimum of five (5) samples;
- (B) No single sample may exceed 406 *E. coli* organisms per 100 milliliters.”

### Biocriteria (OAR 340-041-0011)

“Waters of the State must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.”

### Dissolved Oxygen (OAR 340-041-0016)

“Dissolved oxygen (DO): No wastes may be discharged and no activities must be conducted that either alone or in combination with other wastes or activities will cause violation of the following standards: The changes adopted by the Commission on January 11, 1996, become effective July 1, 1996. Until that time, the requirements of this rule that were in effect on January 10, 1996, apply:

- (1) For waterbodies identified as active spawning areas in the places and times indicated on the following tables and figures set out in OAR 340-041-0101 to 340-041-0340: Tables 101B, 121B, 180B, 201B and 260B, and Figures 130B, 151B, 160B, 170B, 220B, 230B, 271B, 286B, 300B, 310B, 320B, and 340B, (as well as any active spawning area used by resident trout species), the Rules of this Division as last modified by the EQC 05/20/2004 following criteria apply during the applicable spawning through fry emergence periods set forth in the tables and figures:
  - (a) The dissolved oxygen may not be less than 11.0 mg/l. However, if the minimum intergravel dissolved oxygen, measured as a spatial median, is 8.0 mg/l or greater, then the DO criterion is 9.0 mg/l;
  - (b) Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 11.0 mg/l or 9.0 mg/l criteria, dissolved oxygen levels must not be less than 95 percent of saturation;
  - (c) The spatial median intergravel dissolved oxygen concentration must not fall below 8.0 mg/l.
- (2) For waterbodies identified by the Department as providing cold-water aquatic life, the dissolved oxygen may not be less than 8.0 mg/l as an absolute minimum. Where conditions of barometric pressure, altitude, and temperature preclude attainment of the 8.0 mg/l, dissolved oxygen may not be less than 90 percent of saturation. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean, and may not fall below 6.0 mg/l as an absolute minimum (Table 21);



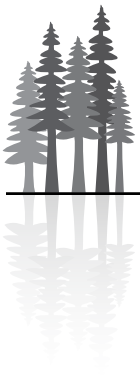
- (3) For waterbodies identified by the Department as providing cool- water aquatic life, the dissolved oxygen may not be less than 6.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 6.5 mg/l as a 30-day mean minimum, 5.0 mg/l as a seven-day minimum mean, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
- (4) For waterbodies identified by the Department as providing warm- water aquatic life, the dissolved oxygen may not be less than 5.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall below 5.5 mg/l as a 30-day mean minimum, and may not fall below 4.0 mg/l as an absolute minimum (Table 21);
- (5) For estuarine water, the dissolved oxygen concentrations may not be less than 6.5 mg/l (for coastal waterbodies)."

### **Temperature (OAR 340-041-0028)**

- A. The seven-day-average maximum temperature of a stream identified as having salmon and steelhead spawning use may not exceed 55.4 degrees Fahrenheit.
- B. The seven-day-average maximum temperature of a stream identified as having core cold water habitat use may not exceed 60.8 degrees Fahrenheit.
- C. The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use may not exceed 64.4 degrees Fahrenheit.
- D. The seven-day-average maximum temperature of a stream identified as having a migration corridor use may not exceed 68.0 degrees Fahrenheit."

### **Turbidity (OAR 340-041-0036)**

"No more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity"



# Appendix J

## Fish



---

This appendix provides background on the analysis and modeling for fisheries including: special status fish species, status of threatened and endangered salmonids, and intrinsic potential and large wood delivery models.

**In this appendix:**

Special Status Fish Species in the Planning Area .....	324
Status Summaries for Threatened or Endangered Salmonids.....	325
Modeling .....	361
Fisheries Planning Criteria .....	374



# Special Status Fish Species in the Planning Area

Fish species designated as Federally Threatened or Endangered under the Endangered Species Act within the Planning Area, and the present status of critical habitat designations are displayed in *Table J-1*. For a complete list of non-status fish species endemic to the Planning Area, refer to the Oregon Natural Heritage Program website at (<http://oregonstate.edu/ornhic/areas.html>).

**TABLE J-1. SPECIAL STATUS AND FEDERALLY THREATENED OR ENDANGERED FISH SPECIES WITHIN THE PLANNING AREA**

Scientific Name	Common Name	ESU_DPS	Status	Critical Habitat Status
<i>Oncorhynchus Tshawytscha</i>	Chinook Salmon	Lower Columbia River	Threatened	Critical Habitat Designated
		Upper Willamette River	Threatened	Critical Habitat Designated
		Southern Oregon/Northern California	Bureau Sensitive	N/A
<i>Oncorhynchus Kisutch</i>	Coho Salmon	Southern Oregon/Northern California	Threatened	Critical Habitat Designated
		Lower Columbia River	Threatened	N/A
<i>Oncorhynchus Keta</i>	Chum Salmon	Oregon Coast	Threatened	Critical Habitat Designated
		Lower Columbia River	Threatened	Critical Habitat Designated
<i>Oncorhynchus Mykiss</i>	Steelhead	Pacific Coast	Bureau Sensitive	N/A
		Lower Columbia River	Threatened	Critical Habitat Designated
		Upper Willamette River	Threatened	Critical Habitat Designated
<i>Chasmistes Brevirostris</i>	Shortnose Sucker	Oregon Coast	Bureau Sensitive	N/A
		Klamath Basin	Endangered	Critical Habitat Proposed
<i>Deltistes Luxatus</i>	Lost River Sucker	Klamath Basin	Endangered	Critical Habitat Proposed
<i>Salvelinus Confluentus</i>	Bull Trout	Columbia River & Klamath River	Threatened	Critical Habitat Not Designated on Federal lands
<i>Oregonichthys Crameri</i>	Oregon Chub	Willamette River Valley <sup>1</sup>	Endangered	Critical Habitat not designated
<i>Rhinichthys Cataractae</i>	Millicoma Dace	All	Bureau Sensitive	N/A
<i>Oncorhynchus mykiss</i>	Inland Redband Trout (All Stocks)	All	Bureau Sensitive	N/A
<i>Oregonichthys kalawatseti</i>	Umpqua Chub	All	Bureau Sensitive	N/A
<i>Lampetra Minima</i>	Miller Lake Lamprey	All	Bureau Sensitive	N/A
<i>Oncorhynchus Clarkii</i>	Coastal Cutthroat Trout	Columbia River/SW Washington	Bureau Sensitive	N/A

<sup>1</sup>Occurs within WOPR planning area, but not on BLM-administered lands



# Status Summaries for Threatened or Endangered Salmonids

The following are summaries of the status of listed fish species within the plan area. Summaries of salmon and steelhead are from the National Marine Fisheries Service (NMFS) “*Updated Status of federally Listed ESUs of West Coast Salmon and Steelhead*” (June 2005). The specific listing status of the species and the threats to the species, are given in the specific Federal Register notice for each species or group of species covered by the notice. The Federal Register notices can be found at the NMFS web site <http://www.nwr.noaa.gov> for anadromous fish and the U.S. Fish and Wildlife Service web site <http://www.fws.gov/pacific/> for resident fish. Federal Register notices for rules regarding the designation of critical habitat can also be found at these web sites. The Federal Register notices give the basic life history requirements for the listed species, the threats that caused the listing, and for critical habitat those basic requirements necessary for the survival and recovery of the species.

## Lower Columbia River Chinook Salmon Evolutionary Significant Unit (ESU)

*Status of the Species (Myers et al. 2006)*

### ***Life History***

The following ESU description is extracted from Myers, et al, 2006. The Lower Columbia River Chinook Salmon ESU exhibits extensive diversity in life history traits, particularly run timing, spawn timing, and juvenile life histories. Run timing is a primary factor in the identification of distinct populations, with spring, fall and late falls present. In the coast strata (Youngs Bay, Big Creek, Clatskanie, and Scappoose) fall Chinook are present, spring, fall and late fall are present in the Western cascades strata (Clackamas and Sandy), and spring and fall Chinook are present in the Columbia Gorge strata (Lower Gorge and Hood drainages).

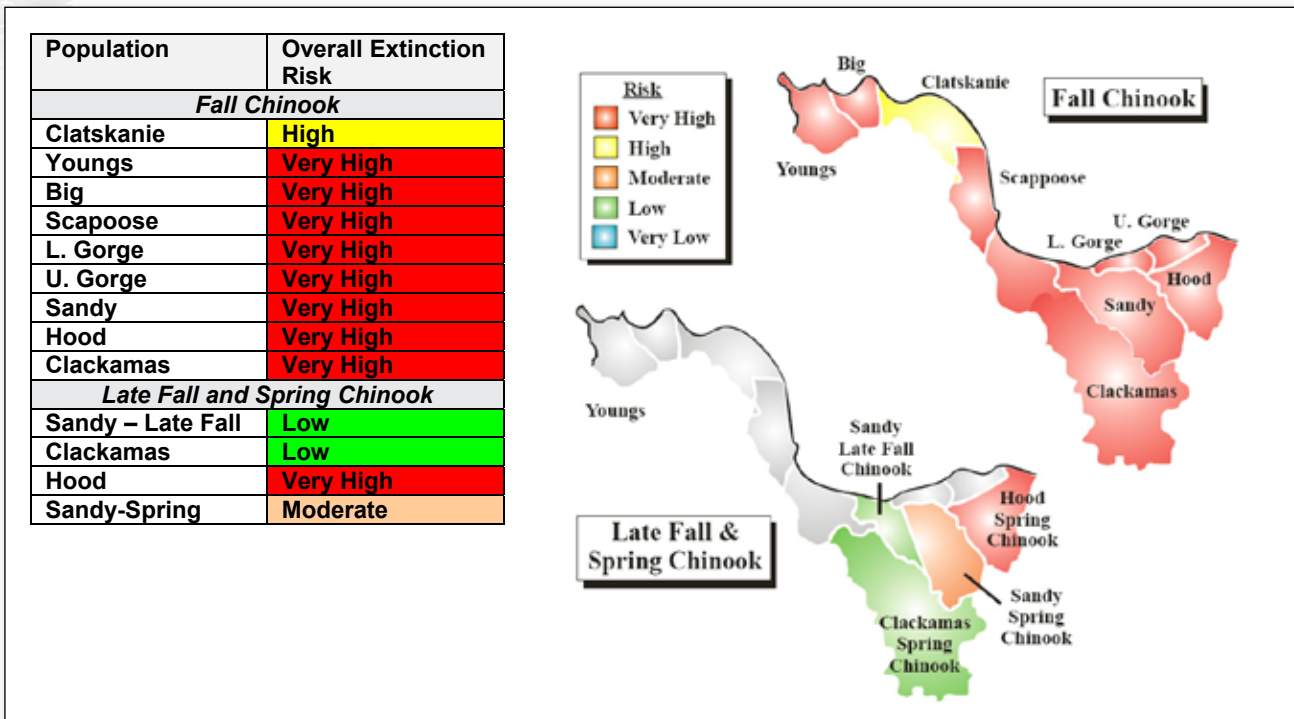
Chinook salmon generally spawn in various-sized rivers, from small streams to large systems such as the Columbia River. Chinook salmon display two dominant life history types: ocean- and stream-types (Myers et al. 1998). Individuals exhibiting an ocean-type life history usually spend only a few months in freshwater before migrating to the ocean, whereas stream-type chinook may spend 1 to 2 years in freshwater before their migration to the sea (Healey 1991, Myers et al. 1998). Both ocean- and stream-type fish can reside in the ocean between 2 and 5 years before returning to spawn (Healey 1991).

### ***Populations***

The Willamette and Lower Columbia Technical Recovery Team estimated that between eight and ten historical populations in this Evolutionarily Significant Unit have been extirpated; mostly spring-run populations. Ten of the twelve Oregon populations of listed lower Columbia River Chinook are estimated to be at high or very high risk of extinction (*see Figure J-1. Extinction risk determinations for the Lower Columbia River Chinook ESU*).



FIGURE J-1. EXTINCTION RISK DETERMINATIONS FOR THE LOWER COLUMBIA RIVER CHINOOK ESU



**Status and Distribution**

The Lower Columbia River Chinook Salmon Evolutionarily Significant Unit was federally listed as threatened in March of 1999 by the National Marine Fisheries Service. Critical habitat was designated in July of 2005. Recovery planning for this ESU is in progress.

The following are the summary of factors contributing to the decline of Lower Columbia Chinook Salmon (70 FR 37160) (factors in **bold** are those that BLM can influence).

- Hatchery introgression
- **Habitat blockages**
- **Logging**
- Eruption of Mt. Saint Helens
- Hydropower development
- Predation
- Harvest

The Lower Columbia River Chinook ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River (64 FR 14208; March 24, 1999).

The BLM-administered land within the planning area comprises less than 0.6% of the ESU. Within the planning area, there are 611 stream miles in this ESU occupied by Lower Columbia chinook; with 22 of the miles on BLM-administered land (See Table J-2. *Distribution of Lower Columbia River Chinook in the ESU and on BLM-administered Lands Within the Planning Area* and Figure J-2. *Lower Columbia River Evolutionary Chinook Significant Unit Within Planning Area*).

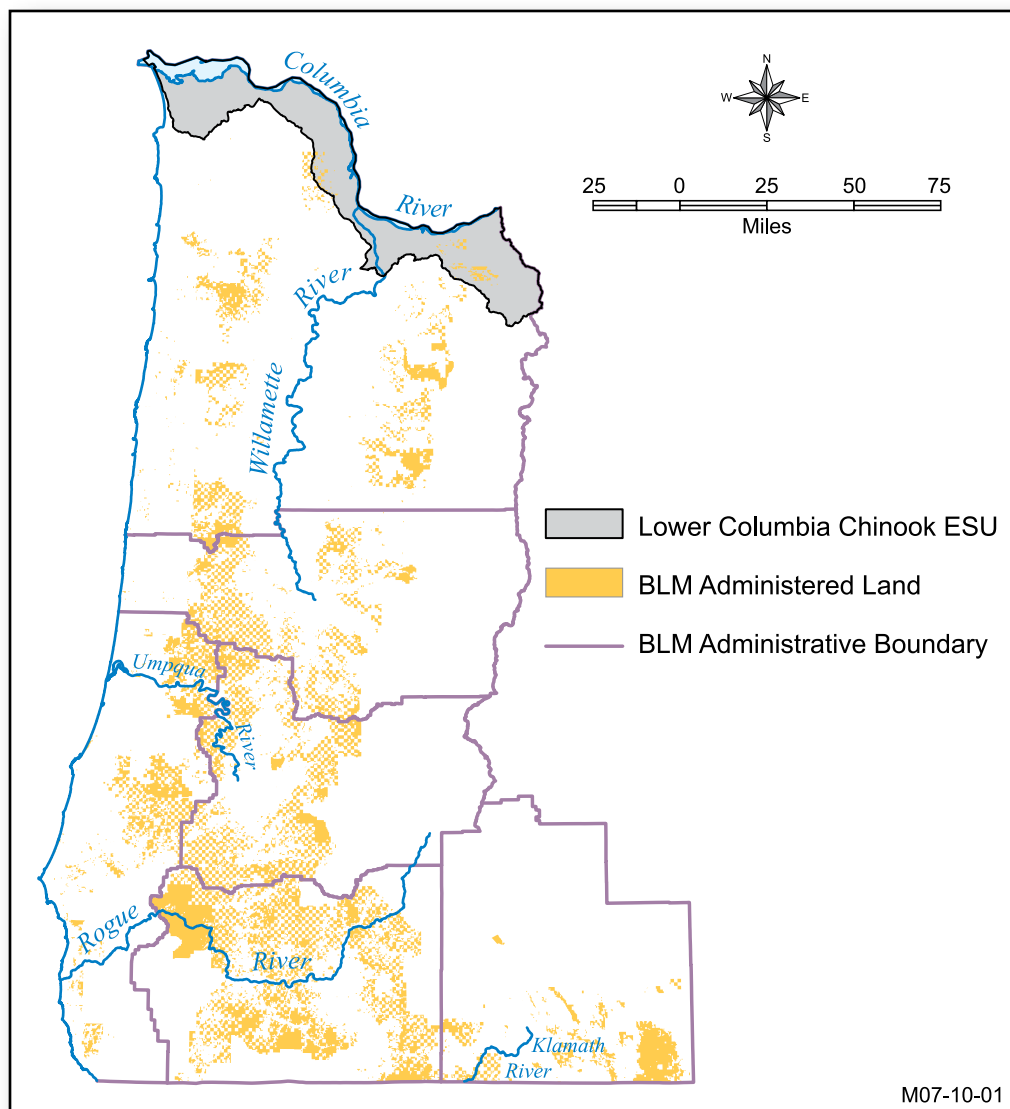


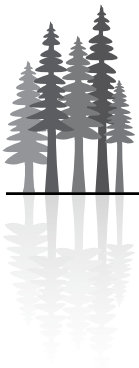


**TABLE J-2. DISTRIBUTION OF LOWER COLUMBIA RIVER CHINOOK IN ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

		Acres in ESU	Chinook Miles in ESU (Plan Area)	Critical Habitat Miles (Entire ESU)
Salem District	BLM	21,470	22	10
	Other	3,448,358	589	1,268
Total	BLM	21,470 (.6%)	22	10
	All	3,469,828	611	1,278

**FIGURE J-2. LOWER COLUMBIA RIVER CHINOOK EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**





### Key Limiting Factors Identified For the Lower Columbia River Chinook Populations

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Lower Columbia River chinook ESU, were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

- Degraded Habitat – *Floodplain Connectivity and Function*
- Degraded Habitat – *Channel Structure and Complexity*
- Degraded Habitat – *Riparian Areas and LWD Recruitment*
- Degraded Habitat – *Stream Substrate*
- Degraded Habitat – *Stream Flow*
- Degraded Habitat – *Fish Passage*

### Status of Critical Habitat

Critical habitat was designated for the Lower Columbia River Chinook ESU in July of 2005. There are 10 miles of critical habitat on BLM-administered lands in this ESU. See *Figure J-3 (Lower Columbia River Chinook Critical Habitat Within The Western Oregon Plan Revision Area)* and *Figure J-4 (Lower Columbia River Chinook CHART Streams and Watersheds)*.

FIGURE J-3. LOWER COLUMBIA RIVER CHINOOK CRITICAL HABITAT WITHIN THE WESTERN OREGON PLAN REVISION AREA

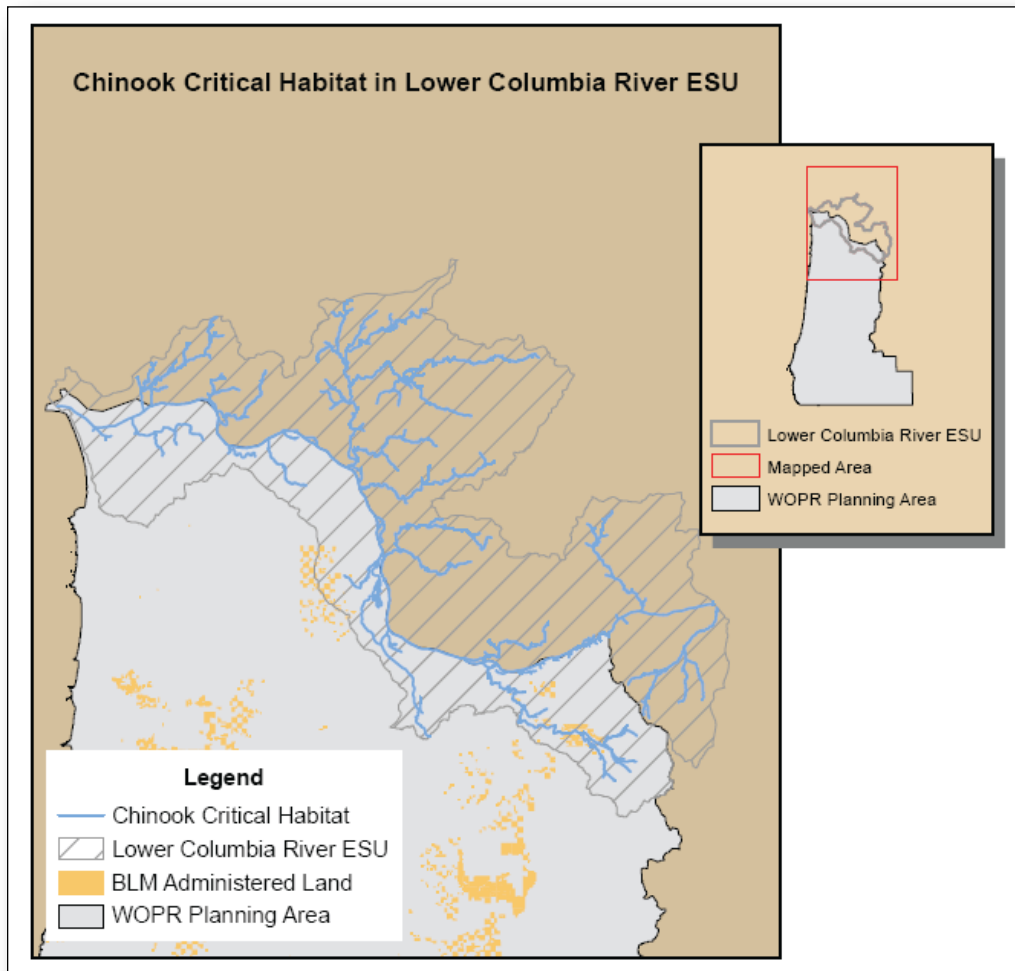
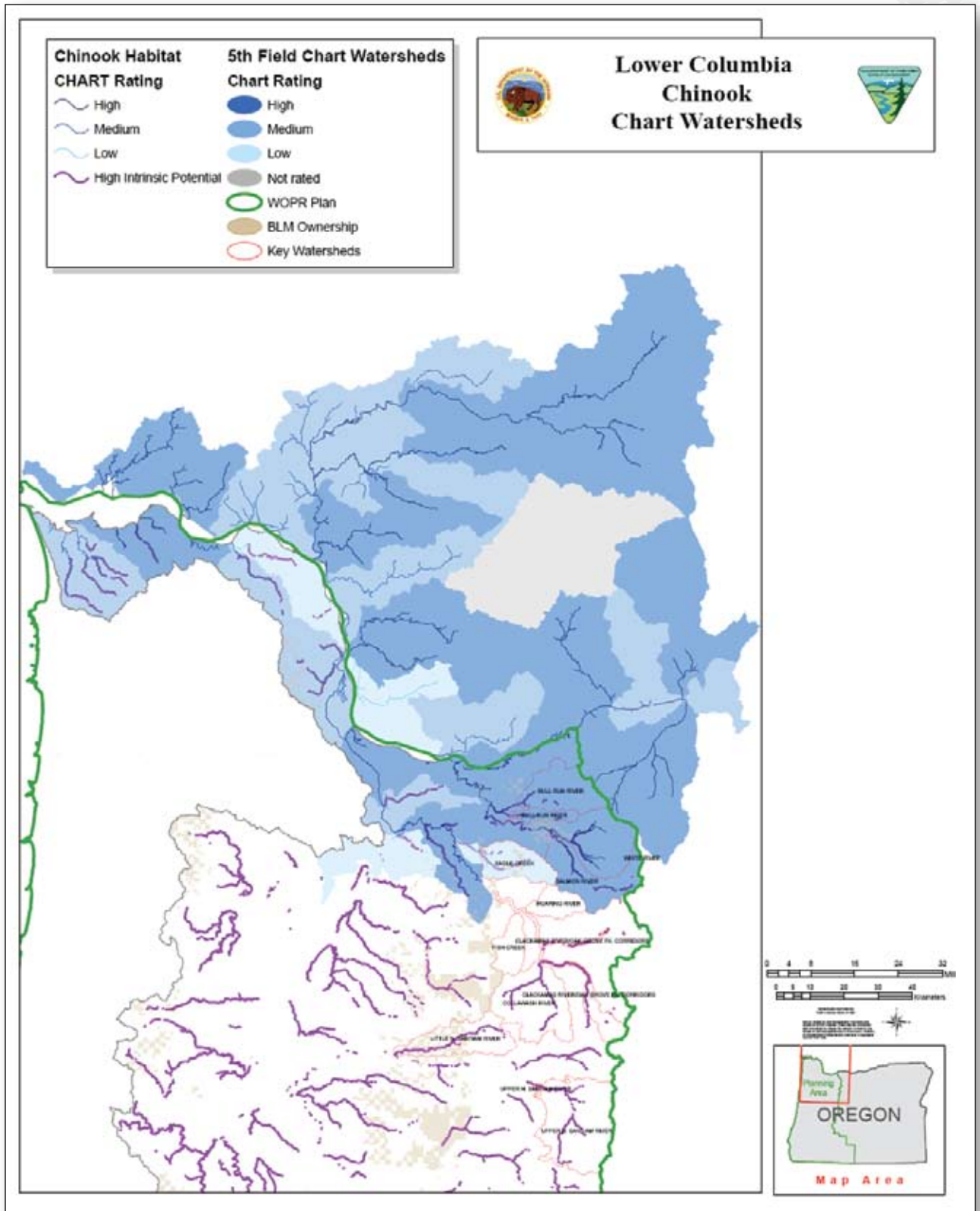




FIGURE J-4. LOWER COLUMBIA RIVER CHINOOK CHART STREAMS AND WATERSHEDS





## Lower Columbia River Coho Salmon Evolutionary Significant Unit

*Status of the Species (Myers et al. 2006, ODFW 2007)*

### **Life History**

The Lower Columbia River Coho Salmon ESU historically supported large numbers (exceeding 300 thousand fish) of coho returning to river basins from the mouth of the Columbia through the Hood River. In Oregon, coho populations were designated in the Coast strata (Youngs Bay, Big Creek, Clatskanie, and Scappoose), Western Cascades strata (Clackamas and Sandy), and Columbia Gorge strata (Lower Gorge and Hood drainages). Two major life history strategies are exhibited. Early run coho tend to spawn in the upper reaches of larger systems in the lower Columbia River and in larger rivers east of the Cascades, returning from August to October and spawning from October to November. Late run coho generally spawn in small streams or the lower reaches of larger systems, returning from October to January and spawning from November to as late as March. Juvenile life histories vary little, with most fish migrating to the ocean in their second spring.

### **Populations**

Seven of the eight Oregon populations of listed Lower Columbia River coho were estimated to be at high or very high risk of extinction. The Clackamas population is the only population rated at low risk (“viable”) (See Figure J-5. *Extinction risk determinations for the Lower Columbia River Coho ESU*).

### **Status and Distribution**

The Lower Columbia River Coho Salmon Evolutionarily Significant Unit was federally listed as threatened in July of 1995. Recovery planning for this ESU is in progress.

The following are the summary of factors contributing to the decline of Lower Columbia Coho Salmon (70 FR 37160) (factors in bold are those that BLM can influence).

- **Habitat blockages**
- Historic Flooding
- Predation
- **Water Diversion/extraction**
- Poaching
- Agriculture
- Hatchery introgression
- **Logging**
- Harvest
- **Mining**

The BLM-administered land within the planning area comprises 0.5 percent of the ESU. There are 964 stream miles in this ESU occupied by the Lower Columbia River coho; with 23 of the miles on BLM-administered land. See Table J-3 (*Distribution of Lower Columbia River coho salmon in ESU and on BLM-administered Lands within the planning area*) and Figure J-6 (*Lower Columbia River coho salmon evolutionary significant unit within the planning area*).

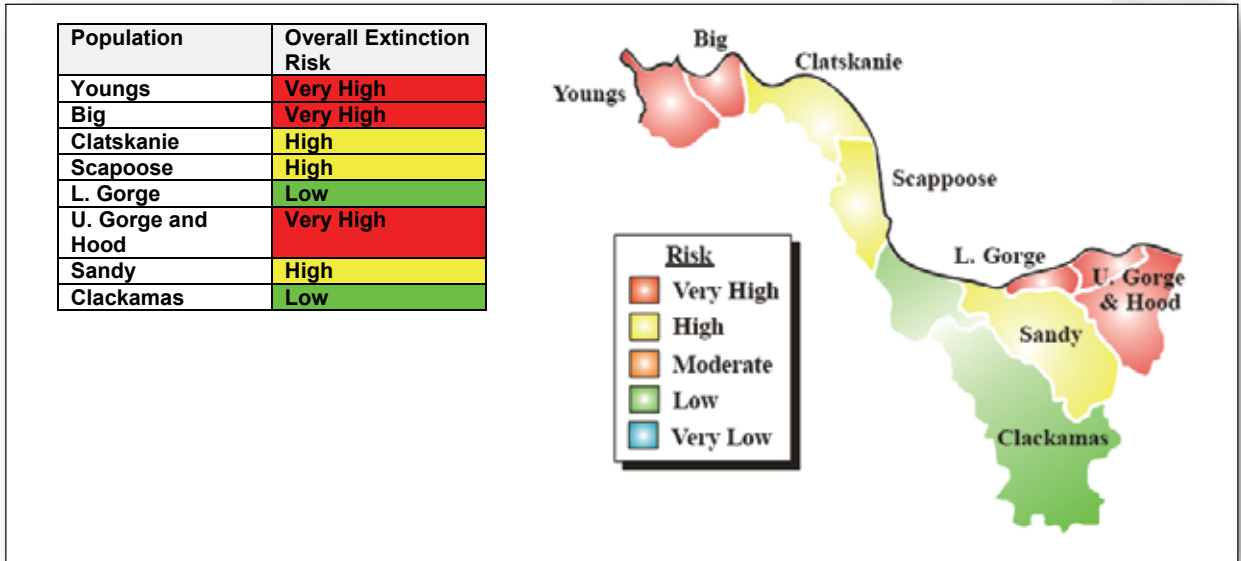
**TABLE J-3. DISTRIBUTION OF LOWER COLUMBIA RIVER COHO SALMON IN ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

		Acres in ESU	Coho Miles in ESU (Plan Area)
<b>Salem District</b>	<b>BLM</b>	35,668	23
	<b>Other</b>	1,728,798	941
<b>Total</b>	<b>BLM</b>	35,668 (0.5%)	23
	<b>All*</b>	6,716,352	964

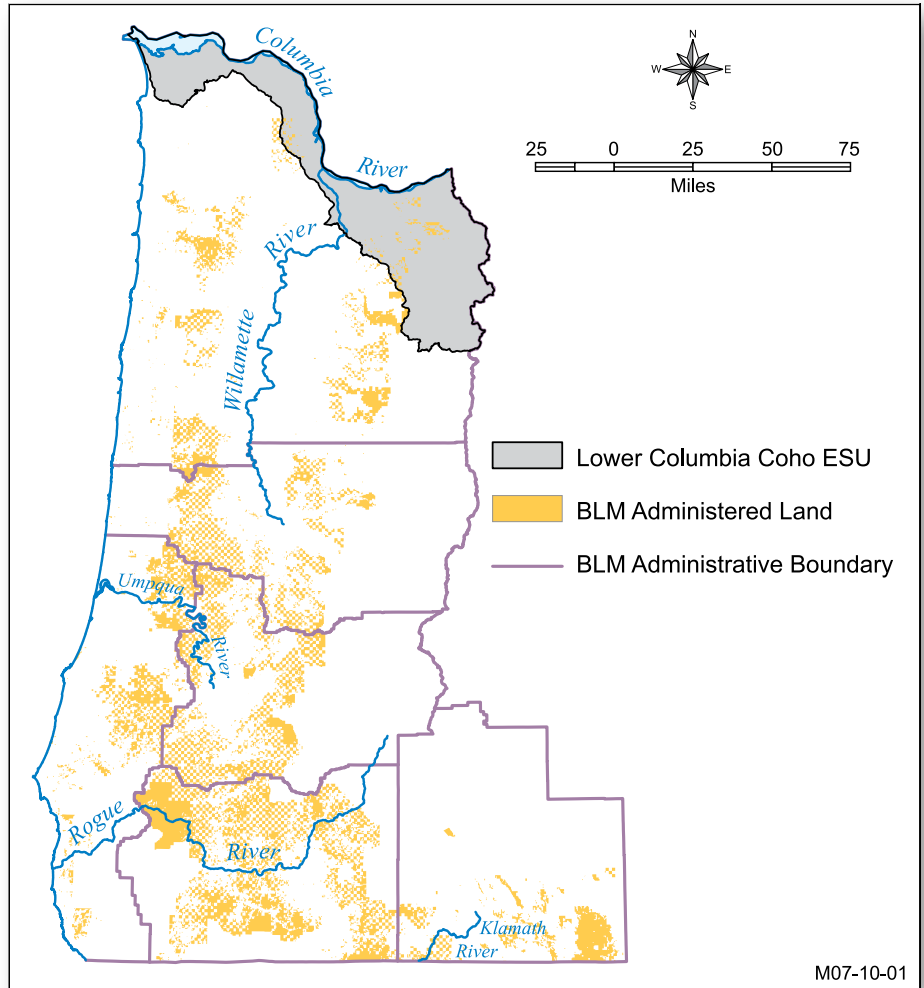
\*All includes acres in ESU outside planning area.



**FIGURE J-5. EXTINCTION RISK DETERMINATIONS FOR THE LOWER COLUMBIA RIVER COHO ESU**



**FIGURE J-6. LOWER COLUMBIA RIVER COHO SALMON EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



M07-10-01



### ***Key Limiting Factors Identified For the Lower Columbia River Coho Populations***

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Lower Columbia River Coho ESU, were identified in the 2006 Pacific Coastal Salmonid

Restoration Fund Report to Congress:

- Degraded Habitat – *Floodplain Connectivity and Function*
- Degraded Habitat – *Channel Structure and Complexity*
- Degraded Habitat – *Water Quality*
- Degraded Habitat – *Riparian Areas and LWD Recruitment*
- Degraded Habitat – *Stream Substrate*
- Degraded Habitat – *Stream Flow*

### ***Status of Critical Habitat***

Critical habitat has not been designated for the Lower Columbia River Coho Salmon ESU.

## **Lower Columbia River Steelhead Distinct Population Segment**

### ***Status of the Species (Myers et al. 2006, ODFW 2007)***

#### ***Life History***

The Lower Columbia River Steelhead DPS has two distinct life history strategies; summer- and winter-run timing. Winter steelhead are typically found west of the Cascades, and summer steelhead are most common east of the Cascades. Steelhead exhibit extensive diversity in life history traits, particularly run timing, spawn timing, and juvenile life histories. In Oregon, winter steelhead are found in the Western Cascades strata (Clackamas, Sandy) and the Columbia Gorge strata (Lower and Upper Gorge, Hood), while summer steelhead are found in the Columbia Gorge strata (Hood). Winter steelhead in the coast strata are not listed under the Endangered Species Act.

There is considerable overlap in the life history patterns of winter and summer steelhead. Each rears in freshwater for 1-4 years prior to emigrating to the ocean where they spend 1-4 years before returning to their natal streams to spawn. The primary difference between summer and winter steelhead is the timing of their return. Summer steelhead return between May and October, holding until the following year where they spawn from January to June. Winter steelhead return between December and May and spawn from February to June. Winter steelhead tend to spawn later than summer steelhead, but there is overlap in the timing of spawning. Unlike salmon, steelhead are capable of being repeat spawners, although the rate of repeat spawning is low (5-10%).

#### ***Populations***

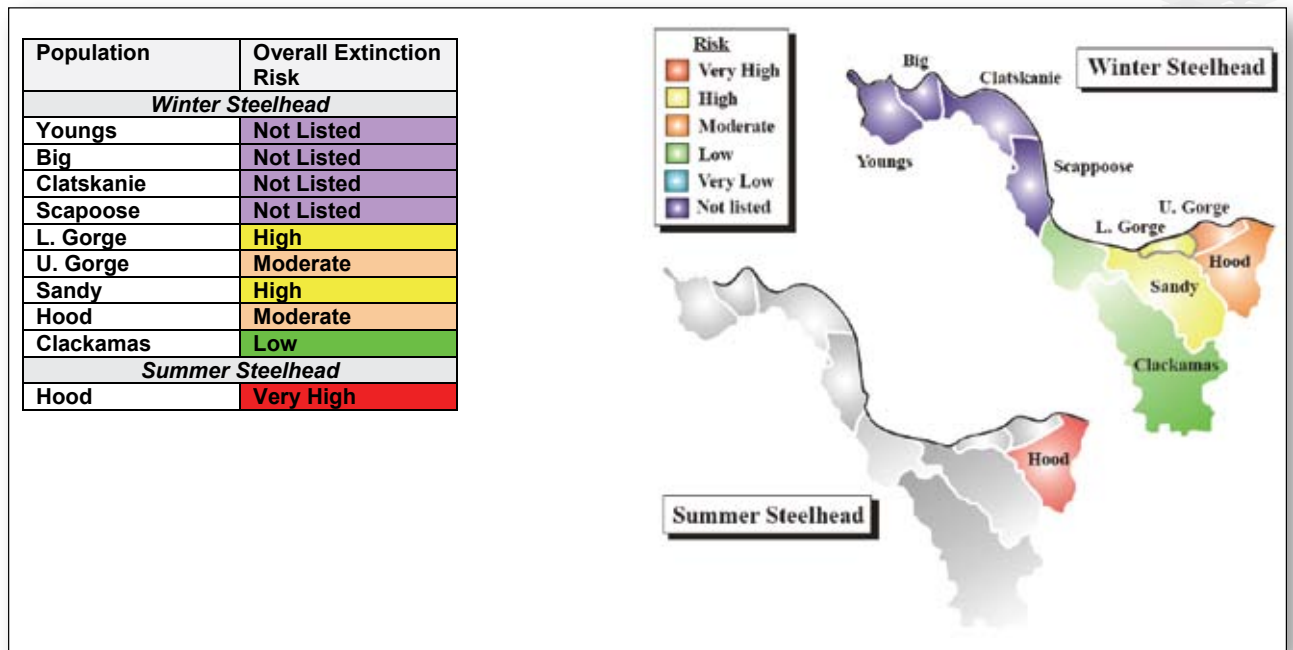
Three of the six populations are estimated to be at high or very high risk of extinction. See *Figure J-7 (Extinction risk determinations for the Lower Columbia River Steelhead DPS)*. The Clackamas and Hood winter steelhead populations have the lowest risks and the Sandy and Lower Gorge winter steelhead and Hood summer steelhead populations have the highest risks. The Upper Gorge and Hood winter steelhead populations are at moderate risk. This is a reflection of the low abundance and productivity scores. While the Sandy winter steelhead population was rated at high risk, due to low abundance and productivity scores, recent population trends (last 10 years) suggest that the primary threat to abundance and productivity (high hatchery fish stray rates) has been reduced to very low levels (<10%).

#### ***Status and Distribution***

The Lower Columbia River Steelhead Distinct Population Segments were federally listed as threatened in March of 1998 by the National Marine Fisheries Service. Recovery planning for this DPS is in progress.



**FIGURE J-7. EXTINCTION RISK DETERMINATIONS FOR THE LOWER COLUMBIA RIVER STEELHEAD DPS**



The following are the summary of factors contributing to the decline of Lower Columbia River Steelhead (NMFS 1996) (factors in bold are those that BLM can influence).

- Hatchery introgression
- Habitat blockages
- **Logging**
- Eruption of Mt. Saint Helens
- Hydropower Development
- Predation
- Harvest

The BLM-administered land within the planning area comprises less than 1% of the DPS. There are 1,099 stream miles in this DPS occupied by the Lower Columbia River steelhead, with 44 of the miles on BLM-administered land. See Table J-4 (*Distribution of Lower Columbia River steelhead salmon in DPS and on BLM-administered Lands within the planning area*) and Figure J-8 (*Lower Columbia steelhead evolutionary significant unit within the planning area*).

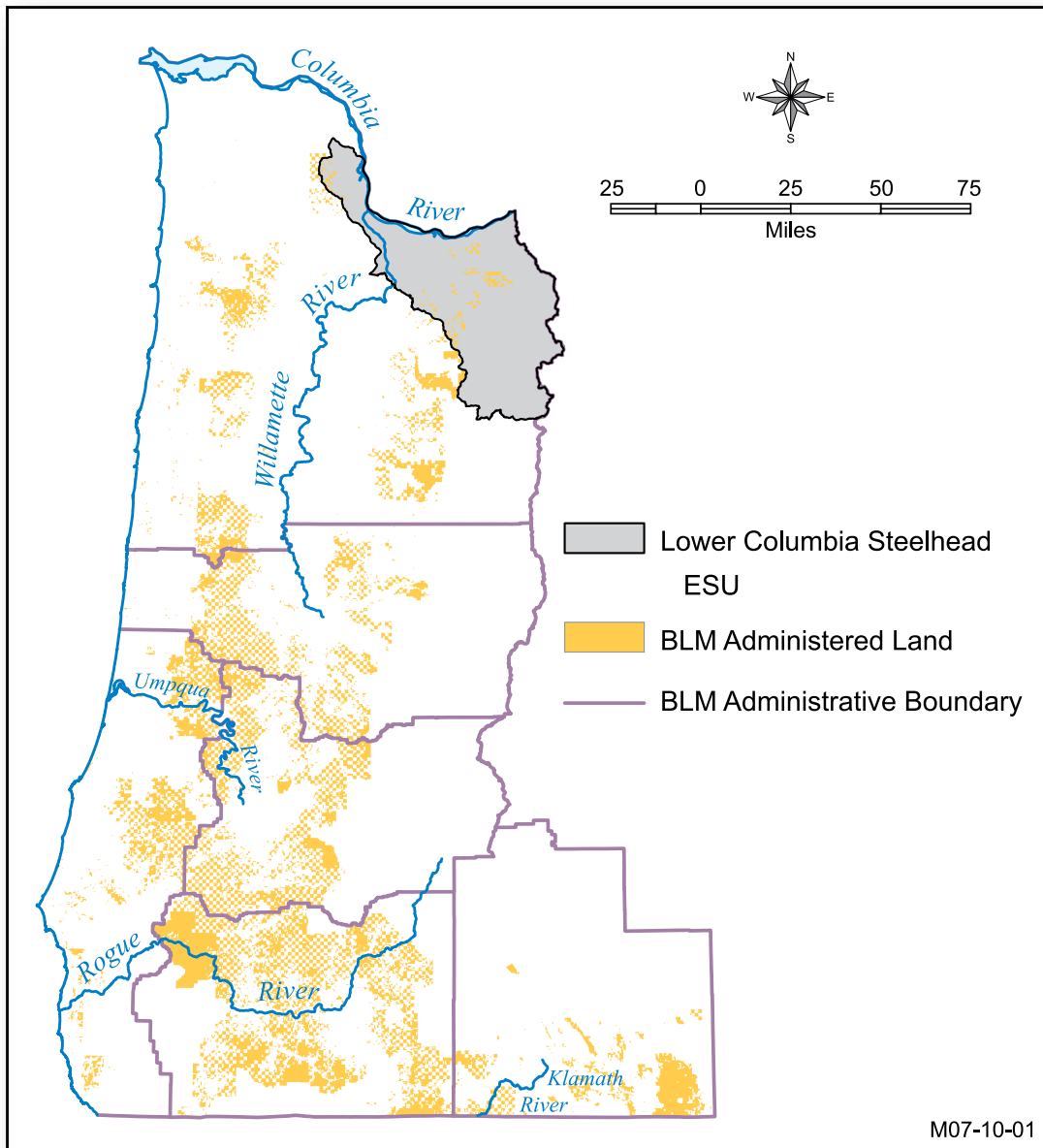
**TABLE J-4. DISTRIBUTION OF LOWER COLUMBIA RIVER STEELHEAD SALMON IN DPS AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

District and Ownership	Acres in DPS	Steelhead Miles in DPS (Plan Area)	Critical Habitat Miles (Entire DPS)
Salem District	BLM	34,911	44
	Other	1,234,391	1,055
Total	BLM	34,911 (1%)	44
	All*	3,244,050	1,099

\*All includes acres in ESU outside planning area.



**FIGURE J-8. LOWER COLUMBIA STEELHEAD EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



**Key Limiting Factors Identified For the Lower Columbia River Steelhead Populations**

Limiting factors outside BLM's control are not listed here. The following limiting factors and their level of threat to the Lower Columbia River Steelhead DPS were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

- Degraded Habitat – *Floodplain Connectivity and Function*
- Degraded Habitat – *Channel Structure and Complexity*
- Degraded Habitat – *Water Quality*
- Degraded Habitat – *Riparian Areas and LWD Recruitment*
- Degraded Habitat – *Stream Substrate*
- Degraded Habitat – *Stream Flow*
- Degraded Habitat – *Fish Passage*





**Status of Critical Habitat**

Critical habitat was designated in September of 2005. There are 13 miles of critical habitat on BLM-administered lands in this DPS. See *Figure J-9 (Lower Columbia River steelhead critical habitat in entire DPS and on BLM-administered lands within the Western Oregon Plan Revision area)* and *Figure J-10 (Lower Columbia River steelhead CHART streams and watersheds)*.

**FIGURE J-9. LOWER COLUMBIA RIVER STEELHEAD CRITICAL HABITAT WITHIN THE WESTERN OREGON PLAN REVISION AREA**

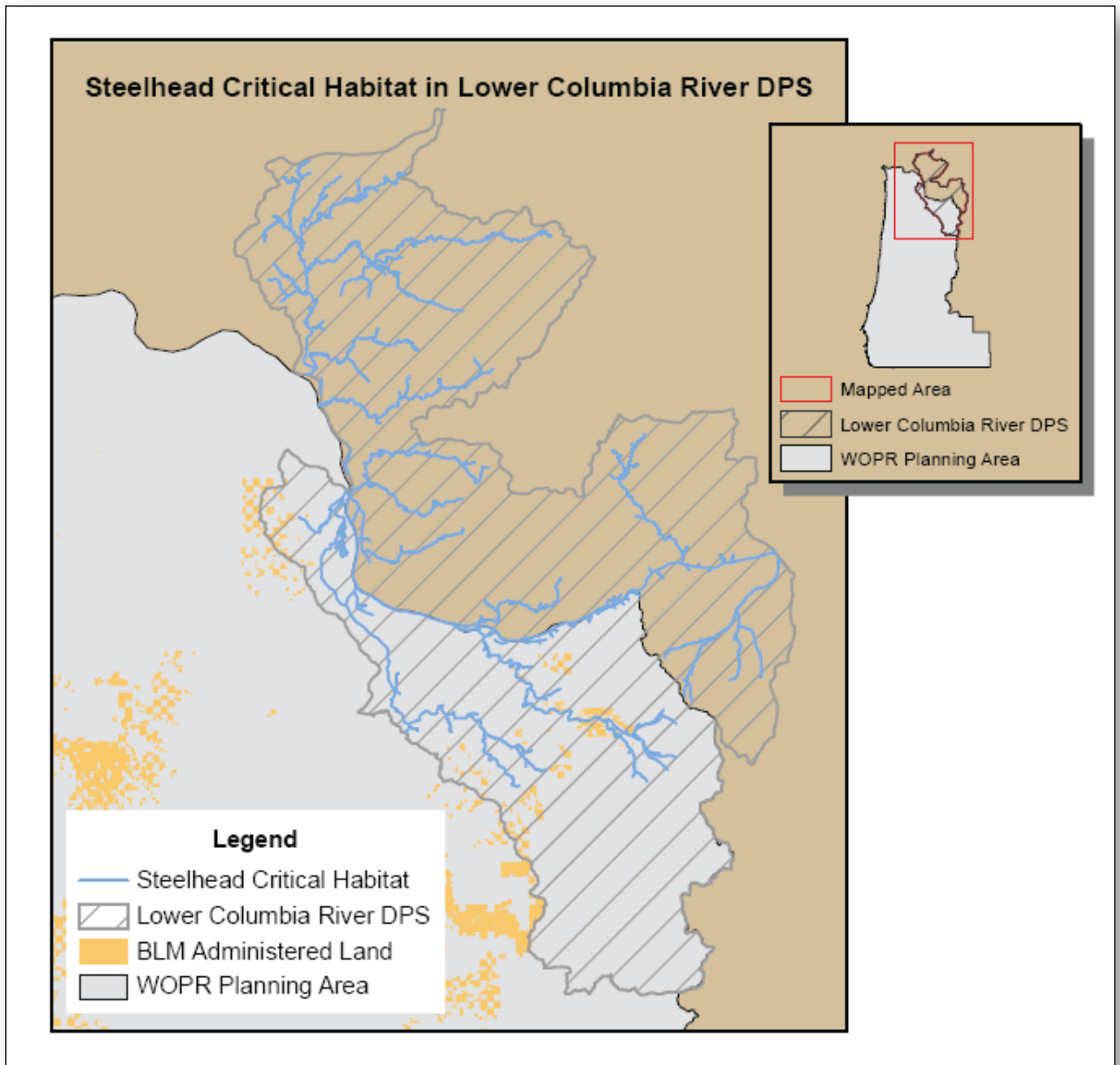
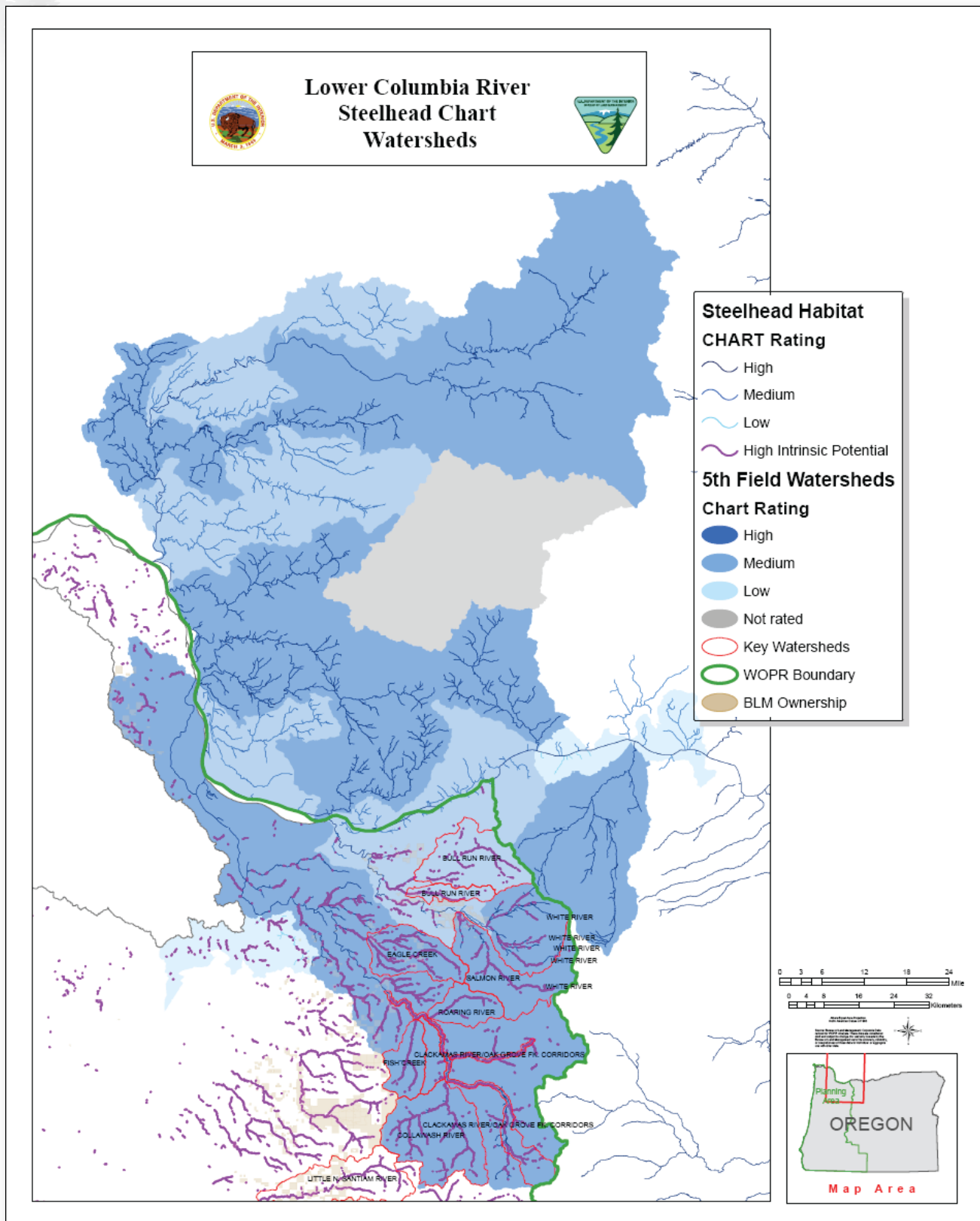




FIGURE J-10. LOWER COLUMBIA RIVER STEELHEAD CHART STREAMS AND WATERSHEDS

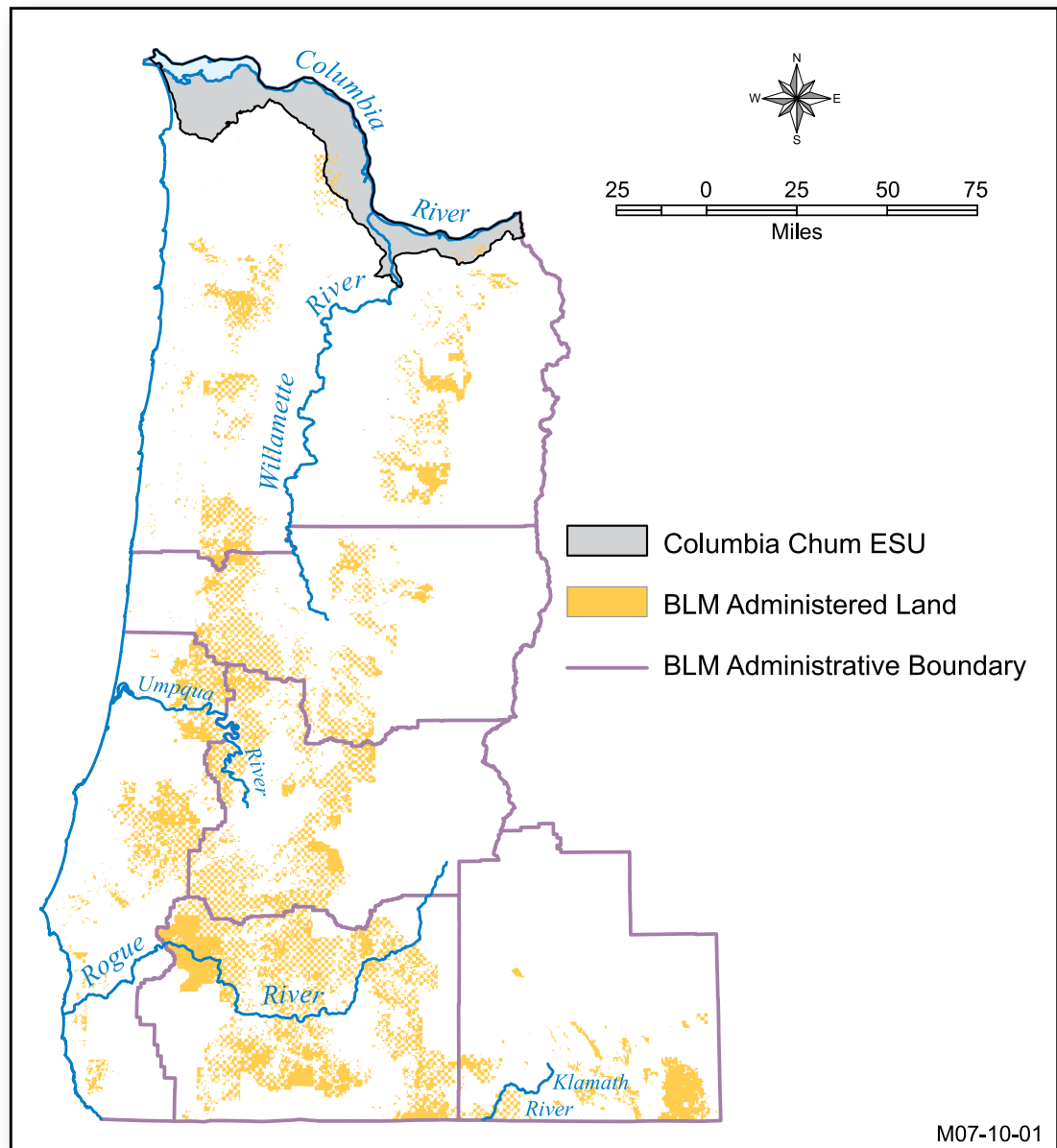




## Columbia River Chum Salmon Evolutionary Significant Unit

Chum salmon spawn on the Oregon side of the lower Columbia Gorge in the Multnomah area, but are absent from other populations in the Oregon portion of the Columbia River Evolutionary Significant Unit. With the exception of the lower Columbia Gorge population, Columbia River chum salmon are considered extirpated, or nearly so, in Oregon. The Columbia River Chum salmon do not occur on BLM-administered lands within the western Oregon revision planning area (NOAA 2005). Within the planning area, Columbia River chum salmon do not occur on BLM-administered lands. See *Figure J-11 (Chum salmon evolutionary significant unit within the planning area)*.

**FIGURE J-11. CHUM SALMON EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



M07-10-01



# Upper Willamette River Chinook Salmon Evolutionary Significant Unit

## Status of the Species (Myers et al. 2006)

### Life History

The geography and ecology of the Willamette Valley is considerably different from surrounding areas. Historically, the Willamette Falls offered a narrow temporal window for upriver migration, which may have promoted isolation from other Columbia River stocks (Myers et al. 1998). Chinook in this ESU exhibit a diverse array of life histories including 1) downstream migration through the lower reaches of tributaries and the Willamette/Columbia as late winter/early spring fry; 2) fall to early winter oceanward migration by fingerlings; and 3) late winter to spring oceanward migration by yearlings.

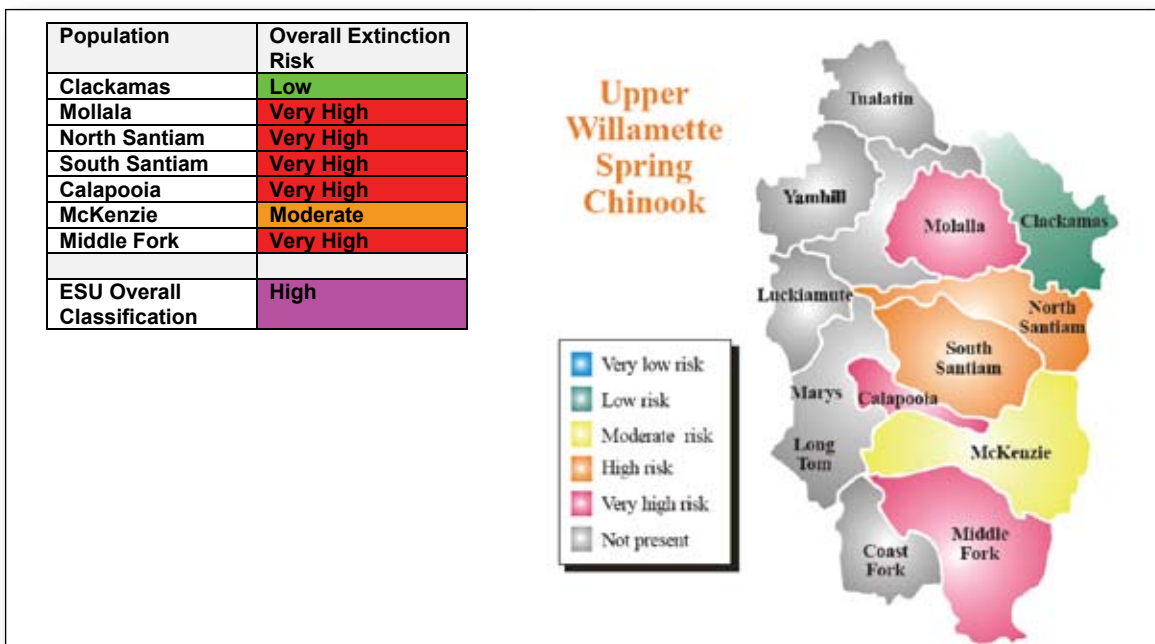
### Populations

The Upper Willamette ESU historically supported large numbers (perhaps exceeding 275 thousand fish) of spring Chinook salmon returning to six river basins: the Clackamas, situated immediately downstream from Willamette Falls; and the Molalla; the Santiam; the Calapooia; the McKenzie; and the Middle Fork Willamette; all located upstream from Willamette Falls (UWRC Recovery Plan 2007).

These basins all drain the Cascade Range from the east. Upper Willamette Chinook run timing is viewed as an adaptive response to flow conditions at Willamette Falls prior to laddering of the falls. The majority of the run ascends Willamette Falls in April, May, and June; passage over the falls regularly tapers off in July (UWRC Recovery Plan 2007). Supported by the six above noted river basins, the Upper Willamette ESU consists of seven historical populations: Clackamas, Molalla, North Santiam, South Santiam, Calapooia, McKenzie, and Middle Fork Willamette (UWRC Recovery Plan 2007).

Based on a review of extinction risk scores assigned by the Lower Columbia/Upper Willamette technical review team, five of seven populations of Upper Willamette Chinook are considered to be at a very high risk of extinction and the Upper Willamette Chinook ESU, as a whole, is at high risk of extinction (UWRC Recovery Plan 2007). See Figure J-12 (Extinction risk determinations for the Upper Willamette River Chinook ESU).

**FIGURE J-12. EXTINCTION RISK DETERMINATIONS FOR THE UPPER WILLAMETTE RIVER CHINOOK ESU**





### **Status and Distribution**

The Upper Willamette River Chinook Salmon Evolutionarily Significant Unit was federally listed as threatened in March of 1999 by the National Marine Fisheries Service. Recovery planning for this ESU is in progress.

The following are the summary of factors contributing to the decline of Upper Willamette Chinook Salmon (70 FR 37160) (factors in bold are those that BLM can influence).

- **Habitat blockages**
  - Hatchery introgression
  - Urbanization
- **Logging**
  - Hydropower Development
  - Harvest

The Upper Willamette River Chinook ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River and its tributaries, above Willamette Falls, Oregon (64 FR 14208; March 24, 1999). The BLM-administered land within the planning area comprises less than 7% of the ESU. There are 1,570 stream miles in this ESU occupied by the Upper Willamette River chinook, with 43 of the miles on BLM-administered land. See *Table J-5 (Distribution of Upper Willamette River chinook ESU and on BLM-administered lands within the planning area)* and *Figure J-13 (Upper Willamette River chinook ESU within the planning area)*.

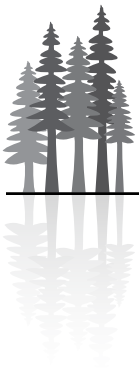
### **Key Limiting Factors Identified For the Upper Willamette River Chinook Populations**

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Upper Willamette River chinook ESU, were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

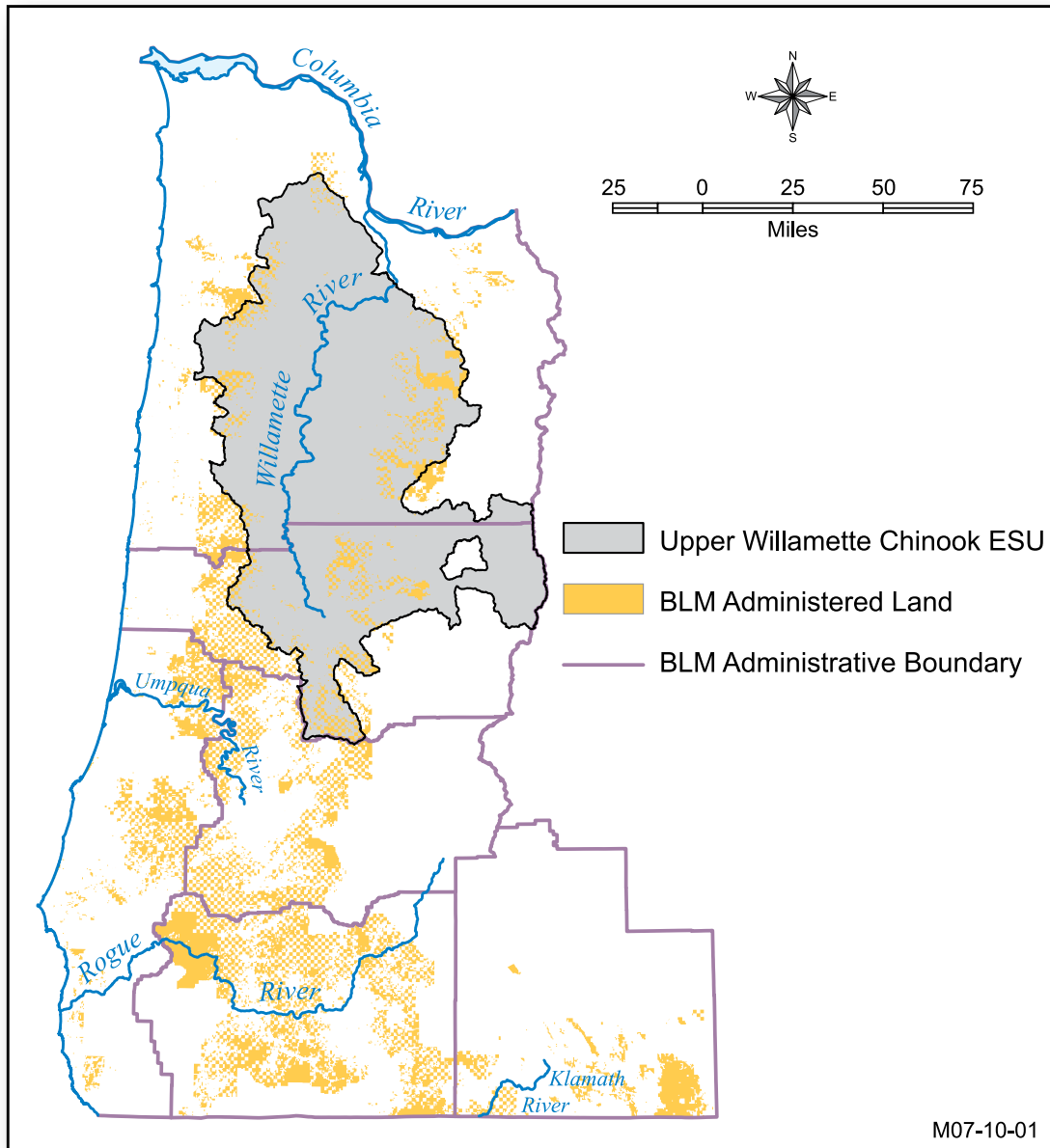
- Degraded Habitat – *Floodplain Connectivity and Function*
- Degraded Habitat – *Channel Structure and Complexity*
- Degraded Habitat – *Water Quality*
- Degraded Habitat – *Riparian Areas and LWD Recruitment*
- Degraded Habitat – *Fish Passage*

**TABLE J-5. DISTRIBUTION OF UPPER WILLAMETTE RIVER CHINOOK IN ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

District and Ownership		Acres in ESU	Chinook Streams in ESU (Miles in Plan Area)	Critical Habitat Miles (Entire ESU)
Salem District	BLM	185,230	29	35
	Other	3,054,863	1,060	934
Eugene District	BLM	153,542	14	0
	Other	1,480,715	424	0
Roseburg District	BLM	806	0	0
	Other	754	0	0
Total	BLM	339,578 (7%)	43	35
	All	4,875,910	1,570	1,004



**FIGURE J-13. UPPER WILLAMETTE RIVER CHINOOK EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



### **Status of Critical Habitat**

Critical habitat was designated for the Upper Willamette River Chinook ESU in July of 2005. There are 35 miles of critical habitat on BLM-administered lands in this ESU. See Figure J-14 (*Upper Willamette River chinook critical habitat within the Western Oregon Plan Revision area*) and Figure J-15 (*Upper Willamette River chinook CHART streams and watersheds*).



**FIGURE J-14.** UPPER WILLAMETTE RIVER CHINOOK CRITICAL HABITAT WITHIN THE WESTERN OREGON PLAN REVISION AREA

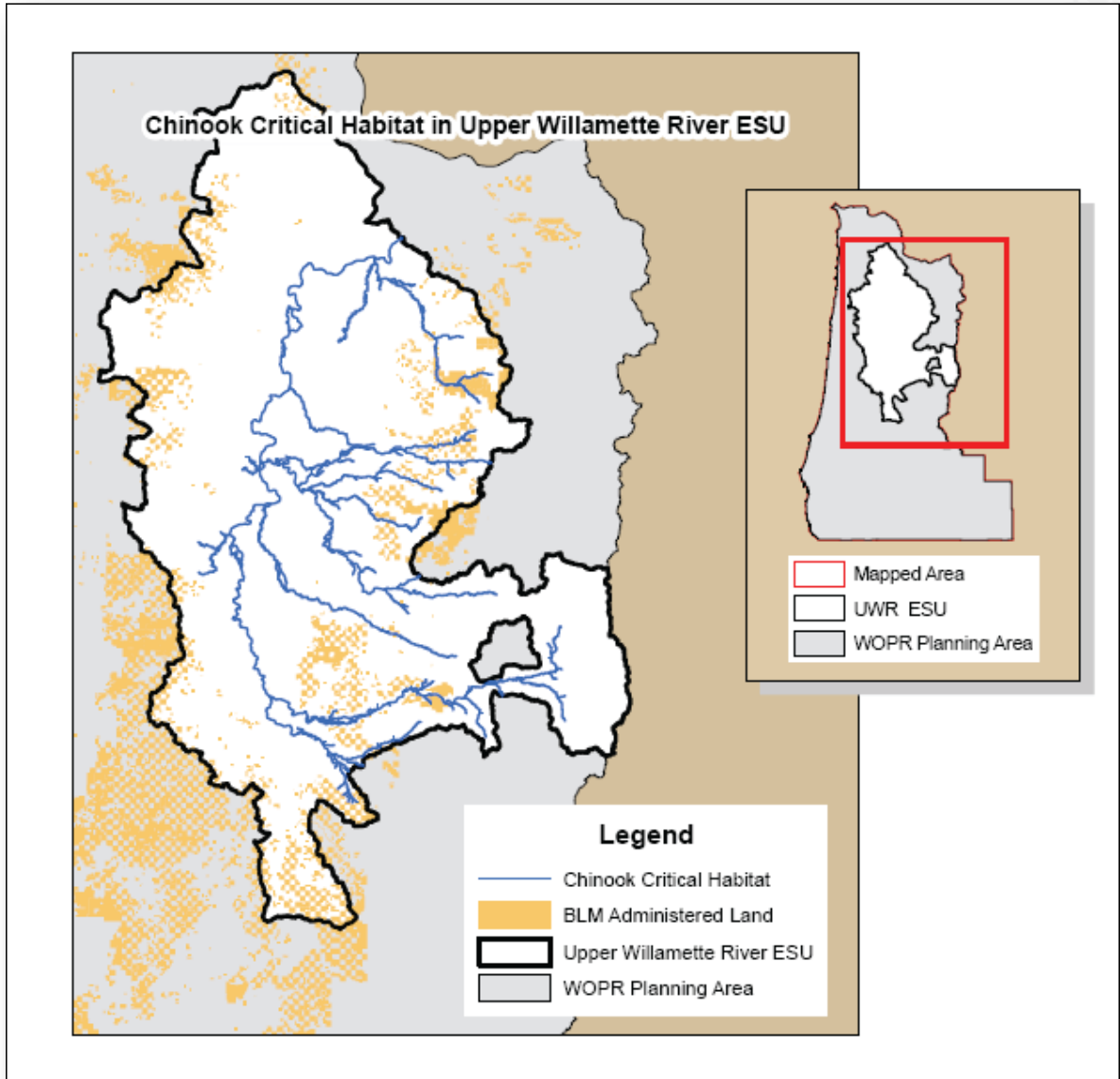
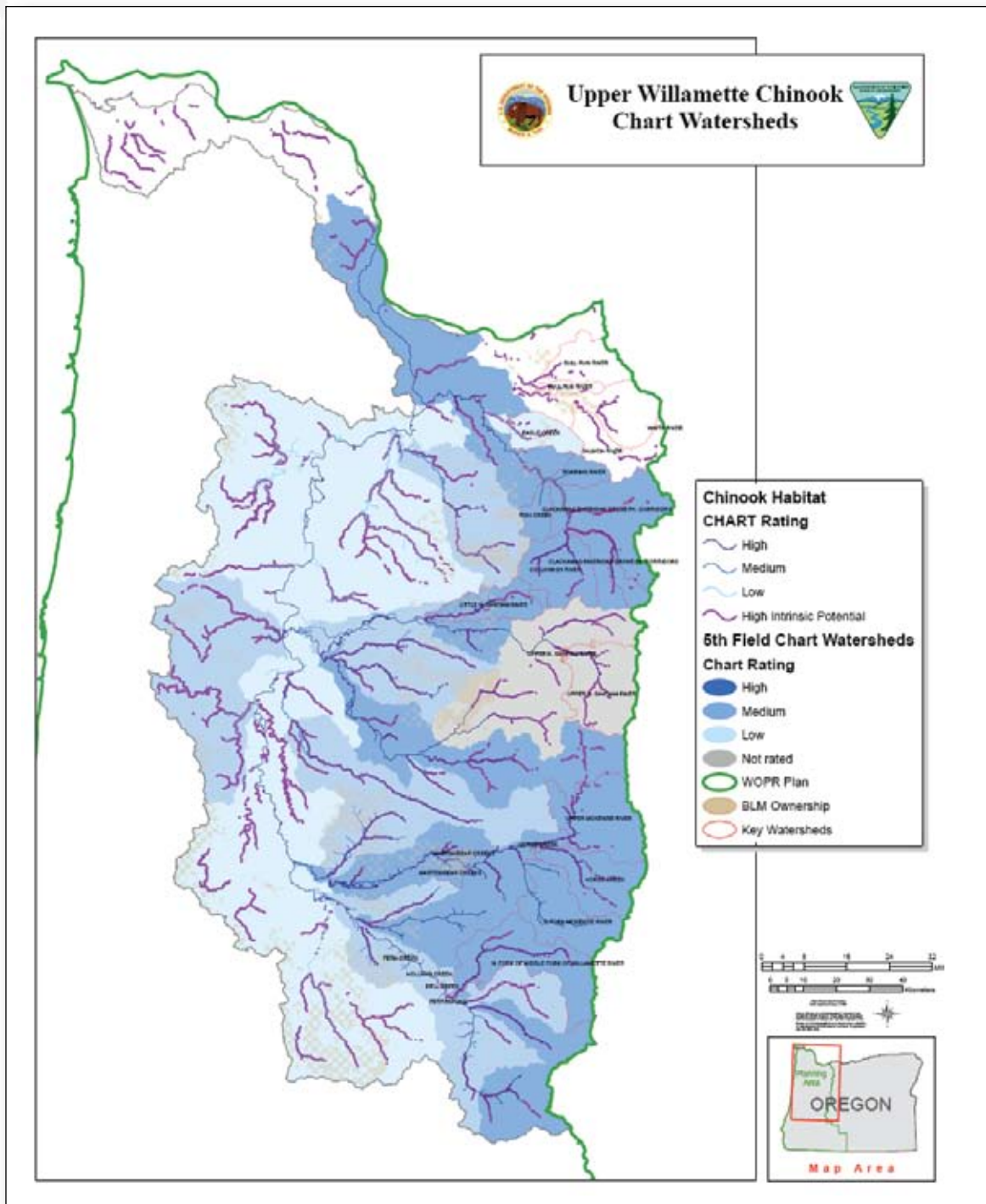




FIGURE J-15. UPPER WILLAMETTE RIVER CHINOOK CHART STREAMS AND WATERSHEDS







# Upper Willamette River Steelhead Distinct Population Segment

*Status of the Species (Myers et al. 2006, UWR Draft Recovery Plan 2007)*

## ***Life History***

Only one run (winter-run) of steelhead historically was found in the Willamette above the Falls. The Upper Willamette steelhead ESU historically supported a large number (over 200 thousand) of late-run, native, winter steelhead returning to three river basins: the Molalla; the Santiam; and the Calapooia; all located upstream from Willamette Falls. These basins all drain the Cascade Range from the east. Willamette River tributaries that drain the Coast Range from the west (West Side Tributaries) represent an area of intermittent use by steelhead, which may be important for recovery, but are not classified as historical independent populations. Upper Willamette steelhead run-timing is viewed as an adaptive response to flow conditions at Willamette Falls prior to laddering of the falls. The majority of the run ascends Willamette Falls in late March and April; spawning typically occurs from April to early June. Unlike the Upper Willamette Chinook, which are sexually immature upon return to natal streams, Upper Willamette (native) winter steelhead enter freshwater and ascend to their natal basins as sexually mature fish and spawn rather quickly after reaching the spawning grounds. Supported by the three above noted river basins, the Upper Willamette Steelhead ESU consists of four historical populations: Molalla, North Santiam, South Santiam, and Calapooia; all four continue to support native late-run steelhead. Genetic analysis indicates a close affinity between winter steelhead populations in the North and South Santiam, Molalla, and Calapooia rivers. Natural- or hatchery-produced summer and early-run winter steelhead are genetically distinct from late-run native steelhead.

In general, resident and anadromous life histories of resident rainbow and anadromous steelhead are considered components of a population unless they have been isolated reproductively from each other because of life history differences or long-standing natural barriers. For example, rainbow trout in the McKenzie River have been identified as genetically distinct from winter steelhead in the upper Willamette Steelhead ESU.

The life history of native steelhead exhibits considerable variability. Juveniles most often overwinter in freshwater for two winters before migrating to the ocean during the spring; however, they may migrate to the ocean after spending one to four winters in freshwater, typically in higher elevation and gradient headwater streams. Most adults return to spawn after spending two summers in the ocean, but a small proportion of a brood may return after spending one, three, or four summers in the ocean. Steelhead may spawn more than once, returning to the ocean between spawning periods.

## ***Populations***

After a decade in which overall abundance (from Willamette Falls count) was near the lowest levels on record, adult returns for 2001 and 2002 were higher; with similar levels to those in the 1980s.

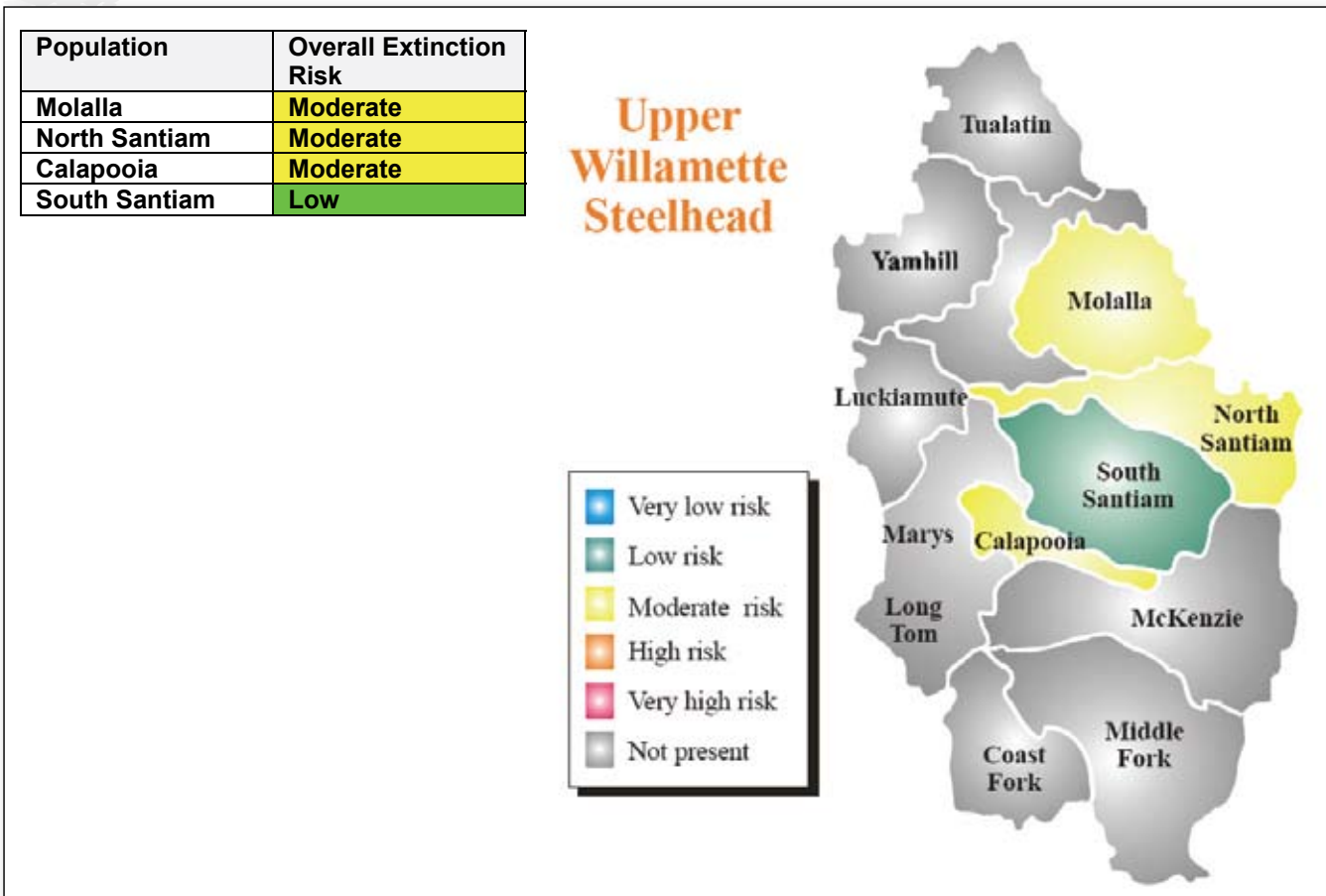
Three of the populations are estimated to be at moderate risk of extinction. See *Figure J-16 (Extinction risk determinations for the Upper Willamette River Steelhead DPS)*.

## ***Status and Distribution***

The Upper Willamette River Steelhead Distinct Population Segments were federally listed as threatened in March of 1999 by the National Marine Fisheries Service. Recovery planning for this DPS is in progress.



**FIGURE J-16.** EXTINCTION RISK DETERMINATIONS FOR THE UPPER WILLAMETTE RIVER STEELHEAD DPS



The following are the summary of factors contributing to the decline of Upper Willamette Steelhead (NMFS 1996) (factors in bold are those that BLM can influence).

- Urbanization
- Habitat blockages
- **Logging**
- Predation
- Harvest
- Agriculture

The BLM-administered land within the planning area comprises approximately six percent of the DPS. There are 2,086 stream miles in this DPS occupied by the Upper Willamette River steelhead; with 80 of the miles on BLM-administered land. See *Table J-6 (Distribution of Upper Willamette River steelhead salmon in DPS and on BLM-administered lands within the planning area)* and *Figure J-17 (Upper Willamette River steelhead evolutionary significant unit within the planning area)*.

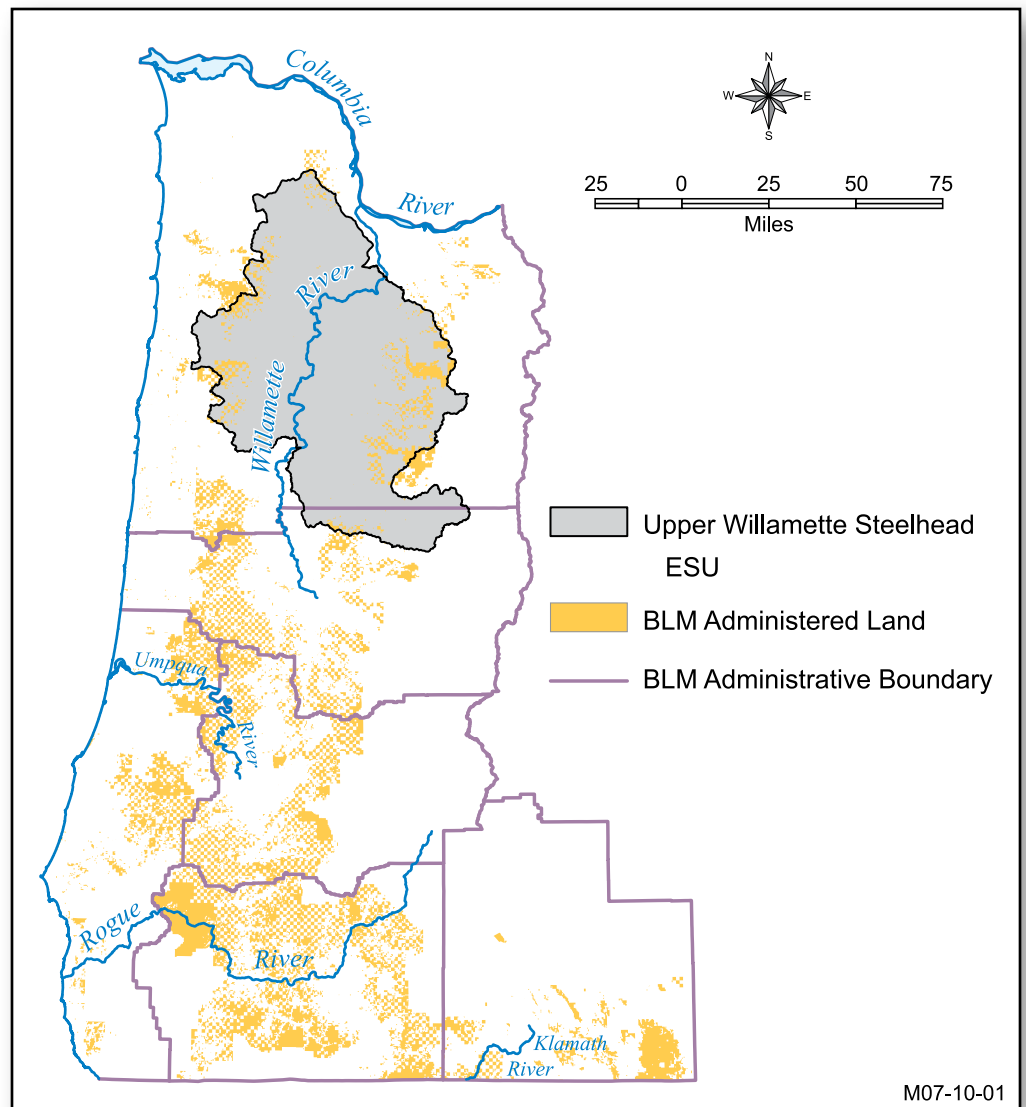


**TABLE J-6. DISTRIBUTION OF UPPER WILLAMETTE RIVER STEELHEAD SALMON IN THE DPS AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

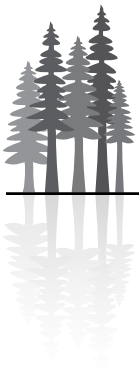
District and Ownership		Acres in ESU	Steelhead Miles in ESU (Plan Area)	Critical Habitat Miles (Entire ESU)
Salem District	BLM	178,281	80	42
	Other	2,711,622	1913	1,018
Eugene District	BLM	8,707	<1	0
	Other	228,444	93	79
Total	BLM	186,988 (6%)	80	42
	All	3,127,055*	2,086	1,139

\*All includes acres in DPS outside planning area.

**FIGURE J-17. UPPER WILLAMETTE RIVER STEELHEAD EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



M07-10-01



### Key Limiting Factors Identified For the Upper Willamette River Steelhead Populations

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Upper Willamette River DPS, were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

- Degraded Habitat – *Floodplain Connectivity and Function*
- Degraded Habitat – *Channel Structure and Complexity*
- Degraded Habitat – *Riparian Areas and LWD Recruitment*
- Degraded Habitat – *Stream Flow*
- Degraded Habitat – *Fish Passage*

### Status of Critical Habitat

Critical habitat was designated July of 2005. There are 42 miles of critical habitat on BLM-administered lands in this DPS. See *Figure J-18 (Upper Willamette River steelhead critical habitat in entire DPS and on BLM-administered lands within the Western Oregon Plan revision area)* and *Figure J-19 (Upper Willamette River steelhead CHART streams and watersheds)*.

**FIGURE J-18. UPPER WILLAMETTE RIVER STEELHEAD CRITICAL HABITAT IN THE ENTIRE DPS AND ON BLM-ADMINISTERED LANDS WITHIN THE WESTERN OREGON PLAN REVISION AREA**

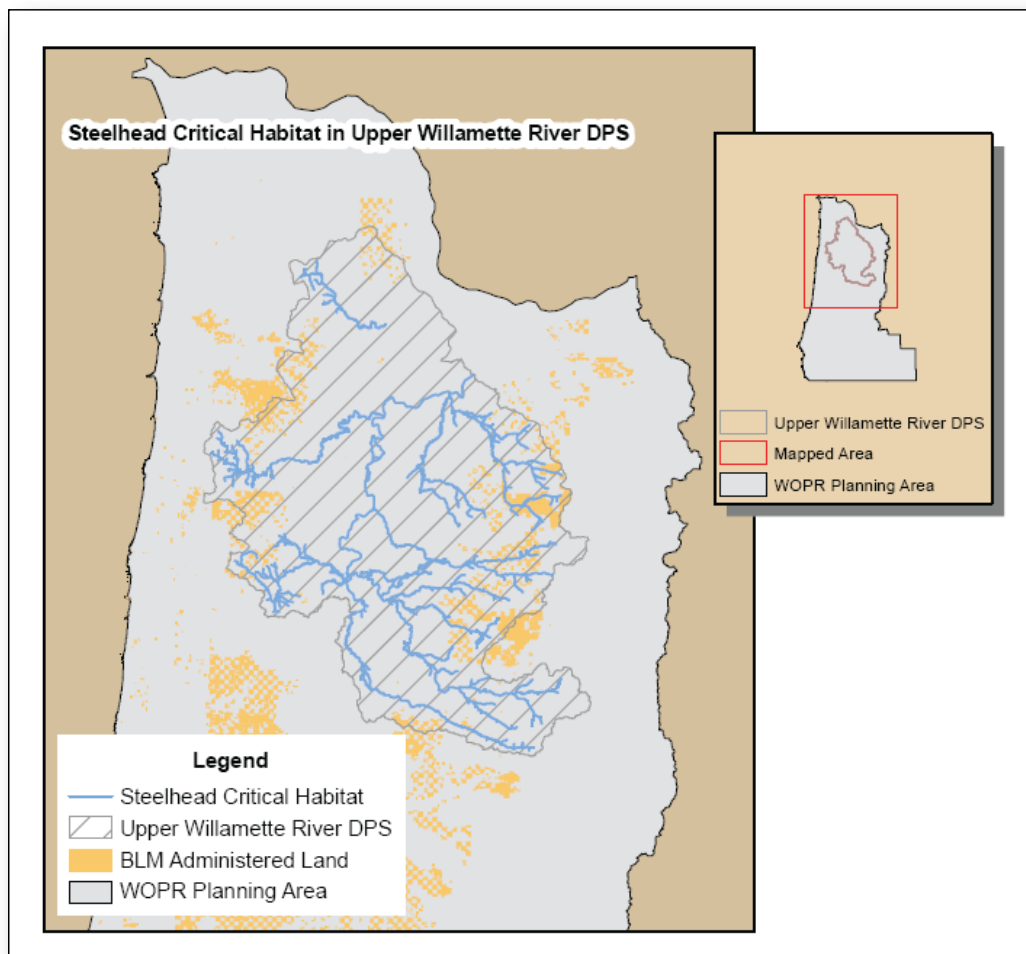
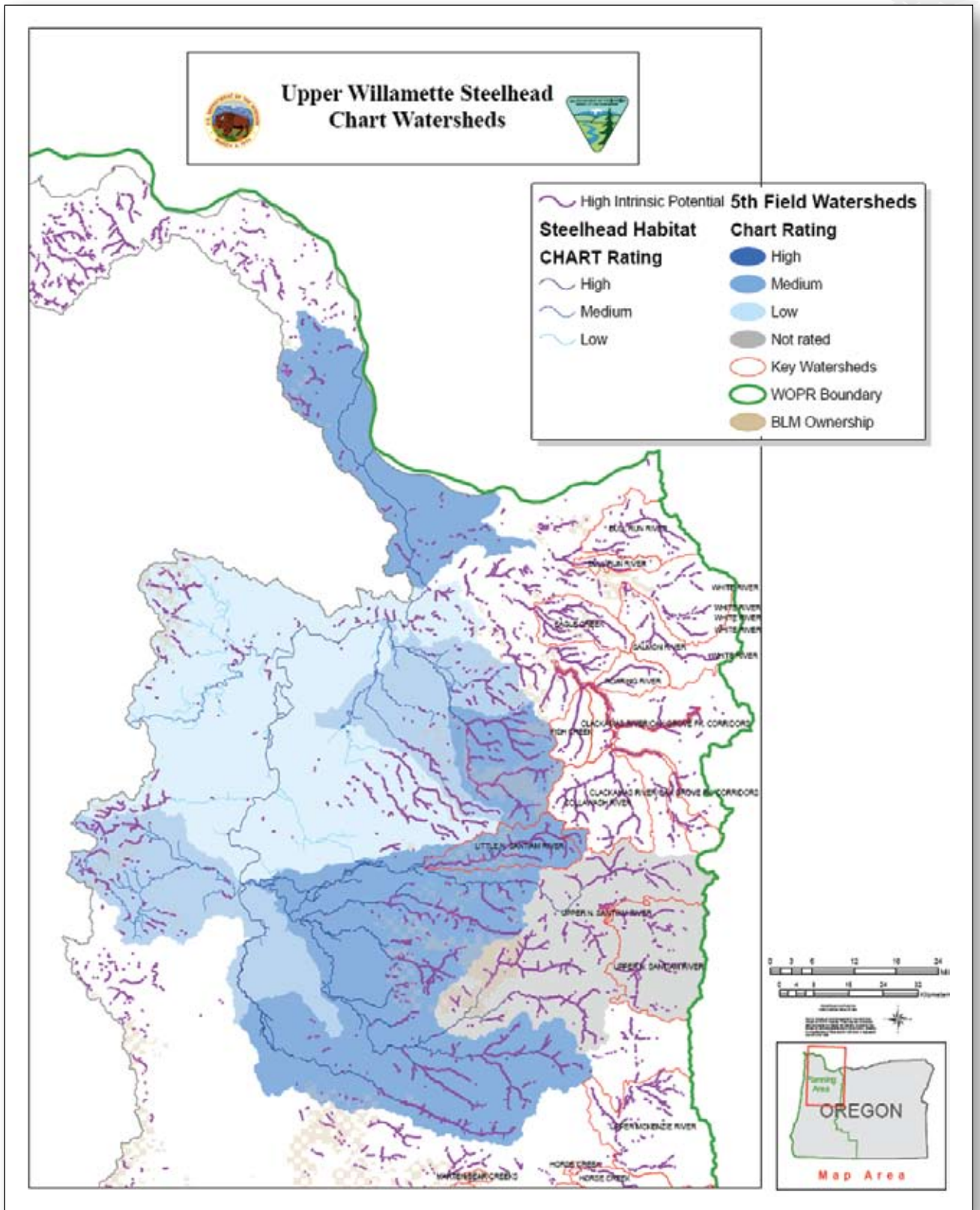




FIGURE J-19. UPPER WILLAMETTE RIVER STEELHEAD CHART STREAMS AND WATERSHEDS





## Oregon Coast Coho Evolutionary Significant Unit

### *Status of the Species (Oregon Coast Conservation Plan 2007)*

#### ***Life History***

Coho from this ESU are present in the ocean from northern California to southern British Columbia, but the bulk of the ocean harvest of coho from this ESU would be expected to be off the Oregon coast. The vast majority of coho migrates as juveniles through estuaries to the ocean after spending one winter in freshwater and then spends two summers in the ocean before returning to spawn as 3-year old adults in the autumn and winter. Coho salmon normally spawn in relatively small tributaries with moderate to low gradient stream reaches and, as adults, return to spawning areas close to where they were hatched. Juvenile coho salmon migrate to the ocean as smolts in the spring, typically from late April, May, and early June. As smolts, coho may be present in estuaries for a period of weeks to perhaps a month during their migration to the ocean. Oregon Coast coho tend to make relatively short ocean migrations.

#### ***Populations***

The Oregon Coast coho ESU includes naturally produced coho salmon in 56 populations, as defined by the National Oceanic and Atmospheric Administration (NOAA) Technical Recovery Team (Lawson et al. 2004.) Coho salmon are widely distributed in large and small Oregon Coastal river basins in this ESU and were historically well distributed in Oregon tributaries to the Columbia River. Coho were the most abundant salmon species in rivers of the Oregon Coast Coho ESU and were the most numerous species in commercial and recreational catches off the Oregon coast during the 1950s through the 1970s. Coho salmon have declined to historically low levels since the 1950s. However, returns of spawning coho to the Coast coho ESU since 2000 have been higher than decadal averages since the 1950s. This improvement is primarily related to two factors: 1) harvest related mortality in ocean fisheries has decreased from levels of over 80% to levels generally less than 15 percent, and 2) marine survival improved from the very low levels observed during the 1990s.

The Technical Recovery Team identified 56 coho populations as components of the ESU; 21 are classified as functionally or potentially independent and 35 are classified as dependent populations. See *Table J-7 (Conclusions from the 2005 Oregon Coast Coho Assessment viability analysis for Oregon Coast coho at the population, strata, and ESU level)*.

#### ***Status and Distribution***

The Oregon Coast Coho ESU was listed as threatened in February of 2008.

The BLM-administered land within the planning area comprises 16 percent of the ESU. There are 6,470 stream miles in this ESU occupied by the Oregon Coast Coho Salmon within the planning area, with 673 of the miles on BLM-administered land. See *Table J-8 (Distribution of Oregon Coast coho salmon in ESU and on BLM-administered lands within the planning area)* and *Figure J-20 (Oregon Coast coho salmon evolutionary significant unit within the planning area)*.

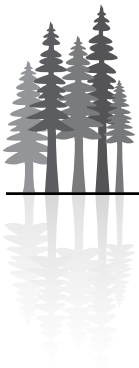


**TABLE J-7. CONCLUSIONS FROM THE 2005 OREGON COAST COHO ASSESSMENT VIABILITY ANALYSIS FOR OREGON COAST COHO AT THE POPULATION, STRATA, AND ESU LEVEL**

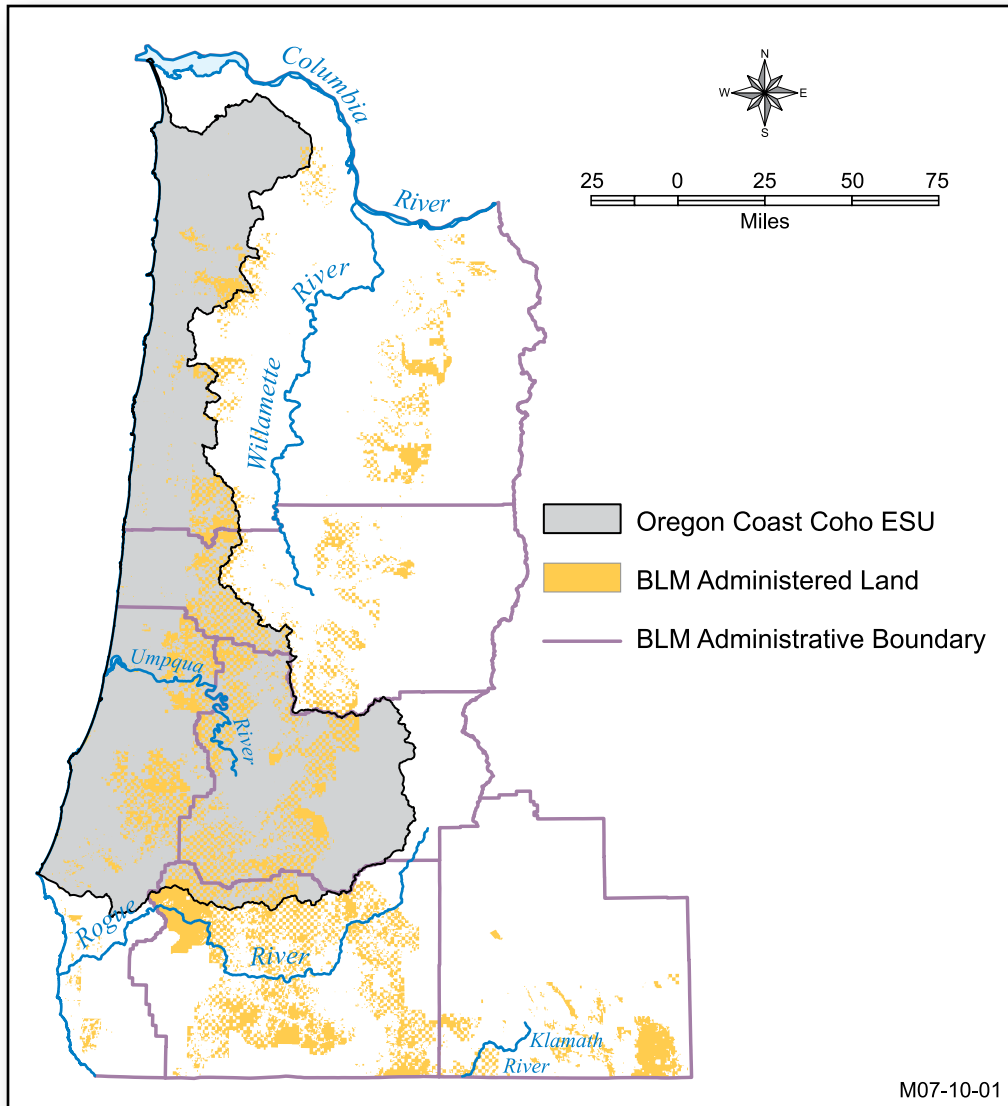
ESU Criteria Conclusion	Geographic Stratum	Stratum Criteria Conclusion	Populations	Populations Criteria Conclusions
Pass	Northern	Pass	Necanicum	Pass
			Nehalem	Fail
			Tillamook	Fail
			Nestucca	Pass
	North-Central	Pass	Salmon	Fail
			Siletz	Fail
			Yaquina	Pass
			Beaver	Pass
			Alsea	Fail
			Siuslaw	Pass
	Umpqua	Pass	Lower Umpqua	Pass
			Mid Umpqua	Pass
			North Umpqua	Fail
			South Umpqua	Pass
	Lakes	Pass	Siltcoos	Pass
			Tahkenitch	Pass
			Tenmile	Pass
	South-Central	Pass	Coos	Pass
			Coquille	Pass
			Floras	Pass
Sixes			Fail	

**TABLE J-8. DISTRIBUTION OF OREGON COAST COHO SALMON IN ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

District and Ownership		Acres in ESU	Coho Miles in ESU (Plan Area)	Critical Habitat Miles (Entire ESU)
Salem District	BLM	151,071	80	83
	Other	1,919,642	2,288	2,354
Eugene District	BLM	137,246	139	151
	Other	468,687	679	751
Roseburg District	BLM	424,967	201	197
	Other	1,676,855	1,145	1,109
Coos Bay District	BLM	295,595	221	231
	Other	1,502,448	1,578	1,661
Medford District	BLM	82,689	32	30
	Other	133,789	107	94
Total	BLM	1,091,568 (16%)	673	693
	All	6,792,989	6,470	5,970



**FIGURE J-20. OREGON COAST COHO SALMON EVOLUTIONARY SIGNIFICANT UNIT WITHIN THE PLANNING AREA**



**Key Limiting Factors Identified for the Oregon Coast Coho ESU**

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Oregon Coast Coho ESU, were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

- stream complexity
- water quality

**Status of Critical Habitat**

Critical habitat was designated February of 2008. There are 693 miles of critical habitat on BLM-administered lands in this ESU. See Figure J-21 (*Oregon Coast coho critical habitat in the entire ESU and on BLM-administered lands within the Western Oregon Plan Revision area*) and Figure J-22 (*Oregon Coast coho CHART streams and watersheds*).





**FIGURE J-21. OREGON COAST COHO CRITICAL HABITAT IN THE ENTIRE ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE WESTERN OREGON PLAN REVISION AREA**

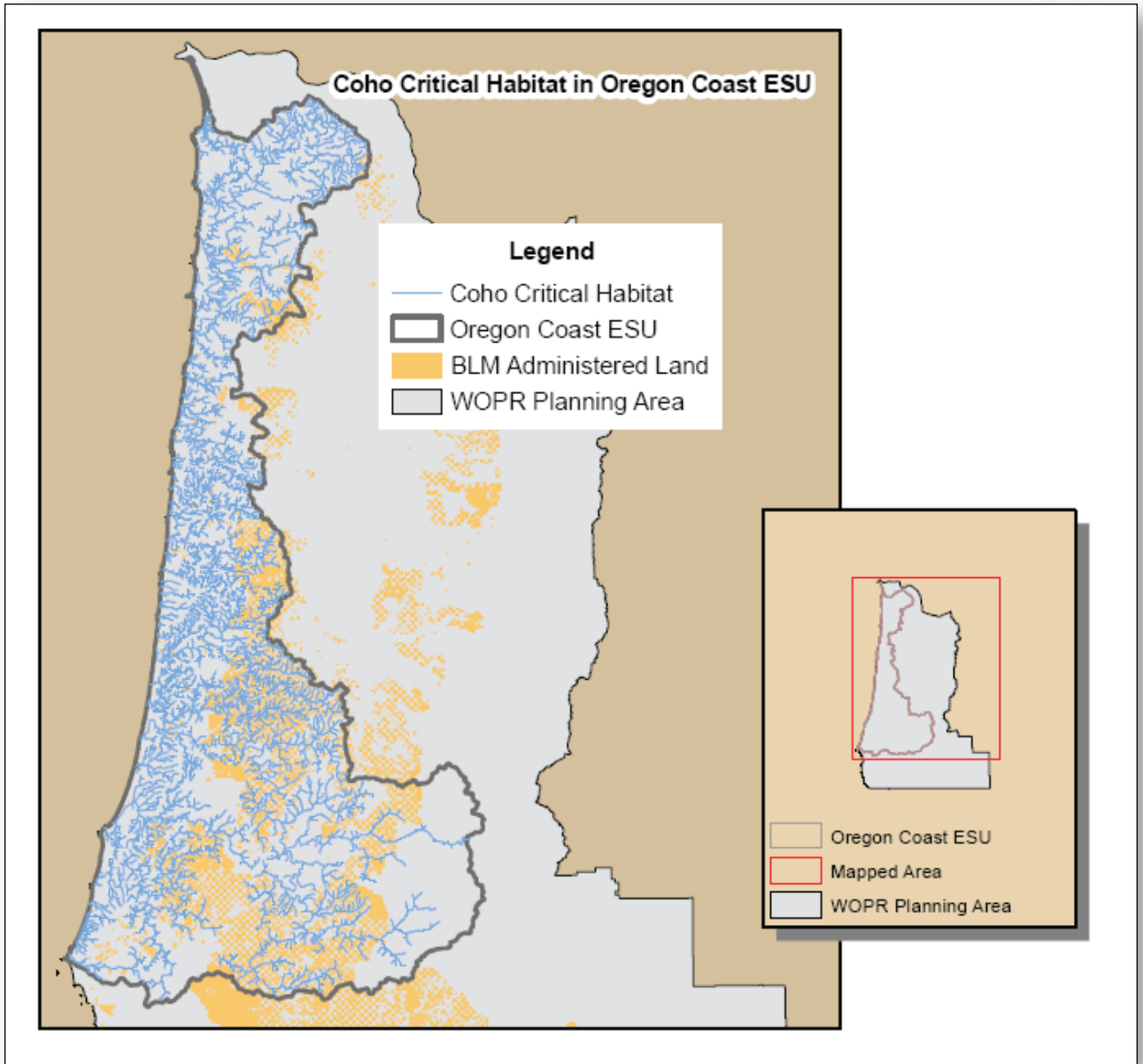
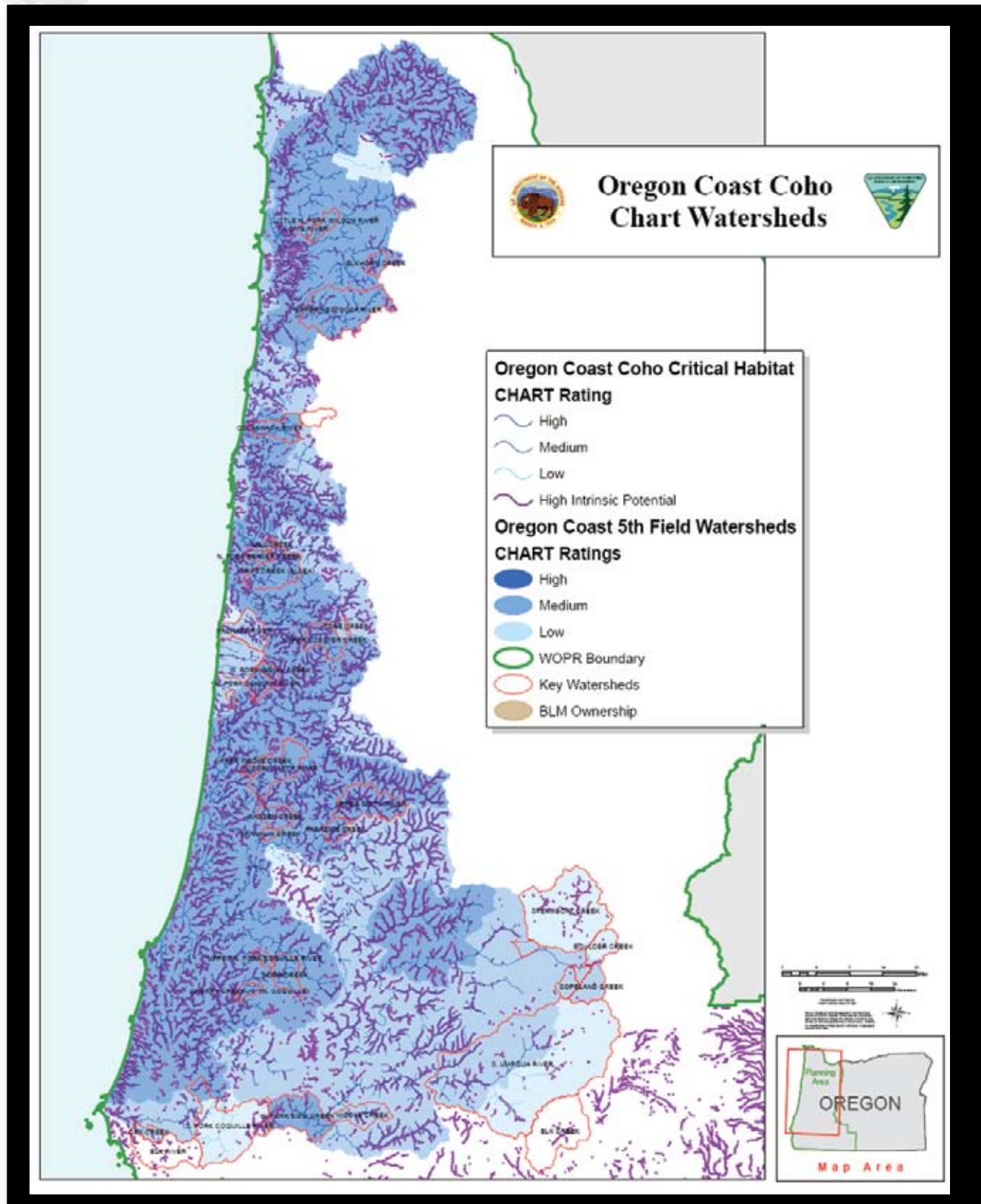




FIGURE J-22. OREGON COAST COHO CHART STREAMS AND WATERSHEDS





# Southern Oregon/Northern California Coast Coho Salmon Evolutionary Significant Unit

## *Status of the Species*

### *Life History*

The Southern Oregon/Northern California Coast coho ESU (SONCC) includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California (62 FR 24588; May 6, 1997). The majority of coho migrates as juveniles through estuaries to the ocean after spending one winter in freshwater and then spend two summers in the ocean before returning to spawn as 3-year old adults in the autumn and winter. Coho salmon normally spawn in relatively small tributaries with moderate to low gradient stream reaches and, as adults, return to spawning areas close to where they were hatched. Juvenile coho salmon migrate to the ocean as smolts in the spring, typically from late April, May, and early June. As smolts, coho may be present in estuaries for a period of weeks to perhaps a month during their migration to the ocean.

### *Populations*

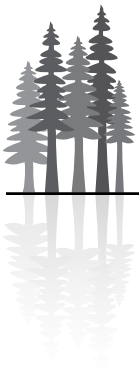
The SONCC coho ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Three artificial propagation programs are considered to be part of the ESU: the Cole Rivers Hatchery (Oregon Department of Fish and Wildlife (ODFW), Trinity River Hatchery, and Iron Gate Hatchery coho programs.

The estimated historical abundance of the SONCC coho ESU is 150,000. The recent mean abundance is 5,170, which is the highest such abundance since 1980. However, this estimated abundance is derived from the only reliable time series of adult abundance for the naturally spawning component of the SONCC coho ESU – the Rogue River population in southern Oregon. The California portion of the ESU is characterized by a paucity of data, with only a few available spawner indices and presence-absence surveys. Less reliable indices of spawner abundance in several California populations exist, and suggest flat or declining trends. Relatively low levels of observed presence in historically occupied coho streams (32–56 percent from 1986 to 2000) indicate continued low abundance in the California portion of this ESU.

Three rivers have hatchery populations and natural populations that are depressed throughout the range of the ESU. Although extant populations reside in all major river basins within the ESU, there are concerns about the loss of local populations in the Trinity, Klamath, and Rogue River systems. The high hatchery production in these systems may mask trends in ESU population structure and pose risks to ESU diversity. The overall ESU trend since the time of listing or first review shows that productivity has remained unchanged, and population abundance has remained unchanged.

The following are the summary of factors contributing to the decline of Southern Oregon / Northern California Coho Salmon (70 FR 37160) (factors in bold are those that BLM can influence).

- **Habitat blockages**
- Historic Flooding
- Predation
- **Water Diversion/extraction**
- Poaching
- Agriculture
- Hatchery introgression
- **Logging**
- Harvest
- **Mining**

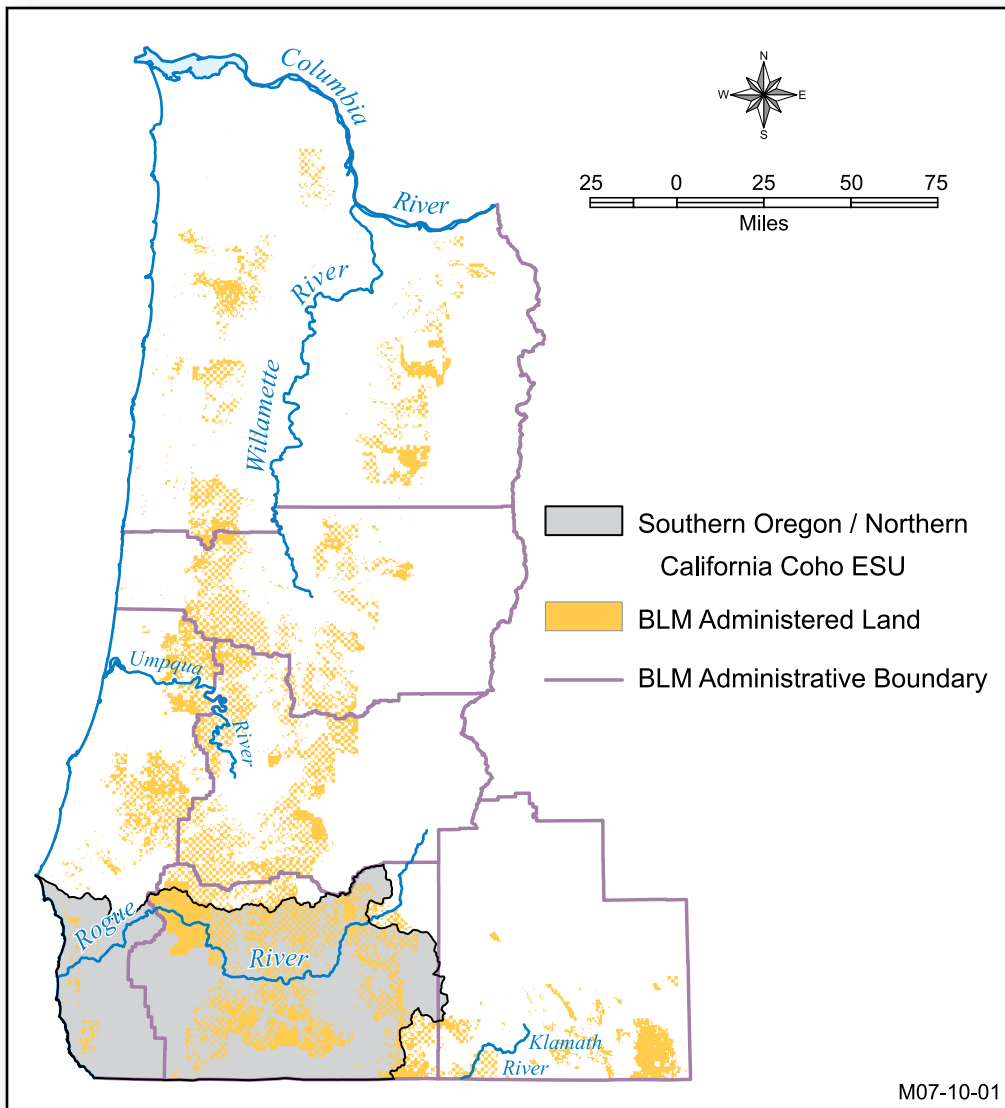


**Status and Distribution**

The Southern Oregon/Northern California Coast coho salmon Evolutionarily Significant Unit was federally listed as threatened in May of 1997 by the National Marine Fisheries Service. Recovery planning for this ESU is in progress.

The BLM-administered land within the planning area comprises 6 percent of the ESU. Within the planning area, there are 1,242 stream miles in this ESU occupied by Southern Oregon/Northern California Coast coho; with 128 of the miles on BLM-administered land. See *Table J-9 (Distribution of Southern Oregon/Northern California Coast coho salmon in ESU and on BLM-administered lands within the planning area)* and *Figure J-23 (Southern Oregon/Northern California Coast coho salmon ESU)*.

**FIGURE J-23. SOUTHERN OREGON/NORTHERN CALIFORNIA CALIFORNIA COAST COHO SALMON ESU**





**TABLE J-9.** DISTRIBUTION OF SOUTHERN OREGON/NORTHERN CALIFORNIA COAST COHO SALMON ESU AND ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA

District and Ownership		Acres in ESU	Coho Miles in ESU (Plan Area)	Critical Habitat Miles (Entire ESU)
Roseburg District	BLM	222	0	Not Available
	Other	561	0	Not Available
Coos Bay District	BLM	26,622	2	Not Available
	Other	788,370	316	Not Available
Medford District	BLM	706,610	126	Not Available
	Other	1,847,492	926	Not Available
Klamath Falls Resource Area	BLM	838	0	Not Available
	Other	12,020	0	Not Available
Total	BLM	734,292 (6%)	128	Not Available
	All	11,538,731	1,242	Not Available

**Key Limiting Factors Identified For the Southern Oregon / Northern California Coho ESU  
(NOAA SW Regional Office 2008)**

Limiting factors outside BLM's control are not listed here. The following limiting factors, and their level of threat to the Oregon Coastal Coho ESU, were identified in the 2006 Pacific Coastal Salmonid Restoration Fund Report to Congress:

- Degraded Habitat - *Floodplain Connectivity & Function*
- Degraded Habitat - *Channel Structure & Complexity*
- Degraded Habitat - *Riparian Areas & Large Woody Debris Recruitment*
- Degraded Habitat - *Stream Substrate*
- Degraded Habitat - *Stream Flow*
- Degraded Habitat - *Water Quality*
- Degraded Habitat - *Fish Passage*

**Status of Critical Habitat**

Critical habitat was designated in May 1999. Critical habitat for this ESU includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). The GIS data is not available for critical habitat distribution in this ESU.

**Shortnose and Lost River Suckers**

**Status of Species (USFWS 1993)**

**Life History**

Lost River and shortnose suckers are large, long-lived and omnivorous suckers that generally spawn in rivers or streams and then return to the lake. Both sucker species have a limited geographic range, and are endemic to the Upper Klamath Basin of Northern California and Southern Oregon. However, both species have separate populations that spawn near springs in Upper Klamath Lake. Lost River suckers from Upper Klamath Lake can be up to 43 years old. Lost River suckers are one of the largest sucker species and may obtain a length of up to 1 meter in total length. Sexual maturity for suckers in Upper Klamath Lake occurs



between the ages of 6 to 14 years, with most maturing at age 9, with most growth in Upper Klamath Lake occurring mainly during the first 8 to 10 years of life. Both species of suckers are lake dwelling but spawn in tributary streams or springs. For stream spawning populations, shortnose and Lost River suckers begin their spawning migration into the Williamson and Sprague Rivers in late March or early April, with spawning activity often continuing well into May. Larval Lost River and shortnose suckers usually spend relatively little time in tributary streams and migrate back to the lake shortly after swim up.

### **Populations**

Early records indicate that Lost River and Shortnose suckers were once widespread and abundant in the upper Klamath Basin of Oregon and California (USFWS website). Currently, the Lost River sucker occupies only a fraction of its former range and is restricted to a few areas in the Upper Klamath Basin, such as the drainages of Upper Klamath Lake, Tule Lake, and Clear Lake (USFWS website).

Declining population trends for both species were noted as early as the mid-1960s, but the severity of the population declines was not evident until the early 1980s. The adult sucker monitoring program (USGS) information on the current status of sucker populations in the Upper Klamath Basin indicates there has been no significant recruitment into the adult population in the last few years (USGS).

### **Status and Distribution**

The Lost River and Shortnose Suckers were federally listed as endangered July of 1988 by the U.S. Fish and Wildlife Service. Recovery Plans for these fish species were completed in March of 1993. Critical habitat was proposed in 1994 (Federal Register 59:61744).

Section 4(c)(2)(A) of the Endangered Species Act requires a review of listed species at least once every 5 years. The U.S. Fish and Wildlife Service completed a comprehensive review of the Lost River sucker and the shortnose sucker in 2007 (USFWS 2007). After completing the five-year status review, the U.S. Fish and Wildlife Service found the Lost River Sucker not in immediate danger of extinction because populations have persisted and stabilized following mortality events and because significant habitat restoration efforts have been completed and are planned for the future. Additionally, because a reproducing population of Lost River Suckers is also found in Clear Lake, the U.S. Fish and Wildlife Service believes this population redundancy further reduces the imminence of extinction. While the U.S. Fish and Wildlife Service does not believe Lost River Sucker is currently at imminent risk of extinction, the U.S. Fish and Wildlife Service does believe that Lost River Suckers are at risk of becoming endangered within the foreseeable future due to the continuing threat of water quality related die-offs in Upper Klamath Lake. According to the Endangered Species Act, a threatened species means "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." This definition most accurately describes the current status of the Lost River Suckers; therefore, the U.S. Fish and Wildlife Service recommended that Lost River Sucker be down-listed to threatened. However, since the 5-year review was completed the U.S. Fish and Wildlife Service has not taken any final agency action (i.e., Federal Register Notice) that downgrades the listing to "threatened."

The final rule listing the Lost River and Shortnose suckers as endangered species included the following factors for their decline (Federal Register 53:27130-27134) (factors in bold are those that BLM can influence):

- damming of rivers
- dredging and draining of marshes
- water diversions
- hybridization, competition and predation by exotic species
- Insularization of habitat
- **water quality problems associated with timber harvest, removal of riparian vegetation, livestock grazing, and agricultural practices** (A shift toward hyper-eutrophication in Upper Klamath Lake has been documented (Miller and Tash 1967, Vincent 1968) and is considered by the Service to be a probable cause for the decline of Lost River and shortnose suckers and a major limiting factor in recovery of the species (USDI 1993). Tule Lake, lower portions of the Lost River, Lake Ewauna, and the upper Klamath River also have severe water quality problems associated with hypereutrophication. Over-harvest and chemical contamination also may have contributed to the decline (USDI 1993).



The BLM-administered land within the planning area comprises 1% of the range. There are 225 stream miles occupied by the Lost River Sucker; with 10 of the miles on BLM-administered land. There are 303 miles occupied by the Shortnose sucker; with 50 of the miles on BLM-administered land. See *Table J-10 (Distribution of Lost River and Shortnose Suckers on BLM-administered lands within the planning area)* and *Figure J-24 (Fifth-field watersheds in the range of Lost River and Shortnose Suckers within the Western Oregon Plan Revision area)*.

### Status of Critical Habitat

Critical habitat was proposed in 1994, but not finalized.

### Conservation Measures and Recovery

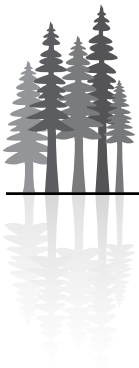
The interim objective is to establish at least one stable refugial population with a minimum of 500 adult fish for each unique stock of both Lost River and shortnose suckers (USDI 1993). A list of recovery “tasks” for BLM administered-lands are included in the recovery plan. See *Table J-11 (Recovery “tasks” listed in the sucker recovery plan for BLM [USDI 1993])*.

**TABLE J-10. DISTRIBUTION OF LOST RIVER AND SHORTNOSE SUCKERS ON BLM-ADMINISTERED LANDS WITHIN THE PLANNING AREA**

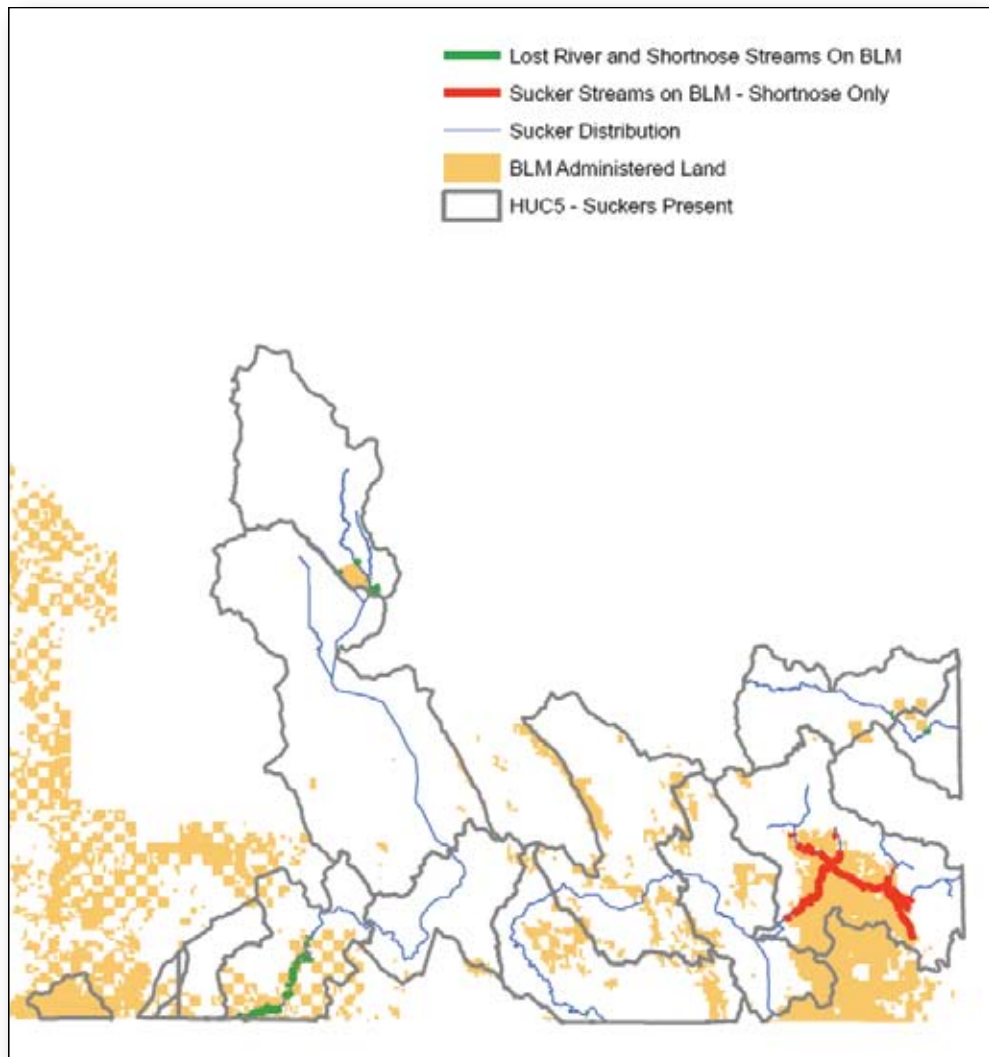
District and Ownership		Acres in Range of the Species	Lost River Sucker Miles in the Planning Area	Shortnose Sucker Miles in the Planning Area
Medford District	BLM	14,632	0	0
	Other	6,296	0	0
Klamath Falls Resource Area	BLM	145,246	10	50
	Other	1,058,990	215	253
Total	BLM	159,878 (1%)	10	50
	All	11,225,164	225	303

**TABLE J-11. RECOVERY “TASKS” LISTED IN THE SUCKER RECOVERY PLAN FOR BLM**

BLM Recovery Tasks for the Suckers	
1.	Determine distribution and abundance of suckers in Gerber Reservoir and small reservoirs in the Lost River system.
2.	Determine habitat requirements of suckers in Upper Klamath Lake.
3.	Develop and implement a plan to monitor habitat and water quality conditions for all populations.
4.	Identify and secure riparian land parcels for rehabilitation.
5.	Develop and implement riparian management unit rehabilitation plans.
6.	Identify land parcels for wetland rehabilitation.
7.	Secure, develop and implement areas for pilot wetland rehabilitation projects.
8.	Develop and implement a long-term plan for wetland rehabilitation.
9.	Develop and implement a plan to reduce impacts of other upland management practices such as forestry, grazing, and farming.
10.	Investigate alternative ways to balance water demands for Clear Lake.
11.	Develop and implement a plan to secure adequate water levels and flows for stable sucker populations in Clear Lake.



**FIGURE J-24. FIFTH-FIELD WATERSHEDS IN THE RANGE OF LOST RIVER AND SHORTNOSE SUCKERS WITHIN THE WESTERN OREGON PLAN REVISION AREA**



## Bull Trout

### *Status of the Species (USFWS 2002)*

In the planning area, there are seven miles of bull trout on BLM-administered lands in the Lower McKenzie River fifth-field watershed of the Eugene District BLM. There are no bull trout streams on BLM-administered land in any other bull trout DPS (or District) within the planning area.

### *Life History*

Bull trout have more specific habitat requirements than most other salmonids. Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning. Spawning and rearing areas are often associated with cold-water springs, groundwater infiltration, and/or the coldest streams in a watershed. Bull trout exhibit both resident and migratory life-history strategies. Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (afluvial form), river (fluvial form) or in certain coastal areas, to saltwater (anadromous). Resident and migratory forms may be found together, and either form may give rise to offspring exhibiting either resident or migratory behavior. The size and age of bull trout at maturity depends





upon life-history strategy. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs. Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented.

### ***Populations***

Bull trout are native throughout the Pacific Northwest. In Oregon, bull trout were historically found in the Willamette River and major tributaries on the west side of the Oregon Cascades, the Columbia and Snake Rivers and major tributaries east of the Cascades, and in streams of the Klamath basin. Currently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers. In the Columbia River Basin, bull trout historically were found in about 60 percent of the basin. They now occur in less than half of their historic range. Populations remain in portions of Oregon, Washington, Idaho, Montana and Nevada.

### ***Status and Distribution***

The Bull Trout (Columbia River) Distinct Population Segment was federally listed as threatened in June of 1998 by the U.S. Fish and Wildlife Service. Critical habitat has not been designated on federal lands. A draft recovery plan was completed in October of 2002. The Klamath DPS also occurs in the planning area; however, there are no occupied stream miles on BLM-administered lands.

While bull trout occur over a large area, their distribution and abundance has declined and several local extinctions have been documented. Many of the remaining populations are small and isolated from each other, making them more susceptible to local extinctions.

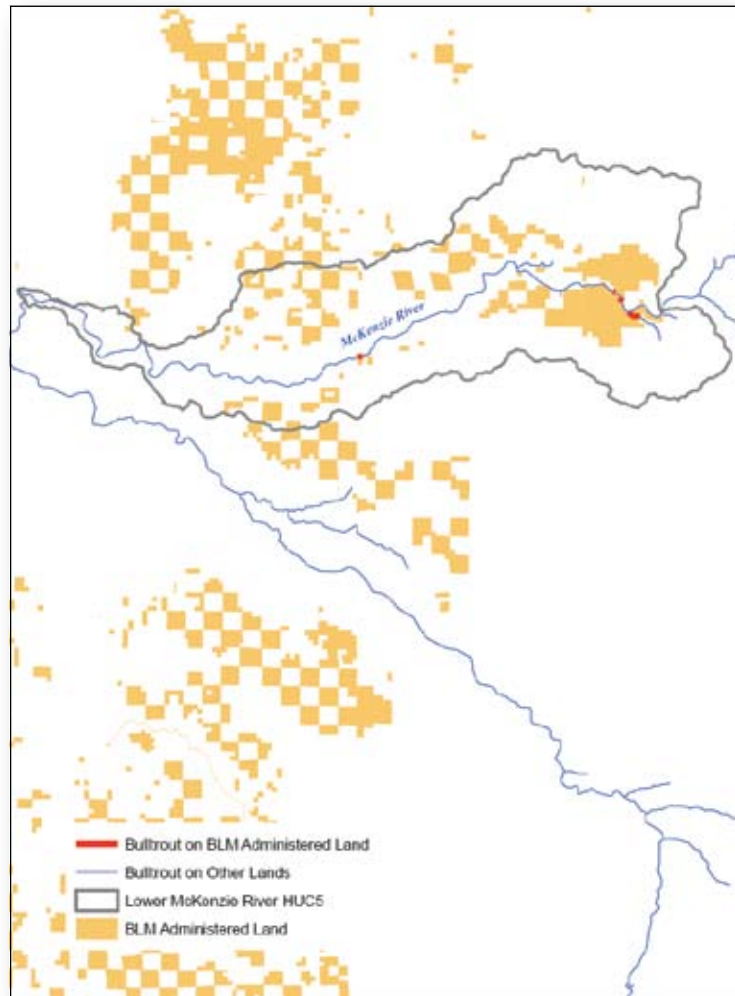
The BLM-administered land within the planning area comprises 3.3% of the DPS's. There are 606 stream miles in the DPS occupied by the bull trout; with 7 of the miles on BLM-administered land. See *Table J-12 (Distribution of Bull Trout in DPS and on BLM-administered lands within the planning area)* and *Figure J-25 (Bull trout distribution on BLM-administered lands within the Western Oregon Plan Revision area)*. All of the bull trout stream miles on BLM-administered lands occur within the Lower McKenzie River fifth-field watershed. There are 165,080 acres in the watershed; of which 25,891 (16%) acres are on BLM-administered lands.

**TABLE J-12. DISTRIBUTION OF BULL TROUT IN THE DPS AND ON BLM-ADMINISTERED LANDS IN THE PLANNING AREA**

District and Ownership		Acres in DPS	Acres in Lower McKenzie River Watershed	Bull Trout Miles in DPS (Plan Area)
Eugene District	BLM	53,277	25,981	7
	Other	1,545,637	139,099	269
Total	BLM	53,277 (3.3%)	25,981	7
	All	1,545,637	165,080	606



**FIGURE J-25. BULL TROUT DISTRIBUTION ON BLM-ADMINISTERED LANDS WITHIN THE WESTERN OREGON PLAN REVISION AREA**



### ***Conservations Measures and Recovery***

The Willamette River Recovery Unit is the only recovery unit within the planning area where bull trout occur on BLM-administered lands.

Five management components were identified for bull trout conservation on federal lands for planning, designing, and implementing management actions within bull trout recovery units (USDI 2002). According to the recovery plan, federal land management agencies should consider these five components when analyzing potential effects of their plans or actions on bull trout (USDI 2002).

A list of recovery “tasks” for BLM administered-lands are included in each of the Recovery Plan Units. See *Table J-13 (Recovery plan conservation measures for bull trout)*.

**TABLE J-13. RECOVERY PLAN CONSERVATION MEASURES FOR BULL TROUT**

<b>BLM Recovery Task For Willamette Recovery Unit</b>
1. Coordinate bull trout recovery monitoring in the Willamette River basin with the monitoring program for the Oregon Plan for Salmon and Watersheds.
2. Participate in efforts by local and regional (basin-wide) watershed groups and others to accomplish site-specific protection and restoration activities.

Source: USDI 2002



## Oregon Chub

Oregon chub are endemic to the Willamette River Valley of western Oregon. Although information is scarce, historically, the Oregon chub likely existed throughout the lower elevations of the Willamette River valley. The current distribution is limited to approximately 20 naturally occurring populations and four reintroduced populations (Santiam River, Middle Fork Willamette River, Coast Fork Willamette River, McKenzie River, and several tributaries to the Main stem Willamette River downstream of the Coast Fork/Middle Fork confluence). Almost all of the populations are small and isolated and do not occur on BLM-administered lands within the WOPR planning area.

## Recovery Planning

Draft recovery plans for the Willamette/Lower Columbia River chinook, coho, chum, and steelhead are currently available on the National Marine Fisheries Service website. Recovery plans for Lost River and Shortnose suckers are available on the U. S. Fish and Wildlife Service website.

# Modeling

## Wood Delivery Model

### Introduction

The large wood delivery model is a spatially explicit, Geographic Information System-based wood recruitment model developed for this analysis to determine the potential large wood contribution to fish-bearing streams from BLM-administered lands. The potential wood contribution is determined to all streams over entire channel networks, including wood recruitment processes for channel-adjacent tree fall, mass wasting, and channel migration. Model inputs are digital elevation and forest cover, with detailed forest stand tables specifying stem density, size, and mortality rates for each size class in each stand type. Outputs are calculated wood recruitment rates to each delineated stream reach and rates of wood supply to channels from each DEM cell. Calculated rates are referenced to input stand characteristics and represent the mean annual wood contribution to channels from the specified conditions over time. For each given spatial distributions of stand types, the outputs are summarized to compare wood recruitment by different processes, pieces and stream size, ownership, and scales, under different management scenarios.

### Assumptions and Methods

See the *Fisheries Planning Criteria* in this appendix for detailed information about assumptions and methodology.

### Source Data for Modeling

See the *Fisheries Planning Criteria* in this appendix for detailed information about analysis steps and the source data used in the modeling.



## General Description of Methodology

This model is used to evaluate the relative effect of different management alternatives on aquatic habitat was to examine potential differences in the rate of wood recruitment to stream channels among the alternatives considered. Wood comes to streams via a variety of processes (Bilby and Bisson 1998) with rates that vary in space and time. Three processes were evaluated:

- trees in riparian areas that die and fall into streams (e.g., Sobota et al. 2006)
- wood carried by landslides and debris flows to streams (e.g., Reeves et al. 2003)
- trees that fall into streams because of bank erosion and channel migration (Latterell and Naiman 2007)

Several factors govern the rate at which wood is supplied to channels by each of these processes. Of primary importance are the number and size of trees available for recruitment to the channel. The spatial distribution of stand types determines in large part the rate at which wood inputs to the channel will occur, and changes in stand characteristics over time determine the degree to which recruitment rate changes over time. Hence, modeled wood recruitment rates depend explicitly on outputs from the OPTIONS scheduling model and the ORGANON stand growth model that OPTIONS uses.

The OPTIONS output files for the wood delivery model contains the WPR\_ID for every resultant GIS polygon for each alternative. The OPTIONS output files for the wood delivery model were derived from State of Forest (SOF run at 5-year intervals along with and Activity and Volume files for the duration of the run. From these files, treatment activity and harvest history were tracked for each WPR\_ID (management polygon). For each WPR\_ID the stand attributes over time were extracted from an Index Lookup Table containing ORGANON Stand Table information. An Index Lookup Table was compiled from ORGANON Guide and Treatment Curves. This table contains the ORGANON summary of stand-level information for All Possible Treatments. These data include live and dead tree statistics, harvested TPA (trees per acre) and average height by 1-inch diameter class split into conifer and hardwood groupings. Entries were compiled for all possible combinations of commercial harvest entries. These All Possible Treatments are the potential combinations of OPTIONS modeled commercial harvest entries. For example, a particular Species Group and Productivity Class modeled to potentially receive 2 CTs (Commercial Thinnings) will have five different treatment combinations:

- No harvest modeled
- No CTs, RH (Regeneration Harvest) only
- First CT only with RH
- Second CT only with RH
- First and Second CTs with RH

The wood delivery model input data is generated based on the OPTIONS output files. For each WPR\_ID, the activity history is derived and the corresponding 'all treatment' curve is identified. Structure Stage is calculated, the latest treatment is stored within the report and, based on the age of the WPR\_ID at the corresponding 5yr interval, the stand parameters are looked up from the Index Lookup Table and also saved within the wood delivery model report. The OPTIONS model uses stand attributes derived from the FOI (Forest Operations Inventory) and the CVS inventory along with stand-level growth and management projections developed with the ORGANON model. The OPTIONS output files for the wood delivery model report derives the activity history for each individual WPR\_ID. With this, the appropriate "All Possible Treatments" curve was identified from a crosswalk table. Then, based on the age of the WPR\_ID, the corresponding 5-year interval was selected for that curve from the Index Lookup Table and the ORGANON-derived stand parameters were added to the report. The Stand Structure was calculated for the stand at that point in time, and that along with the latest OPTIONS treatment are saved within the Wood Delivery Model Report for each WPR\_ID for every 5-year report interval.

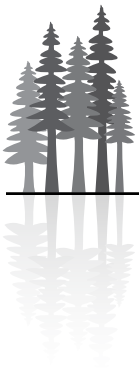


Topography also poses a primary control on wood recruitment rates, particularly for landslide and debris-flow recruitment. Basin topography determines the locations where different recruitment processes occur and so affects the spatial pattern of recruitment rates. Because topography (in our model) does not change over time, it has no effect on temporal changes in recruitment rate. The wood delivery model focused on recruitment, not on in-stream wood abundance. The two are intimately related, because the amount of wood in a stream system depends on the accumulation of recruited wood over time, minus wood lost to decay. Several factors complicate estimates of wood abundance. Because wood can persist in a stream for many years, wood abundance depends explicitly on the temporal sequence of recruitment events. Moreover, wood can be carried downstream and redeposited by fluvial processes. The sequence of storms, which drive recruitment events, and floods, which redistribute wood, can create large temporal and spatial variability in wood abundances within a channel system (Benda et al. 2003). To avoid these complicating factors, and to greatly simplify the modeling tasks, the model focused solely on estimating recruitment rates for a specified spatial distribution of stand types, and did not attempt to model wood abundances over time and space. Changes in estimated recruitment rates among alternatives provide one metric to assess the relative influence of different management alternatives on aquatic habitat.

For all of the modeled processes, wood inputs are associated with distinct events, with potentially long intervals with little or no wood recruitment. A frequency distribution of recruitment rates (e.g., in number of pieces per year) for any specified portion of a channel network is highly skewed, with little or no inputs most of the time, and large inputs some of the time (Benda et al. 2003). The mean of this frequency distribution is determined to apply as a measure of wood recruitment potential. Mean recruitment rate provides a measure to assess differences in recruitment potential for the different spatial distribution of stand characteristics predicted with the OPTIONS model under each of the proposed management alternatives. However, differences in mean recruitment rate between processes can be difficult to interpret, because of differences in the frequency distribution of recruitment events. Wind and rain may cause dead or dying trees in riparian zones to topple, so that storms may trigger wood inputs to a stream reach from riparian zones every few years to decades; landslides or debris flows may deposit wood in a reach only every few centuries (May and Gresswell 2004). The relationship between mean recruitment rate and the frequency of recruitment events can differ dramatically between processes. Likewise, the volume of wood delivered in a single recruitment event may differ dramatically between recruitment processes. These differences in the frequency of occurrence, and the volume of wood involved with a single occurrence, hinder direct comparison of recruitment rates among processes. Hence, differences in mean recruitment rate between alternatives must be evaluated independently for each modeled process.

Different algorithms and data are required for each recruitment process. To estimate inputs from mortality of riparian trees, the following were determined:

- The number and location of dead or dying trees that may fall. These are estimated from the outputs of the ORGANON stand growth model used by OPTIONS. For each stand type, a tree list is used that provides the density (in stems per acre) of trees that have died (over a five-year time step) by species (conifer and hardwood) and size (diameter) class. It was assumed that all dead trees fall during the next time step
- The slope gradient at each tree location (trees on steeper slopes are more likely to fall in a downslope direction than trees on less steep slopes). This is calculated from the 10-m DEM.
- The location of falling trees relative to the channel edge. Channel-edge locations are based on channel centerlines traced using flow-paths derived from the DEM, with channel width estimated using regional regressions to drainage area (Castro and Jackson 2001, Clarke et al. 2008).
- The probability that a falling tree intersects the channel. This probability is derived from an empirical probability density function for fall direction (Sobota et al. 2006) together with the location of all channel edges within a distance less than or equal to the tree height.
- The diameter of the tree bole where it intersects the channel. Tree boles were approximated as a cone, with a diameter-at-breast-height (using a breast height of 1.4 meters) based on the size class for the tree (from the tree lists) tapering linearly to zero at the tree height.



The digital elevation model (DEM) is used as a spatial reference. Streams are traced from the DEM (Clarke et al. 2008) and stand-type polygons are referenced to DEM cell boundaries. Channel-edge segments are defined where traced channel edges (centerline plus a buffer of one half the estimated channel width) cross DEM cells. For each channel segment, DEM point is found within a tree height of the segment to calculate the probability that: a) a tree within that stand is dead (and ready to fall), and b) if a tree at that point falls, it hits the channel segment.

This calculation is repeated for every DEM point and integrated to the probabilities over all DEM cells. This gives the probability that a tree falls into the channel segment. This is repeated for all channel segments and for all tree species and size classes, summing results by piece-size classes for each segment. This procedure provides the annual probability for wood recruitment from each DEM cell and the annual probability of recruitment to each channel segment. These probabilities are interpreted as average rates. For example, if the calculated annual probability for input of wood to a reach is 0.1, it is interpreted as a recurrence interval of 10 years; that is, one piece every ten years, or an average rate of 0.1 pieces per year. The results are then summed over specified sets of reaches (e.g., all BLM-owned, fish-bearing reaches in a fifth-field hydrologic-unit-code basin).

To estimate wood inputs from debris flows, the following were determined:

- The locations of potential debris flow tracks, and the recurrence interval for debris flows that traverse each track. Debris-flow locations were estimated using empirical topographically driven models (Miller and Burnett 2007, 2008) calibrated to landslide data from throughout the plan area and to debris-flow tracks mapped by the Oregon Department of Forestry following the large 1996 storms (Robison et al. 1999). Recurrence intervals are based on data for low-order channels in the Coast Range reported by May and Gresswell (2004), who estimate a recurrence interval for debris flows to ~3rd order channels of about 350 years.
- The number of live and dead trees available along the debris-flow track. These values are obtained from the tree lists output by OPTIONS. The DBH of each tree is used as the diameter for the recruited piece of wood.
- The number of pieces contributed (per year) by dead trees from adjacent areas falling into the track. This number is estimated using the same procedure described above for riparian recruitment to stream channels.
- The probability for debris flow scour and deposition along each potential track, based on data from the 1996 storm study (Miller and Burnett 2008, Robison et al. 1999).
- The average width of a debris-flow track, set to 6 meters based on data in Robison et al. (1999).

To estimate the number of pieces of wood carried to a stream channel by a potential debris flow, the number of trees available along the track within each DEM cell traversed by the track is summed, and multiplied by the probability that a debris flow will traverse the cell. If the stem density for the stand indicates (on average) 10 trees per 10-meter DEM cell, 6 of these will be incorporated into a 6-meter-wide debris flow. If the estimated recurrence interval for a debris flow to traverse the cell is 500 years, that gives 6 trees recruited (into the debris flow) every 500 years, or 0.012 trees per year. These values along all potential debris flow tracks are summed. To estimate the proportion of the accumulated wood that is deposited (on average, for all the debris flows that may traverse each cell), the proportional downslope decrease is determined in debris flow probability. If the probability decreases by 1% from one cell to the next, 1% of the accumulated wood is left in the cell.

In some cases, a large proportion of the wood carried by debris flows is not from the current stand, but has been excavated from wood deposited in previous debris-flow deposits (May 2002). To estimate debris-flow recruitment rate from a specified spatial distribution of stand types, it is important to account for the incorporation of wood from this stand into future debris flows. This is an estimated probability that a debris flow encounters wood deposited from a previous debris flow based on the recurrence interval. The probability that a future debris flow encounters a deposit containing wood from this stand is estimated as



one minus the probability that no debris flows had occurred over the recurrence interval for debris flows to that cell, i.e.,  $1 - (1-1/R)^R$ , where R is the recurrence interval in years. For values of R exceeding 100 years, this equation has a nearly constant value of 0.63; hence, we estimate a 63% probability (on average) that a future debris flow will encounter wood from this year's forest stands. However, over recurrence intervals of this length, any wood that is not buried in the deposit will likely be completely decayed. Benda and Dunne (1997) estimate from field observations that approximately 70% of debris-flow deposit volume resides in fans and terraces; hence we assume that 70% of the available wood is buried in these fans and terraces. This argument suggests that about 44% ( $0.63 \times 0.7$ ) of the deposited wood is available to future debris flows.

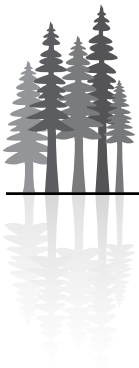
The modeling provides an estimate of the rate at which wood from the specified forest stands may be carried by debris flows to stream channels. The resulting value is a function of estimated debris flow recurrence intervals and wood availability. The model calibration accounts for regional differences in topographic controls on landslide susceptibility, but not for climatically and geologically controlled differences in landslide rate. Likewise, the debris-flow runout model is calibrated only to data from the Siuslaw basin in the Coast Range province (Miller and Burnett 2008). Hence, differences in basin- or region-wide average debris-flow recruitment rates reflect differences in topography and, primarily, differences in modeled stem density. Because there is no data to reliably estimate regional differences in average landslide rate, the calculated debris-flow wood recruitment rates undoubtedly suffer systematic errors that differ from province to province. However, because the errors are systematic, relative differences calculated for debris-flow recruitment rate between alternatives is indicative of the relative difference in actual recruitment rates. Therefore, these procedures provide a reliable measure of the relative difference in debris-flow wood recruitment between management alternatives, but the magnitude of these rates cannot be reliably compared to the magnitude calculated for other recruitment processes, or between regions.

Observational evidence indicates that landslide rate and the extent of debris flow runout vary with forest stand characteristics (Miller and Burnett 2007, 2008). For simplicity and to reduce modeling uncertainty, the debris flow probabilities in the analysis were modeled using a uniform non-forested land cover, with the resulting probability values multiplied by a constant value to give an average 350-year recurrence interval for debris flows to 3rd order channels for the basins studied by May and Gresswell (2004). This approach removed the effects of management on modeled debris flow probability, so that differences in calculated wood recruitment rates between alternatives and over time solely reflect differences in the amount of wood available to debris flows. Depending on the modeling approach and landslide inventory data source, the effects of forest-cover vary; which is why a uniform non-forested land cover was used to compare alternatives based on wood availability.

However, this strategy masks the effects of management on landslide potential. Therefore, these effects are modeled for three watersheds in the plan area to demonstrate the influence of forest-cover over time on landslide susceptibility. The potential wood contribution is shown using two different landslide data sets to demonstrate the variability of results for each data set used.

The magnitude of modeled wood recruitment rates vary between different landslide models. It is likely that every data set would give somewhat different results since the relative landslide rates would depend on the sequence of storms. For this, two data sets are used to show the both the variance between models and the effects of forest-cover on landslide susceptibility over time. The first data set is based on air photo landslide inventories over the entire WOPR planning area (Model 1). The second data set is based on the landslide inventory that was collected by the Siuslaw National Forest following the 1996 storm. The modeled recruitment rates were “normalized” by dividing all values by the results under the No Harvesting reference analysis at 2006. The results show how the predicted magnitude changes over time and gives the ability to compare the results using different data sets directly.

The results for each model were also “normalized” relative to the landslide density under un-forested conditions, so the difference between the models depends solely on the degree of change among different forest-cover classes.



The results under the Proposed RMP do not account for the No Harvest areas within the Riparian Management Area. The results should not be used to evaluate alternatives, but rather, to see the implications that differences in forest cover imply for the results.

Figures J-26 through J-28 show the potential wood contribution from debris flow sources relative to the No Harvesting reference analysis at 2106 from the contribution under the No Harvesting reference analysis at 2006, in the Upper Molalla River, Eagle Creek, and Upper Smith River watersheds for Model 1, Model 2, and with uniform non-forested land cover).

When debris flow probabilities are dependant on the spatial distribution of forest types over time, the results change depending on the degree to which the forest type influences landslide susceptibility over time. Under Model 1, there is a substantial reduction in landslide susceptibility between 0-10 year stands and the 10-100 year stands, with a smaller difference between the 10-100 and >100 year stands. In Model 2, there is a smaller difference between the 0-10 and 10-100 year stands, and a larger difference between the 10-100 and >100 year stands.

Model 1 shows that the potential wood contribution would change the results between alternatives. For example, Alternatives 2 and 3 provide less wood than Alternative 1 and Alternative 3 provides less than Alternative 2; the opposite of the results found using the uniform non-forest cover. This occurs because landslide susceptibility decreases in older forests. Using a static debris flow from a uniform non-forest cover, the results reflect the amount of wood “available” for debris flow recruitment over time based on the amount and size of trees available. When landslide susceptibility is based on forest cover, the results reflect both the amount of wood available and the imposed effect of forest cover on debris flow recurrence intervals. When different landslide raters are used from different data sets (Model 1 and Model 2), the ratios are different between forest types which gives different results. For example, under Model 1, the relative difference in landslide density between forest types is smaller (densities in older forests were 30% of those in stand establishment forests).

These results demonstrate how the influences of forest cover on landslide susceptibility influences debris-flow recruitment. Patterns of modeled recruitment rate over time and the potential wood recruitment to streams differs between models and watersheds. Model 2 is more similar to the results using a uniform forest cover than Model 1. This occurs because the 10-100 year landslide density in Model 2 is closer to that applied under the uniform scenario. Under Model 1, debris flow probabilities are generally reduced by age class, which consequently reduces the modeled debris-flow recruitment rate and reduces the proportion of debris flow wood contribution from the harvest land base and increases the amount of wood contribution from the riparian management area. Thus, Model 1 would show a greater wood contribution from alternatives with a more extensive riparian management area.

Based on these scenarios, utilizing the uniform forest cover for the analysis gives the best representation, with the least amount of uncertainty, in determining the amount of wood available under each alternative over time; since the modeled debris flow recruitment rate is based on 1) topographic controls on debris flow locations, and 2) the amount of wood available for debris flow recruitment.

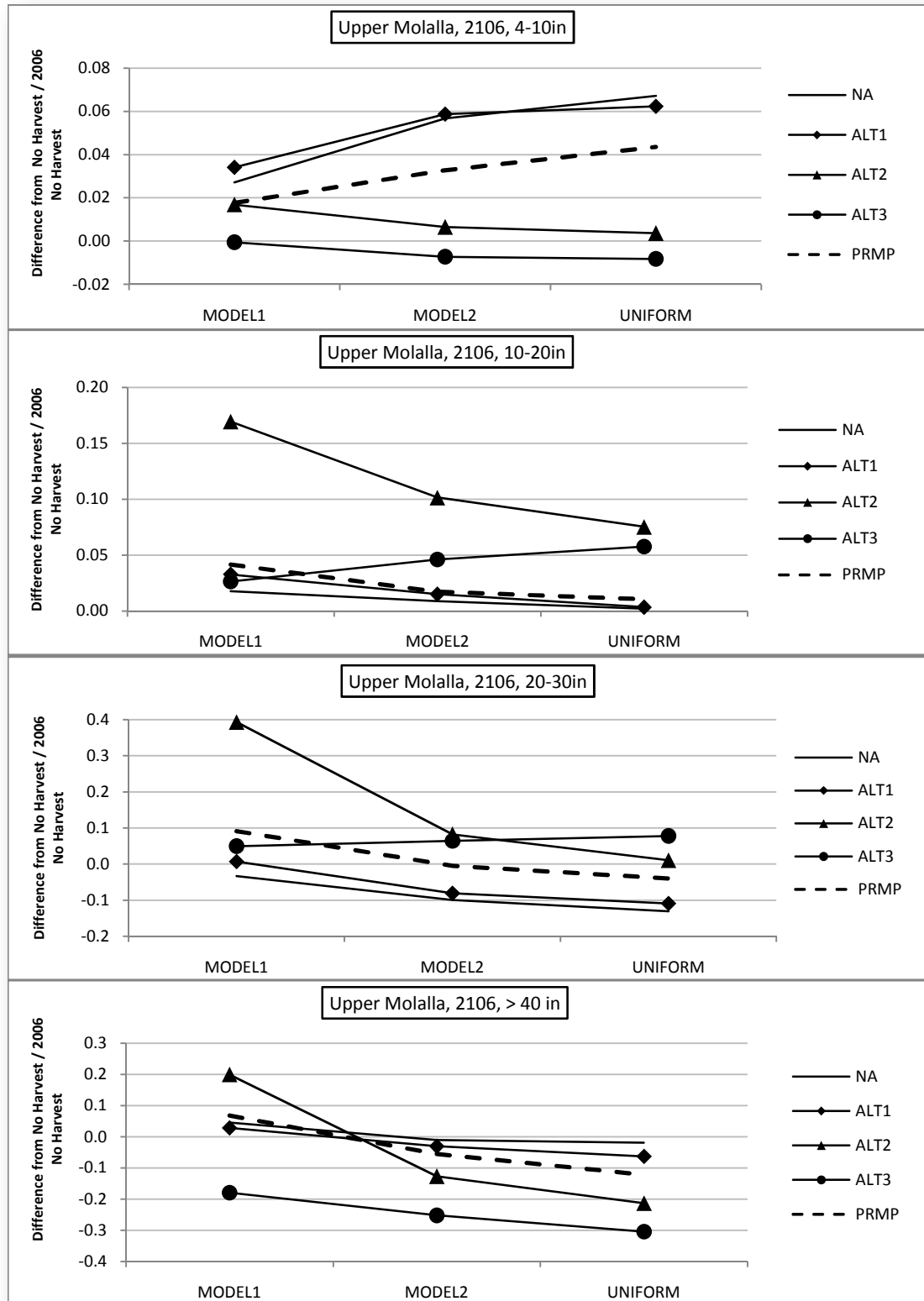
To estimate wood inputs from channel migration, the following was determined:

1. Channel migration (or bank erosion) rates. Due to the great variety of unquantified controlling factors, channel migration rates are not estimated. Rather, the floodplain area potentially susceptible to occupation by the channel is identified. This is done using the DEM, flagging all cells within 5 bankfull depths above the channel elevation (along flow lines to a channel cell). Then the assumption that a constant 0.01 probability for any point on the delineated floodplain to be occupied by the channel is used (e.g., every point on the floodplain is assessed by the channel on average once every century).
2. The number of live and dead trees available to be recruited by channel migration into the channel. Stem densities obtained from OPTIONS are multiplied by the delineated floodplain area.



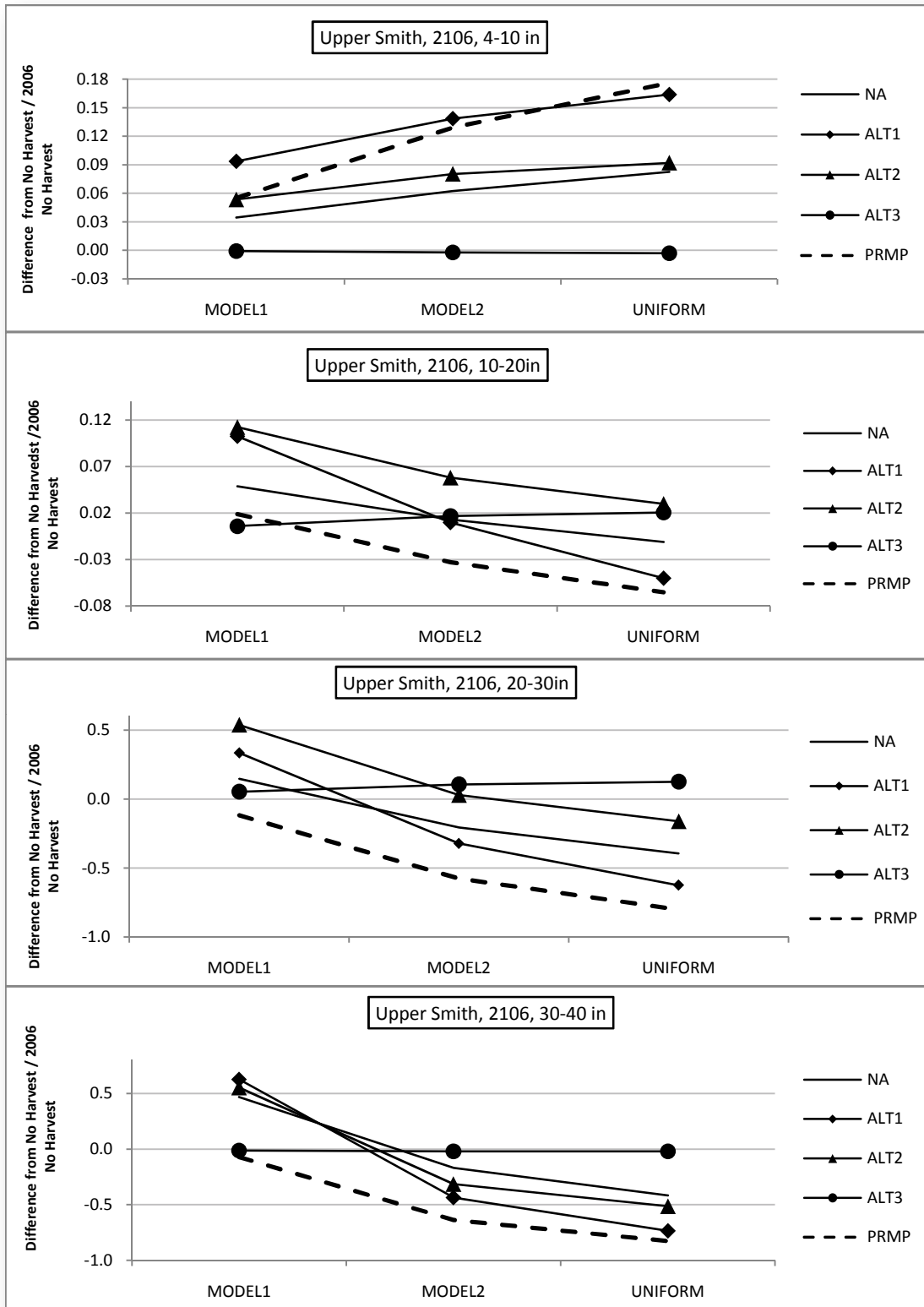


**FIGURE J-26. POTENTIAL WOOD CONTRIBUTION FROM DEBRIS FLOW SOURCES RELATIVE TO NO HARVESTING REFERENCE ANALYSIS IN THE UPPER MOLALLA WATERSHED**



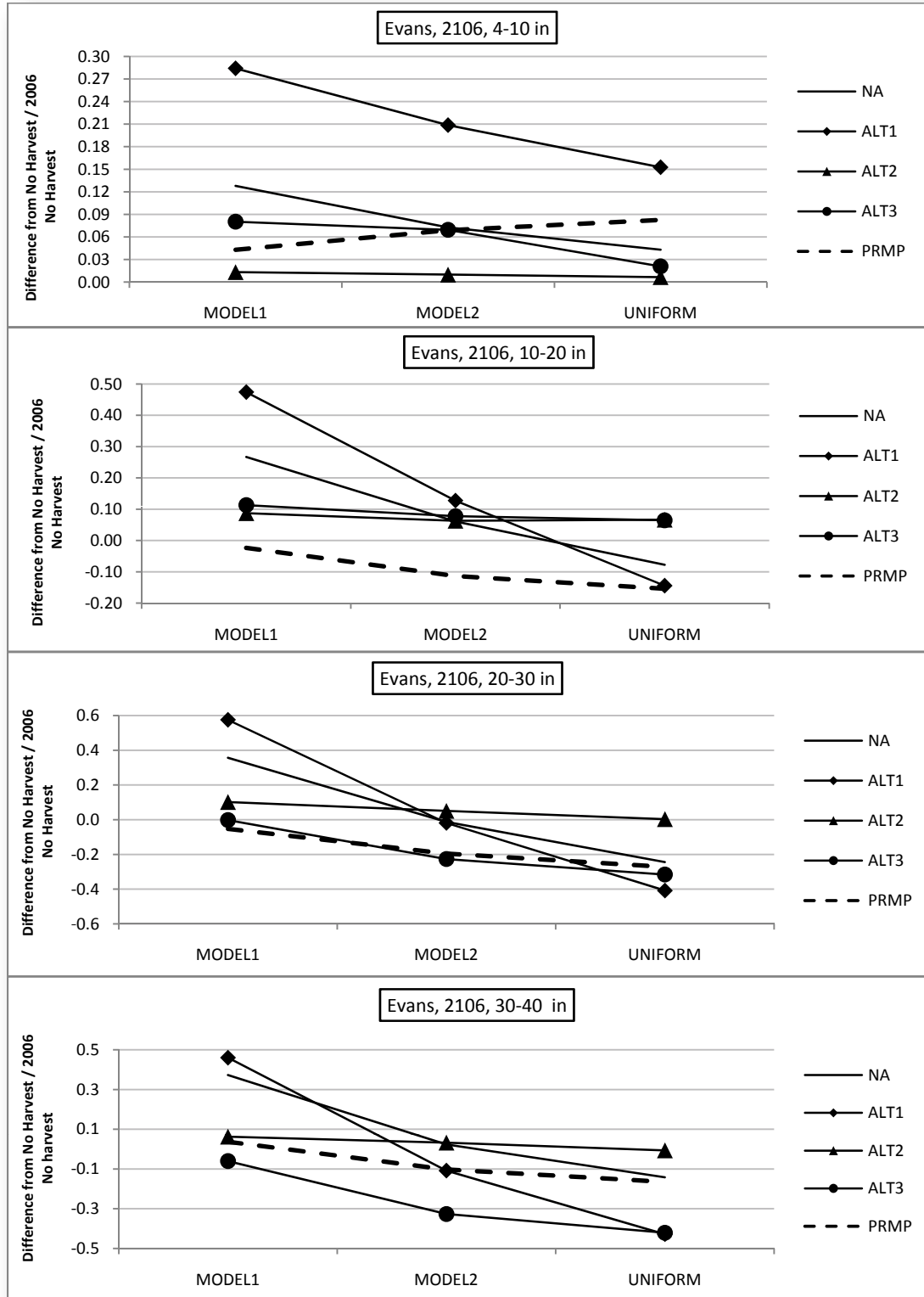


**FIGURE J-27. POTENTIAL WOOD CONTRIBUTION FROM DEBRIS FLOW SOURCES RELATIVE TO NO HARVESTING REFERENCE ANALYSIS IN THE UPPER SMITH RIVER WATERSHED**





**FIGURE J-28. POTENTIAL WOOD CONTRIBUTION FROM DEBRIS FLOW SOURCES RELATIVE TO NO HARVESTING REFERENCE ANALYSIS IN THE EVANS CREEK WATERSHED**





This procedure provides a relative measure of the wood available for recruitment by channel migration across DEM-delineated flood plains. For each of these three recruitment processes, the number of pieces recruited to channels by piece size class is tracked (based on diameter of the bole where it intersects the channel edge for riparian recruitment and the DBH of standing trees for debris flow and channel migration recruitment). Piece lengths are not estimated; hence there are no estimates of wood volume. The results provide a means to compare potential effects of the management alternatives on relative wood recruitment rates to channels. Recruitment by piece size is tracked, so that these effects can be evaluated relative to the size of the channels receiving the wood: the minimum diameter for wood capable of providing a habitat function varies with channel size. Recruitment rates for stream-width classes in terms of either functionally sized or key (> 20 inches diameter) pieces are then reported.

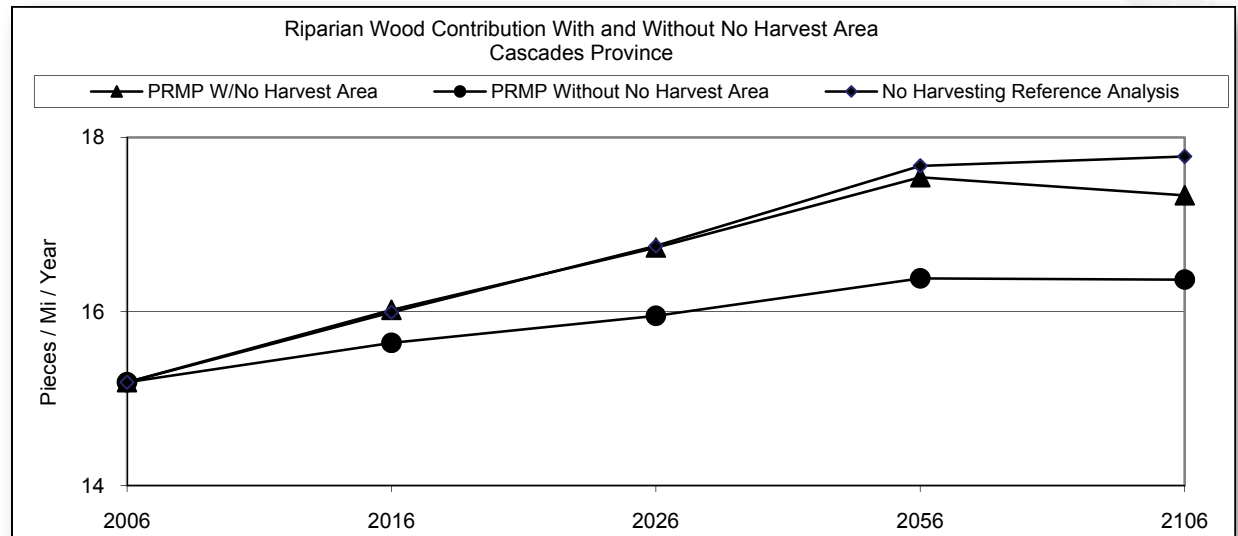
It is important when evaluating and interpreting these model results to consider the factors included and not included in the models. The most available data was used to characterize three key recruitment processes; and the data is sufficient to provide a relative index of management effects for each process, but are insufficient to estimate relative rates between processes. The mean annual rates of wood input that we calculate reflect the average of a right-skewed distribution of values, and the degree of skew differs between processes, with higher skew for debris-flow delivery of wood. Recruitment of wood from riparian mortality and bank erosion probably occurs more frequently than recruitment from debris flow. For a given rate, the longer the time between events, the greater is the quantity of wood delivered with each event. Within a fifth-field HUC, riparian mortality probably provides some wood every year, whereas debris flows may provide wood only a few years out of every decade. For a 100-m reach, riparian inputs may occur every decade (depending on stand conditions), whereas debris flows may occur only every few centuries (depending on adjacent topography and forest disturbance).

The model does not include other disturbance-driven wood recruitment processes. Other simulation models suggest that fire-killed trees can provide a substantial source of wood (Benda et al. 2003). Disease and insect infestations can dramatically increase rates of riparian tree mortality (Bragg 2000). Blowdown, particularly along the outer edge of riparian buffers, can substantially increase rates of riparian recruitment (Liquori 2006, Martin and Grotfendt 2007). These factors are also sensitive to management influences. No-harvest area within riparian areas, for example, while providing a greater number of dead trees for recruitment to the channel than a thinned stand, may also result in increased fuel loading along riparian corridors, with consequent increases in fire potential. Likewise, the stand-growth modeling does not resolve distinct riparian stand types, which may in some areas experience more frequent disturbance than upland stands, with consequently greater density of hardwood species in riparian zones (Nierenberg and Hibbs 2000, Pabst and Spies 1999).

Modeled wood recruitment rates from riparian mortality are sensitive to the stand conditions specified for channel-adjacent zones, as we found when a no-harvest area was added within the riparian management area. See *Figure J-29 (Riparian wood recruitment rates with and without no-harvest buffer in the Cascades Province)*.



**FIGURE J-29. RIPARIAN WOOD RECRUITMENT RATES WITH AND WITHOUT NO-HARVEST BUFFER IN THE CASCADES PROVINCE**



## Intrinsic Potential Model

Intrinsic potential is a scientific, topographical approach used to determine the potential of a stream to provide high-quality habitat for salmonids. Comprehensive information on the location of stream reaches with the greatest potential to provide high-quality habitat for salmonids was generally missing for the planning area. The intrinsic potential of stream channels to provide high-quality rearing habitat was modeled for juvenile coho salmon (*Oncorhynchus kisutch*), juvenile steelhead (*O. mykiss*), and juvenile chinook salmon (*O. tshawytscha*). The initial research was conducted in the Coastal Landscape Analysis and Modeling Study (CLAMS) and was expanded for coho, steelhead and chinook on all ownerships within the planning area.

Spatial models were developed that estimate the potential of streams to provide high-quality rearing habitat for coho, steelhead and chinook. The calculated metric, termed intrinsic potential, reflects species-specific associations between fish use and persistent stream attributes; stream flow, valley constraint, and stream gradient.

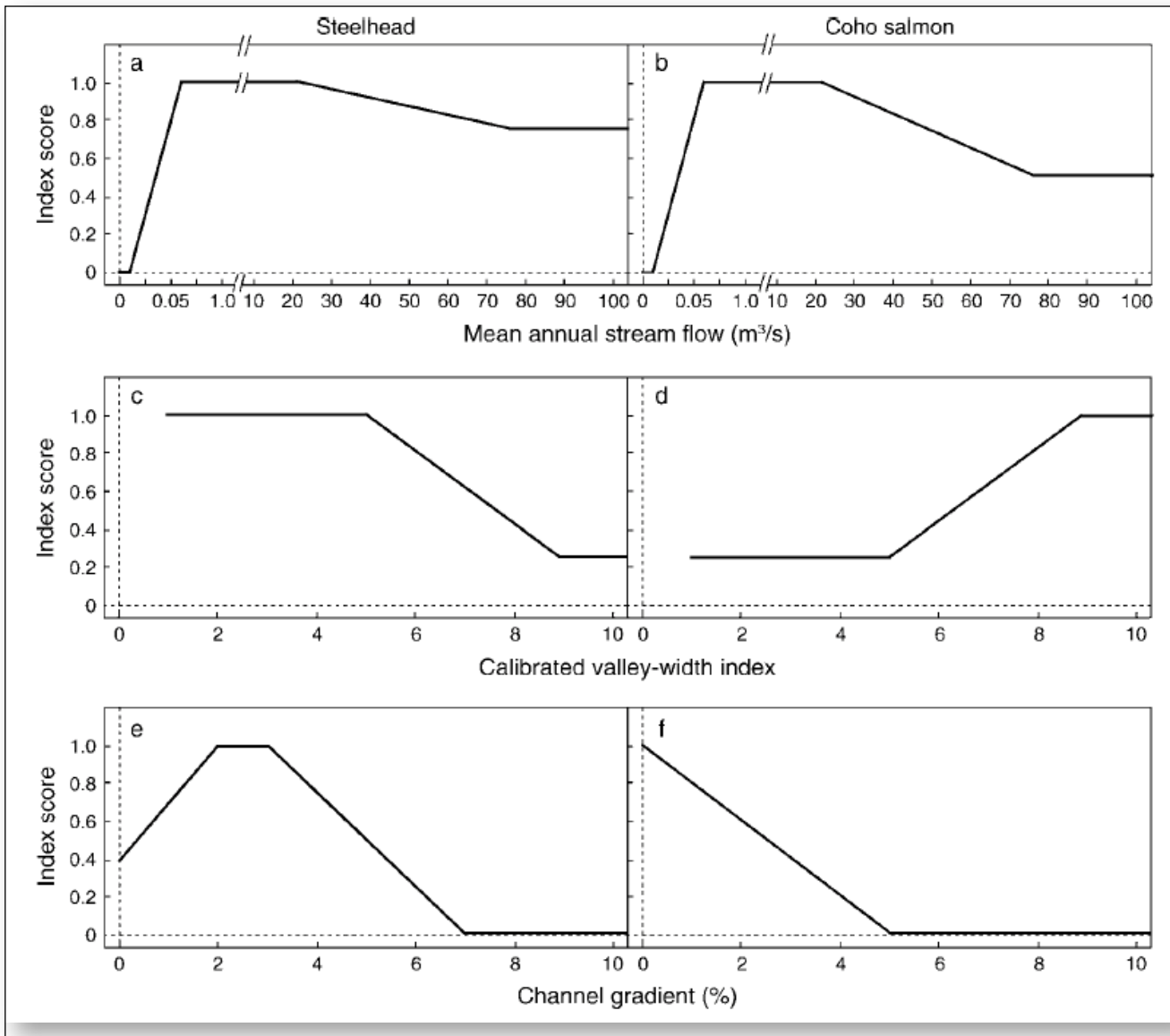
The intrinsic potential for each stream reach was modeled independently for juvenile steelhead, coho, and chinook salmon from stream attributes of mean annual stream flow, valley constraint, and channel gradient. These attributes were produced in conjunction with the digital stream network from 10-m digital elevation models (DIGITAL ELEVATION MODELS) (Miller 2003). The stream network output was in an ArcView shape file format and then imported into ArcInfo (version 8.3; ESRI, Redlands, California, USA) for all subsequent processing. Stream attribute values were translated into index scores for each species as shown in *Figures J-30 and J-31*.

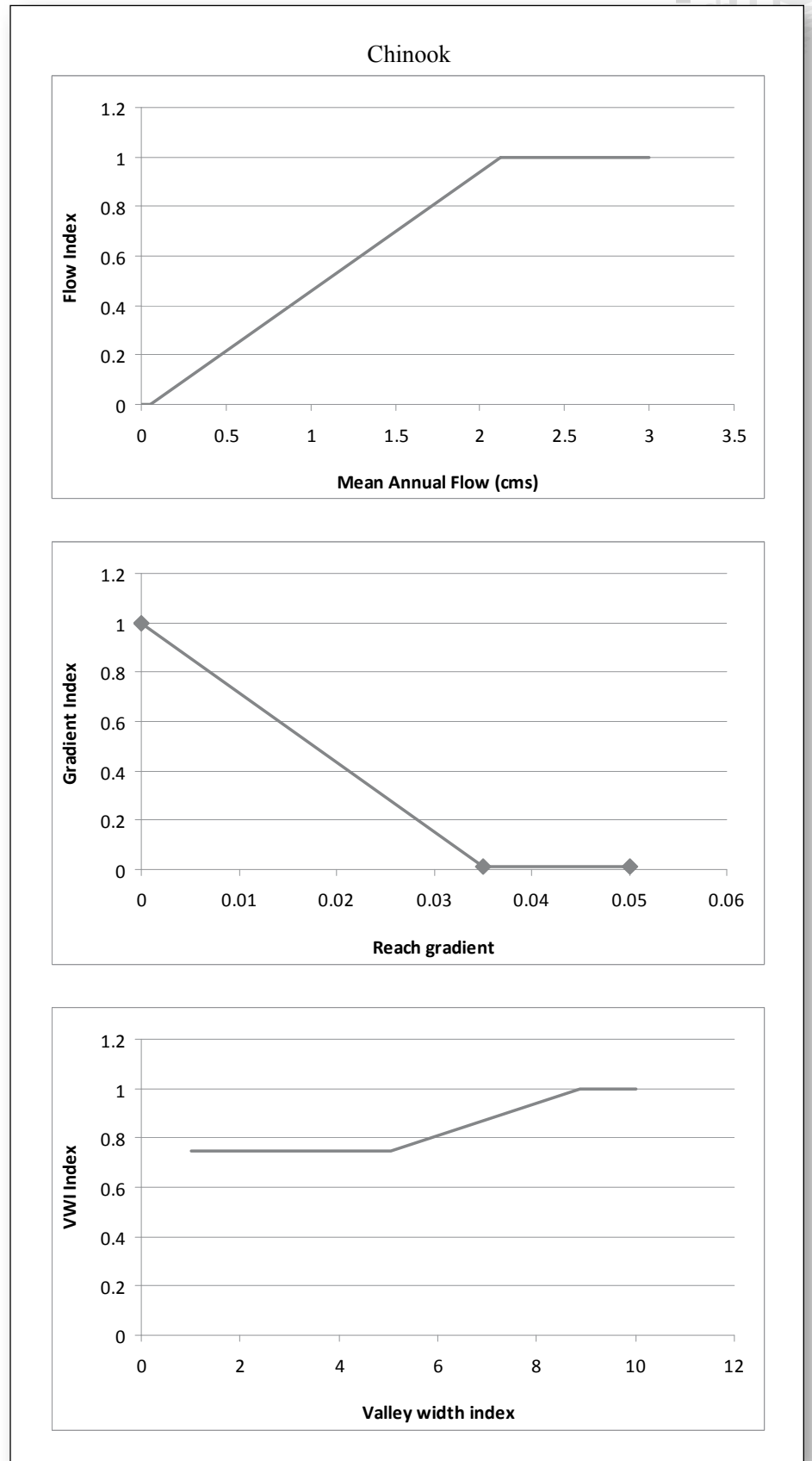
The index scores were based on empirical evidence from published studies regarding the relationship between a stream attribute and juvenile fish use. The index scores for chinook were developed for this EIS and have not been peer-reviewed or published.

Following the most commonly applied approaches for modeling habitat suitability (Morrison et al. 1998 and Vadas and Orth 2001 in Burnett et al *in press*), intrinsic potential for each stream reach was calculated by multiplying the un-weighted species-specific index scores together and then taking the geometric mean



**FIGURE J-30.** EXAMPLES OF RELATIONSHIP BETWEEN VALUES OF THE THREE STREAM ATTRIBUTES AND THE INDEX SCORES USED TO CALCULATE INTRINSIC POTENTIAL FOR STEELHEAD AND COHO





**FIGURE J-31.** EXAMPLES OF RELATIONSHIP BETWEEN VALUES OF THE THREE STREAM ATTRIBUTES AND THE INDEX SCORES USED TO CALCULATE INTRINSIC POTENTIAL FOR CHINOOK



of the product. This approach reflects the assumption that the three stream attributes are of approximately equal importance and only partially compensatory, and that the smallest index score has the greatest influence on the intrinsic potential. The index scores and intrinsic potential can range from zero to one; larger values indicating a greater potential for providing high-quality rearing habitat. Stream reaches were classified with a high species-specific intrinsic potential when the calculated value was 0.75. Intrinsic potential is reported for a species only below naturally occurring barriers to migrating adults (Burnett et al. in press).

# Fisheries Planning Criteria

## Analytical Question 1

*How would the potential large wood contribution and small functional wood contribution to fish-bearing and non-fish-bearing stream channels on BLM-administered lands and non-BLM-administered lands in forested landscapes vary by alternative?*

### Analytical Assumptions

Large woody debris (large wood) are coniferous or deciduous logs, limbs, or root wads that intrude into a stream channel.

Depending on stream size, woody material of all sizes from tiny fragments to intact trees can function in stream systems.

Woody debris is considered “functional” if it is pool-forming (Beechie et al. 2000) relative to stream size. See Table J-14.

Because decay rate and probability of displacement are a function of size, larger pieces have a greater influence on habitat and physical processes in stream channels than small pieces (Dolloff and Warren 2003). For this analysis, trees greater than 20 inches in diameter are considered large wood and the contribution to stream channels is tracked independently from smaller “functional” woody debris.

Wood enters stream channels from chronic and episodic events (Bisson et al. 1987).

Large wood source areas across the landscape that have a higher probability of delivering wood to stream channels include areas from:

- trees in riparian areas that die and fall into streams (e.g., Sobota et al. 2006)
- wood carried by landslides and debris flows to streams (e.g., Reeves et al. 2003)
- trees that fall into streams because of bank erosion and channel migration (Latterell and Naiman 2007)

**TABLE J-14. FUNCTIONAL PIECE SIZE AND STREAM CHANNEL WIDTHS**

Stream Width	Functional Wood Diameter
15 feet	4.5 inches
20 feet	6.0 inches
30 feet	9.0 inches
40 feet	12.0 inches
50 feet	15.0 inches
>50 feet	>20 inches: large wood or “key piece”

Source: Beechie et al.2000





Several factors govern the rate at which wood is supplied to channels by each of these processes. Of primary importance are the number and size of trees available for recruitment to the channel. The spatial distribution of stand types determines in large part the rate at which wood inputs to the channel will occur, and changes in stand characteristics over time determine the degree to which recruitment rate changes over time. Modeled wood recruitment rates depend explicitly on outputs from the OPTIONS scheduling model and the ORGANON stand growth model that OPTIONS uses.

Topography is a primary control on wood recruitment rates, particularly for landslide and debris-flow recruitment. Basin topography determines the locations where different recruitment processes occur and so affects the spatial pattern of recruitment rates.

Because topography (in the model) does not change over time, it has no effect on temporal changes in recruitment rate.

Wood inputs are associated with distinct events, with potentially long intervals with little or no wood recruitment. A frequency distribution of recruitment rates (e.g., in number of pieces per year) for any specified portion of a channel network is highly skewed, with little or no inputs most of the time, and large inputs some of the time (Benda et al. 2003).

Mean recruitment rate provides a measure to assess differences in recruitment potential for the different spatial distribution of stand characteristics predicted with the OPTIONS model under each of the proposed management alternatives.

Wind and rain may cause dead or dying trees in riparian zones to topple, so that storms may trigger wood inputs to a stream reach from riparian zones every few years to decades; landslides or debris flows may deposit wood in a reach only every few centuries (May and Gresswell 2004).

The relationship between mean recruitment rate and the frequency of recruitment events can differ dramatically between processes. Likewise, the volume of wood delivered in a single recruitment event may differ dramatically between recruitment processes.

The maximum potential large wood contribution reflects a maximum biological potential, and does not necessarily reflect average historic conditions.

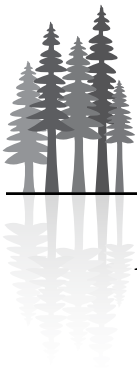
The average historic conditions at the province scale ranged from 79% in a mature & structurally complex structural stage class in the Coast Range and West Cascades Provinces to 45% in a mature & structurally complex structural stage class in the Eastern Cascades Province.

At the individual fifth-field watershed scale, the variability in historic amounts of mature & structurally complex structural stage class would have been extremely high, likely with long periods of time in which the watershed was nearly all in the mature & structurally complex structural stage class (Wimberley et al. 2000). These periods of time in which a fifth-field watershed would be nearly all in the mature & structurally complex structural stage class, which would correspond to the maximum large wood contribution calculated in the model, would represent the maximum potential for large wood delivery.

The model output of potential large wood contribution is an estimate of the potential wood contribution to stream channels over time based on forested stand conditions and tree availability, but is not meant to be a prediction of actual instream conditions at a specific point in time.

Debris flow source areas for wood are widely distributed, but most of the wood accumulated by debris flows is scoured from low-order channels.

Debris flow inputs to fish-bearing streams occur at these low-order channel junctions.



## Analytical Methods and Techniques

### Step 1

Use Stand Table information to determine number of stems, density, height and diameter of the live and standing dead trees by 10-inch diameter class for conifer and hardwood at each reporting point. Reports account for management activities and stand growth and mortality.

- 1) Obtain stand table information on live and dead trees by species type. The abundance of live and dead trees is sensitive to management activities. For this analysis, detailed information about these activities is provided by WOPR unit from the OPTIONS model. However, since OPTIONS utilizes and reports stand average information, its methods were adopted to determine the stand table information for each WOPR unit at each reporting period.

In the OPTIONS model, each WOPR is uniquely managed based on the hierarchy of management assumptions and objectives. The application of these assumptions and objectives create a dynamic modeling process that affects the sequence and timing of stand level treatments, this sequence cannot be forecast outside of the OPTIONS model. However, based on the OPTIONS modeling framework it was possible to define the entire range of possible treatment combination based on modeling group, site index and treatment timing and intensity, which were modeled in ORGANON to create individual stand tables

- 2) Consolidate large set of ORGANON stand tables into a single Index Table for every combination of modeling group, species group, site index and treatment timing and intensity. Determine detailed stand table information for each WOPR unit by reviewing the sequence of OPTIONS treatment details and then referring to the corresponding ORGANON data in the Index Table.
- 3) Use All Possible Treatment Yield Curve Crosswalk Table (ACT2CVS\_XWALK). This table identifies which treatment yield curve to use to obtain the required stand characteristics and index values for the large wood analysis report. The treatment yield curve is identified based on the current alternative, management regime, species, site productivity class, and treatment age.
- 4) Use Index Value Lookup Table (INDX\_LKUP)  
This table is an Alternative based lookup table containing projected stand characteristics and index values for each treatment yield curve. Some of the index values available include:
  - Stand characteristics: age, basal area, TPA, QMD, height, volume, crown ratio, canopy closure, relative density, SDI, CV, DDI,
  - TPA by 10" diameter classes for live and dead trees by Conifer and hardwood: # of trees in 0" to 9", 10" to 19", 20" to 29", 30" to 39", greater than or equal to 40"
  - Average height by 10" diameter classes for live and dead trees by Conifer and hardwood: weighed height by TPA in 0" to 10", 11" to 20", 21" to 30", 31" to 40", greater than 40"
  - Average diameter by 10" diameter classes for live and dead tree by conifer and hardwood: weighed diameter by TPA in 0" to 10", 11" to 20", 21" to 30", 31" to 40", greater than 40"
- 5) Use OPTIONS Run Files to post-process an OPTIONS run. The following OPTIONS run files are required:
  - OPTIONS data files (.DBF, .DBS, .SPG, .SIC)
  - OPTIONS run files (.DEF, .DEV, .RUN, .I, .II, .V)



## Step 2

For each Alternative:

- 1) Using ORGANON, generate the possible treatment stand tables based on the Alternative's management regime definitions. Create the Crosswalk Table to identify which stand table to reference for a particular treatment combination.
- 2) Based on the Crosswalk Table, pre-process each treatment stand table to generate the index values that will be used to in the large wood analysis. Create the Index Table to identify which index values to use for a particular treatment stand table.
- 3) Initialize a Large Wood Report Table by listing for each WOPR unit the OPTIONS inventory values for forest type (forest, non-forest, road), initial management regime, species group, site productivity class and area.

For each forested WOPR unit in the Large Wood Report Table:

- 4) Set initial conditions:
  - Initial Structural Stage and legacy (based on OPTIONS inventory structural stage)
  - Plant Series/Retention Zone (based on OPTIONS inventory)
  - NSO Variance: based on plant series, species group and habitat definition
  - Flag for MOCA and SHRUB areas
  - GTR (green tree retention) flag for LSMA and additional GTR Areas
- 5) Based on the OPTIONS run results, build the WOPR unit Activity History Table including harvest activities and state of the forest years in chronological order. Record the stand management regime, species group, site productivity and age at which these activities occur. This history table represents the changes in stand characteristics over time.

For each Activity in the Activity History:

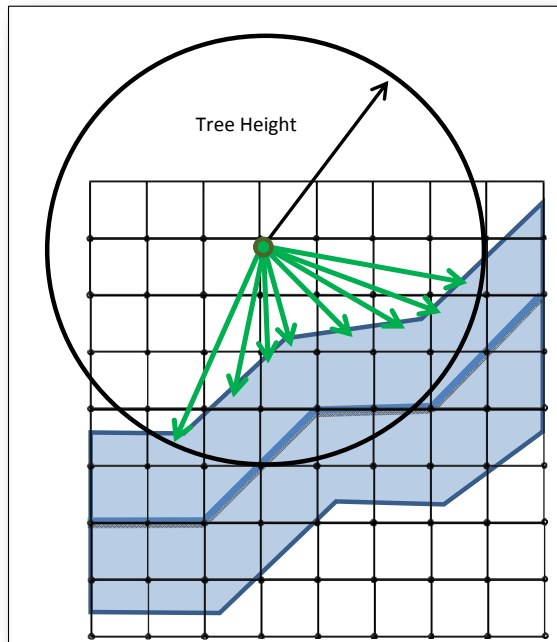
- 6) Determine the current thinning treatment combination, partial harvest condition and legacy based on the type of activity completed.
  - For Regeneration Harvest: reset thinning treatment combination, reset partial harvest conditions, re-evaluate legacy for each management scenario.
  - For Selection Harvest: reset thinning treatment combination, set partial harvest condition, re-evaluate legacy
  - For Commercial Thinning: set thinning treatment combination based on thinning age and thinning sequence, no change to partial harvest condition or legacy.
- 7) Set activity stand table reference from Crosswalk Table based on the treatment combination.
- 8) Retrieve stand characteristics and index values from Index Table based on stand table reference.
- 9) Calculate Structure Stage Classification based on index values and structural stage definition.
- 10) Update Report Table with Structural Stage and stand table values such as TPA, average HT and DBH for live and dead trees by conifer and hardwood in 10" diameter classes for each reporting year.



### Step 3

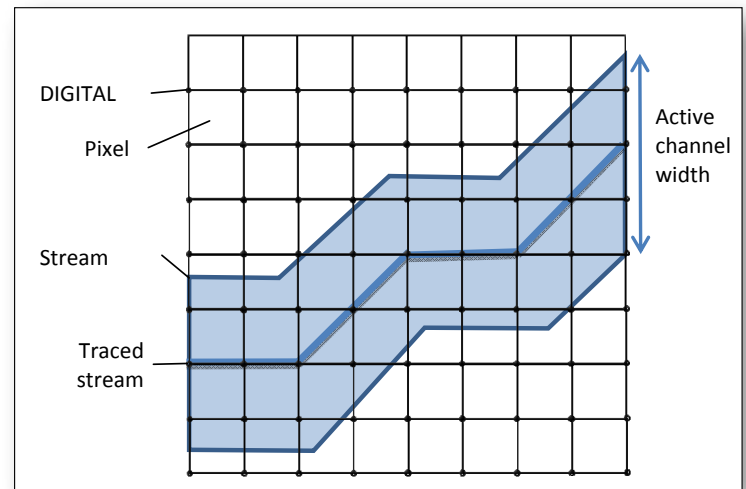
The following analytical technique is a spatially explicit, Digital Elevation Model and Geographic Information System-based wood recruitment model developed for this analysis to determine the potential wood contribution to streams from BLM-administered lands. Outputs are calculated wood recruitment rates to each delineated stream reach and rates of wood supply to channels from each DEM cell in the planning area.

- 1) Identify fish-bearing and non-fish-bearing stream channels. Trace stream channel locations inferred from flow routing indicated by DEM, based on flow directions defined for every DEM point (e.g. Tarboton 1997), and upslope contributing calculated for all flow paths. Determine fish-bearing and non fish-bearing stream channels with Western Oregon Plan Revision Geographic Information System stream fish distribution layer.
- 2) Estimate wood inputs from mortality of riparian trees. Determine:
  - The number and location of dead or dying trees that may fall. These are estimated from the outputs of the ORGANON stand growth model used by OPTIONS. For each stand type, generate tree list that provides density (in stems per acre) of trees that have died (over a five-year time step) by species (conifer and hardwood) and size (diameter) class. Assume all dead trees fall during the next time step.
  - The slope gradient at each tree location (trees on steeper slopes are more likely to fall in a downslope direction than trees on less steep slopes), calculated from the 10-m DEM.
  - The location of falling trees relative to the channel edge. Channel-edge locations are based on channel centerlines traced using flow-paths derived from the DEM, with channel width estimated using regional regressions to drainage area (Castro and Jackson 2001; Clarke et al. 2008).
  - The probability that a falling tree intersects the channel. This probability is derived from an empirical probability density function for fall direction (Sobota et al. 2006) together with the location of all channel edges within a distance less than or equal to the tree height.
  - The diameter of the tree bole where it intersects the channel. Tree boles are approximated as a cone, with a diameter-at-breast-height (using a breast height of 1.4 meters) based on the size class for the tree (from the tree lists) tapering linearly to zero at the tree height.
  - Reference stand-type polygons to DEM cell boundaries. Channel-edge segments are defined determine where traced channel edges (centerline plus a buffer of one half the estimated channel width) cross DEM cells. For each channel segment, find every DEM point within a tree height of the segment and calculate the probability that a) a tree within that stand is dead (and ready to fall), and b) if a tree at that point falls, it hits the channel segment.
  - Repeat this calculation for every DEM point and integrate the probabilities over all DEM cells to determine the probability that a tree falls into the channel segment.
  - Repeat for all channel segments and for all tree species and size classes, summing results by piece-size classes for each segment to determine the annual probability for wood recruitment from each DEM cell and the annual probability of recruitment to each channel segment.
  - Interpret these probabilities as average rates. For example, if the calculated annual probability for input of wood to a reach is 0.1, we interpret this as a recurrence interval of 10 years; that is, one piece every ten years, or an average rate of 0.1 pieces per year.



**FIGURE J-32.** CALCULATING TREE HEIGHT RELATIVE TO CHANNEL EDGE

**FIGURE J-33.** CALCULATING PROBABILITY THAT TREES WILL INTERSECT THE CHANNEL



- 3) Estimate wood inputs from debris flows. Determine:
  - The locations of potential debris flow tracks, and the recurrence interval for debris flows that traverse each track. Estimate debris-flow locations using empirical topographically driven models (Miller and Burnett 2007, 2008) calibrated to landslide data from throughout the plan area and to debris-flow tracks mapped by the Oregon Department of Forestry following the large 1996 storms (Robison et al. 1999). Recurrence intervals are based on data for low-order channels in the Coast Range reported by May and Gresswell (2004), who estimate a recurrence interval for debris flows to ~3rd order channels of about 350 years.
  - The number of live and dead trees available along the debris-flow track, obtained from the tree lists output by OPTIONS. Use the DBH of each tree as the diameter for the recruited piece of wood.
  - The number of pieces contributed (per year) by dead trees from adjacent areas falling into the track. This number is estimated using the same procedure described above for riparian recruitment to stream channels.
  - The probability for debris flow scour and deposition along each potential track, based on data from the 1996 storm study (Miller and Burnett 2008; Robison et al. 1999).
  - The average width of a debris-flow track set to six meters based on data in Robison et al. (1999).

To estimate the number of pieces of wood carried to a stream channel by a potential debris flow:

- Sum the number of trees available along the track within each DEM cell traversed by the track, and multiply this value by the probability that a debris flow will traverse the cell. If the stem density for the stand indicates (on average) 10 trees per 10-meter DEM cell, 6 of these will be incorporated into a 6-meter-wide debris flow. If the estimated recurrence interval for a debris flow to traverse the cell is 500 years, that gives 6 trees recruited (into the debris flow) every 500 years, or 0.012 trees per year.
- Sum these values along all potential debris flow tracks.



- To estimate the proportion of the accumulated wood that is deposited (on average, for all the debris flows that may traverse each cell), determine the proportional downslope decrease in debris flow probability. If the probability decreases by 1% from one cell to the next, 1% of the accumulated wood is left in the cell.
- In some cases, a large proportion of the wood carried by debris flows is not from the current stand, but has been excavated from wood deposited in previous debris-flow deposits (May 2002). To estimate debris-flow recruitment rate from a specified spatial distribution of stand types, account for the incorporation of wood from this stand into future debris flows. Estimate the probability that a debris flow encounters wood deposited from a previous debris flow based on the recurrence interval. The probability that a future debris flow encounters a deposit containing wood from this stand is estimated as one minus the probability that no debris flows had occurred over the recurrence interval for debris flows to that cell, i.e.,  $1 - (1-1/R)^R$ , where R is the recurrence interval in years. For values of R exceeding 100 years, this equation has a nearly constant value of 0.63; hence estimate a 63% probability (on average) that a future debris flow will encounter wood from this year's forest stands. However, over recurrence intervals of this length, any wood that is not buried in the deposit will likely be completely decayed. Benda and Dunne (1997) estimate from field observations that approximately 70% of debris-flow deposit volume resides in fans and terraces; hence assume that 70% of the available wood is buried in these fans and terraces. This suggests that about 44% ( $0.63 \times 0.7$ ) of the deposited wood is available to future debris flows.

Observational evidence indicates that landslide rate and the extent of debris flow runout vary with forest stand characteristics (Miller and Burnett 2007, 2008). For simplicity, model debris flow probabilities using a uniform non-forested land cover, with the resulting probability values multiplied by a constant value to give an average 350-year recurrence interval for debris flows to 3rd order channels for the basins studied by May and Gresswell (2004). This removes the effects of management on modeled debris flow probability, so that differences in calculated wood recruitment rates between alternatives and over time solely reflect differences in the amount of wood available to debris flows. However, this strategy masks the effects of management on landslide potential. Therefore, these effects are examined for a subset of basins in the plan area, for the appendix.

- 4) Estimate wood inputs from channel migration. Determine:
  - Channel migration (or bank erosion) rates. Due to the great variety of un-quantified controlling factors on channel migration rates, identify the floodplain area potentially susceptible to occupation by the channel. Use the DEM, flagging all cells within 5 bankfull depths above the channel elevation (along flow lines to a channel cell). Assume a constant 0.01 probability for any point on the delineated floodplain to be occupied by the channel (e.g., every point on the floodplain is assessed by the channel on average once every century).
  - The number of live and dead trees available to be recruited by channel migration into the channel.
  - Multiply the stem densities obtained from OPTIONS by the delineated floodplain area to derive a relative measure of the wood available for recruitment by channel migration across DEM-delineated flood plains.
- 5) Estimate relative wood contribution across all ownerships:
  - Use Interagency Vegetation Mapping Project (IVMP) data to determine stand information on non-BLM administered lands.
  - Use simplified structural stage stand type data (Stand Establishment, Young, Mature and Structurally Complex, and Non-Forest) for BLM and non-BLM administered lands.
  - Follow Steps 1-3 to determine relative wood contribution by ownership.



## Analytical Conclusion

Compare alternatives in terms of potential large wood and small functional wood contribution for the entire planning area and by province.

## Data Display

Summarize results over specific sets (BLM, non-BLM, large wood, small functional wood, fish-bearing, non-fish-bearing, land use allocation, piece/size and stream size, plan-wide and by province, by wood contribution source). Graph format potential wood contribution over time compared to current condition and no harvest reference analysis for large wood and small functional wood.

## Data Needs

- Ownership, by watershed
- Stream miles, by ownership
- Fish distribution
- OPTIONS growth and yield detailed stand data (In grid format)
- 10-meter Digital Elevation Models
- Land use allocation spatial data.

## Analytical Question 2

*How will changes in sediment delivery to stream channels affect fish under each alternative?*

## Analytical Assumptions

Salmonids have the ability to cope with some level of sediment at various life stages.

In gravel-bed streams, persistent infiltration of fine sediment into gravel reduces survival of salmonid eggs and fry (Hall and Lantz 1969, Everest et al. 1987, Sullivan et al. 1987).

Fine sediments (sand, silt, and clay at less than 2 mm) enter and leave river channels naturally, but increased suspended sediment (turbidity) and sedimentation (embeddedness) can adversely affect fish (Anderson et al. 1996).

The timing of the sediment inputs relative to the biological vulnerability of each fish species is more important than the absolute quantity of sediment.

Once sediment enters the channel, downstream routing and effects on fish habitat are determined by channel morphology, quantity and size of sediment, and frequency and magnitude of flow events (Swanston 1991).

Predicting sediment delivery to streams is difficult due to both the extreme variability in site conditions and in the variables leading to accelerated erosion. It is difficult to quantify or accurately predict the indirect effects sediment delivery will have on fish habitat (such as sedimentation of gravel interstices, channel aggradation and widening, and increased suspended sediment load).

Thresholds beyond general levels at which lethal and sub-lethal effects have not been well established in terms of the levels of sediment delivery that would cause impairment to fish at the scale of this analysis.



Suttle and co-authors suggest there is no threshold below which fine sediment is harmless to fish, and the deposition of fine sediment in the stream channel, even at low concentrations, can decrease the growth of salmonids (Suttle et al. 2004). It is not possible to describe quantitative changes in sub-lethal effects under the alternatives over time at this scale of analysis. Therefore, this analysis focuses on the sediment levels that would affect fish survival. This analysis assumes that every 1% increase in fine sediment from management activities would result in a 3.4% decrease in fish survival (Cederholm et al. 1981).

Like the watersheds used in the Cederholm study, existing fine sediment levels in watersheds in the planning area are generally not currently above background rates. The assumption is based on the current condition of fine sediment in streams within the planning area on BLM-administered lands.

For this analysis, sediment yields are calculated at a fifth-field scale and expressed as tons per square mile per year. Since this output (tons/square mile/year) cannot be directly equated to a percent embeddedness, using the assumption above (>1% increase above natural levels) provides the ability to utilize a relative increase to evaluate the effects of fine sediment delivery on fish species at the watershed scale for each alternative.

## Analytical Methods and Techniques

### Step 1

Determine increase in fine sediment to stream channels for each alternative . For each fifth-field watershed, use results from sediment analysis to assess impacts to fish.

## Analytical Conclusions

Rank alternatives, showing changes in sediment delivery. For each fifth-field watershed, outcome will be displayed as a table formatted for each alternative:

*Outcome A:* Changes in sediment delivery to stream channels would not increase above 1% of base rates; and would not affect fish habitat.

*Outcome B:* Changes in sediment delivery to stream channels would increase above 1% base rates and decrease fish survival.

## Analytical Question 3

*How will changes to stream temperature affect fish under each alternative?*

## Analytical Assumptions

Salmonids are a beneficial use and their needs are included in water quality temperature standards.

If water quality temperature standards are not met, an increase in stream temperature could harm fish.

Water temperatures affect the biological cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations. See *Table J-15* for temperature standards for species within the plan area (ODEQ 2004).





**TABLE J-15. TEMPERATURE STANDARDS FOR SPECIES WITHIN THE WESTERN OREGON PLAN REVISIONS AREA**

<i>Species</i>	<i>Seven-Day Average Maximum Temperature Standard (Degrees Fahrenheit)</i>
Salmon and steelhead	55.4
Salmon and trout rearing and migration	64.4
Lahontan cutthroat trout or Redband trout	68.0
Bull trout spawning and juvenile rearing	53.6

## Analytical Methods and Techniques

### Step 1

Use output from stream temperature analysis, fish distribution, and temperature standards.

## Analytical Conclusions

Rank alternatives displaying how each alternative meets shade targets or contributes to an increase in stream temperature.

## Data Display

Table display of data.

## Analytical Question 4

*How will changes in peak flows within stream channels affect fish under each alternative?*

## Analytical Assumptions

Channel forming flow is a series of naturally occurring discharges that result in channel morphology close to the existing channel.

Extreme flood flows can cause large-scale effects on channel morphology and fish habitat. The runoff volume from these storms can overwhelm the hydrologic effects of vegetation management and roads (Harr 1981).

More frequently occurring flows, such as those with a 1.5-year to 2-year return interval, are generally the dominant channel forming flows in stable natural streams (Grant et al. 2008). For steep mountain streams and for this analysis, the 2-year, 24-hour peak flow is used to simulate a channel forming flow (Lisle 1981). Water available for runoff in rain-on-snow areas is estimated as an incremental change compared to this reference flow.

When 5-year, 24-hour flows (10%-20% above 2-year 24-hour flow) begin to occur at the 2-year, 24-hour frequency, stream channels can become unstable, effect channel morphology and increase streambank erosion (Harr 1992).



Whether susceptibility to peak flow increases result in fish egg mortality depends on watershed and stream-specific characteristics and the timing of peak flow increases, making it impossible to make a reasonable prediction of the precise effects on fish from peak flow increases under each alternative over time. For example, streambed scour that would result in egg mortality would generally occur in lower gradient stream channels with gravel and sand-bed substrates, and would not typically occur within cascade and step-pool stream types (Grant et al. 2008).

On BLM-administered lands within the planning area, eighty percent of the streams are stream types where increases in peak flows would not cause streambed scour.

Increases in peak flow susceptibility would result in adverse effects on fish only if all of the following conditions would occur in concert: a storm that would increase flow would occur during the time period a subwatershed would be susceptible; the increase in flows would occur in pool/riffle streamtypes with gravel-bed and sand substrates; and the increase in flows would occur when fish would be spawning.

## Analytical Methods and Techniques

### Step 1

Determine percentage increase of peak flow by alternative.

For each sixth-field:

- Use output from Hydrology peak flow analysis to determine if peak flows would increase in frequency from a 2-year 24-hour flow, to a 5-year 24-hour flow.

## Analytical Conclusions

Rank alternatives by amount of susceptible watersheds compared to No Harvesting reference analysis and Intensive Management on Most Commercial Timber Lands reference analysis showing peak flow changes, by sixth-field watersheds.

## Analytical Question 5

*How will aquatic restoration affect fish under each alternative?*

## Analytical Assumptions

Increasing habitat complexity in streams with high priority fish populations or occupied high intrinsic potential streams would be more effective in improving habitat complexity in those streams with a greater potential to support salmonids than others.

Intrinsic potential for streams is the stream's inherent ability to provide high quality rearing habitat for salmonids.

The species specific relationship between habitat value and mean annual discharge reflects that coho salmon are thought to rear primarily small to mid-size streams (Sandercock 1991 and Rosenfeld et al. 2000 in Burnett et al, 2007); that juvenile steelhead generally use a somewhat broader range of stream sizes (Meehan and Bjornn 1991 and Benke 1992 in Burnett et al. 2007); and that juvenile chinook rear in medium to larger rivers (Healy 1991).



Species specific relationships between value of juvenile rearing habitat and channel gradient reflect that: 1) coho and chinook salmon predominate in the lowest gradient reaches while steelhead predominate in reaches of 2-3%; and 2) fish density decreases with increasing channel gradient beyond the optimum up to a maximum of 7% for coho salmon and 10% for steelhead (Burnett et al. 2007) and up to a maximum of 5% for chinook salmon (Burnett 2001), which also encompasses gradients where adult chinook salmon spawn (Montgomery et al. 1999).

Species specific relationships between habitat value and channel constraint reflect that densities of chinook salmon and coho salmon tend to be greater in unconstrained than in constrained reaches (Burnett 2001) but that juvenile steelhead may avoid unconstrained reaches (Burnett 2001).

## Step 1

Determine location of High Intrinsic Potential Streams for coho, chinook and steelhead.

*This technique is a topographically-based modeling approach that was used to assess the intrinsic potential of stream channels to provide high quality habitat for salmonids developed by Burnett, 2003 for coho salmon, chinook salmon and steelhead trout for all lands in the Western Oregon Plan Revision planning area. Spatial models were developed that estimate the potential of streams to provide high-quality rearing habitat for coho, steelhead and chinook.*

The calculated metric, termed intrinsic potential reflects species-specific associations between fish use and persistent stream attributes; stream flow, valley constraint, and stream gradient.

Intrinsic potential is calculated as:

$$I.P. = (MD * CG * VC)^{1/3}$$

Where:

MD = Mean Annual Discharge

CG = Channel Gradient

VC = Valley Constraint

And:

High (>.75)

Medium (.5-.75)

Low (<.5)

### *Mean Annual Discharge*

- Calculate mean annual discharge as a function of drainage area derived from 10m DEM data and average annual precipitation from PRISM (Parameter-elevation Regressions on Independent Slopes Model) using the equation developed for Western Oregon.

### *Channel Gradient*

- Calculate channel gradient from 10m DEM generated by interpreting contour lines from USGS 7.5-minute quadrangles.
- Calculate the mean percent reach gradient from points of known elevation wherever a contour line crosses the modeled stream and the estimated length of the channel between the points.

### *Valley Constraint*

- Derive channel constraint from the relationship between channel form in Oregon Department of Fish and Wildlife ODFW) stream surveys and modeled valley width index (VWI), a ration of valley floor width to active channel width (ACW).



- Approximate valley floor width from the 10m DEM as the length of a transect intersecting valley walls above the channel at a height that varies with bankfull depth.
- Model ACW from ODFW data and mean annual discharge.

Model intrinsic potential for each stream reach independently for juvenile steelhead, coho, and chinook salmon from stream attributes of mean annual stream flow, valley constraint, and channel gradient.

Produce attributes in conjunction with the digital stream network from 10-m digital elevation models (Miller et al. 2003).

Import stream network output from ArcView shape file format into ArcInfo (version 8.3; ESRI, Redlands, California, USA) for HIP processing.

Translate stream attribute values into index scores for each species See *Figures J-30* and *J-31* earlier in this appendix.

- Following the most commonly applied approaches for modeling habitat suitability (Morrison et al. 1998 and Vadas and Orth 2001 in Burnett et al, 2007), calculate intrinsic potential for each stream reach by multiplying the un-weighted species-specific index scores together and then taking the geometric mean of the product.
- This approach reflects the assumption that the three stream attributes are of approximately equal importance and only partially compensatory, and that the smallest index score has the greatest influence on the intrinsic potential.
- The index scores and intrinsic potential can range from zero to one; larger values indicate a greater potential for providing high-quality rearing habitat. Stream reaches are classified with a high species-specific intrinsic potential when the calculated value is  $>0.75$ .
- Overlay all fish barriers (GIS data layer) and calculate intrinsic potential for species only below naturally occurring barriers to migrating adults. (Burnett et al. 2007).

## Analytical Conclusions

Compare alternatives in terms of amount and location of restoration compared to current condition.

## Data Display

Table and map format.

## Data Needs

- Ownership, by watershed
- Stream miles, by ownership
- Fish distribution

# Appendix K Recreation



---

This appendix provides supplemental material for the recreational topics discussed in this final environmental impact statement.

**In this appendix:**

Interim Off-highway Vehicle Management Guidelines .....	388
Planning Frameworks for Special Recreation Management Areas .....	400



# Interim Off-highway Vehicle Management Guidelines

This section provides interim off-highway vehicle (OHV) management guidelines that would be implemented until subsequent transportation management plans are completed. These interim guidelines have been developed at the district level, for OHV emphasis areas. These guidelines are presented in the order of Salem, Eugene, Roseburg, Coos Bay, Medford (the five western Oregon BLM districts), and Klamath Falls (one of the resource areas of the Lakeview District).

Maps associated with these interim OHV management guidelines are available at BLM district offices. These maps show OHV area designations, a preliminary road and trail network, and BLM-administered lands that have secured legal public access. See *Chapter 2* for a listing of individual closed areas and OHV emphasis areas by district.

The BLM road maintenance levels that pertain to limitations on types of OHV use are described below.

**Level 1** – This level is assigned to roads where minimum maintenance is required to protect adjacent lands and resource values. Emphasis is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless roadbed drainage is being adversely affected, causing erosion. Closure and traffic restrictive devices are maintained as needed.

**Level 2** – This level is assigned to roads that are passable by high clearance vehicles. Drainage structures are to be inspected within a 3-year period and maintained as needed. Grading is conducted as necessary to correct drainage problems. Brushing is conducted as needed to allow access. These are typically low standard, low volume, single lane, natural and aggregate surfaced, and are functionally classified as a resource road.

**Level 3** – This level is assigned to roads where management objectives require the road to be open seasonally or year-round for commercial, recreational, or administrative access. Typically, these roads are natural or aggregate surfaced, but may include low use bituminous surfaced road. These roads have a defined cross section with drainage structures (e.g., rolling dips, culverts, or ditches). These roads may be negotiated by passenger cars traveling at prudent speeds. User comfort and convenience are not considered a high priority. Drainage structures are to be inspected at least annually and maintained as needed. Grading is conducted to provide a reasonable level of riding comfort at prudent speeds for the road conditions. Brushing is conducted as needed to improve sight distance.

**Level 4** – This level is assigned to roads where management objectives require the road to be open all year (except may be closed or have limited access due to snow conditions) and which connect major administrative features (recreational sites, local road systems, administrative sites, etc.) to County, State, or Federal roads. Typically these roads are single or double lane, aggregate, or bituminous surface, with a higher volume of commercial and recreational traffic than administrative traffic.

## Salem District

### OHV Designations:

Limited to designated roads and trails: 274,600 acres

Limited to designated roads: 85,165 acres

Closed: 39,646 acres

**Description:**

Includes all BLM-administered lands within the Salem District. See additional interim guidelines for the Upper Nestucca OHV Emphasis Area.

**Limited Area Management Guidelines:**

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or their use limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, protection of cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

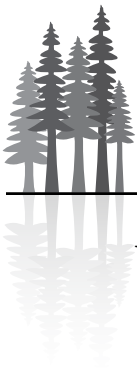
**Process for selecting a final road and trail network:**

Route designations have been completed for the Upper Nestucca OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.



## Upper Nestucca OHV Emphasis Area

**Acres:** 9,579

**OHV Designation:**

Limited to designated roads and trails

**Niche:** Located 20 miles northwest of McMinnville, Oregon, this area provides Class I (ATVs) and Class III (motorcycles) OHV riding experience along a designated road and trail network.

**Management Guidelines:**

- Designated trails and maintained roadways are limited to Class I and Class III motor vehicle use within the boundaries of the OHV emphasis area.
- All Class I and Class III vehicles must be equipped with approved spark arresters, an Oregon ATV sticker for the appropriate vehicle class, and must meet posted noise requirements.
- Class II vehicle use is only authorized on Level 3 and Level 4 roadways.
- Motorized use on the trail system may be restricted during summer months due to fire hazard conditions.
- Areas and trails may be permanently or temporarily closed for administrative use, extreme wet conditions, construction/reconstruction requirements, or other environmental concerns.

**Process for ongoing public collaboration/outreach:**

The principal venue for public collaboration on the trail system is through local partnership with the Applegate Rough Riders Motorcycle Club. A trail map is available to the public at the Salem District Office and Tillamook Field Office. The trail system is marked on the ground with regulatory and directional signage.

**Process for selecting a final road and trail network:**

Route designations have been completed through the Upper Nestucca Motorcycle Trail System Environmental Assessment (EA OR 086-97-05). Adaptive management is used to adjust the system for timber management, user needs, and resource protection.

**Road and trail construction and maintenance standards:**

Construction and maintenance are completed in accordance with the design features identified in the Monitoring and Maintenance Plan for the Upper Nestucca OHV Trail System. Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users and to conserve natural resource values.

## Eugene District

**OHV Designations:**

Limited to designated roads and trails: 321,138 acres

Closed: 3,277 acres



**Description:**

Includes all BLM-administered lands within the Eugene District. See additional interim guidelines for the Shotgun Creek OHV Emphasis Area.

**Limited Area Management Guidelines:**

- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

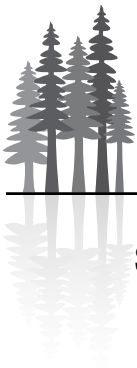
**Process for selecting a final road and trail network:**

Route designations have been completed for the Upper Lake Creek Special Recreation Management Area and the Shotgun Creek OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.



## Shotgun Creek OHV Emphasis Area

**Acres:** 8,090

**OHV Designation:**

Limited to designated roads and trails

**Niche:** Offers a multiple-use trail riding experience for motorcycle riders, ATV riders, and four-wheel drive enthusiasts.

**Management Guidelines:**

- The trail system is available to Class I (ATVs), Class II (4WDs) and Class III (motorcycles) motorized vehicles with Oregon ATV permits.
- Routes open to OHV use will be signed and mapped.
- Routes available for OHV use may change periodically due to timber harvest activity or trail rehabilitation.

**Process for ongoing public collaboration/outreach:**

The principal venue for public collaboration on the trail system is through local partnership relationships. A trail map is available to the public at the Eugene District Office and will be updated as trail routes change. The trail system is marked on the ground with regulatory and directional signs.

**Process for selecting a final road and trail network:**

Route designations were completed through two Shotgun OHV Trail System Environmental Assessments (EA OR 090-00-04 and EA OR 090-06-04). Amendments to the transportation system will be considered during the route designation planning process. These modifications will be accomplished in collaboration with trail partners and users.

**Road and trail construction and maintenance standards:**

Trail maintenance will be a priority within this OHV emphasis area to ensure quality riding experiences for trail users and to conserve natural resource values.

## Roseburg District

**OHV Designations:**

Limited to designated roads and trails: 423,986 acres

Closed: 3,317 acres

**Description:**

Includes all BLM-administered lands within the Roseburg District. See additional interim guidelines for the Hubbard Creek OHV Emphasis Area.

**Limited Area Management Guidelines:**

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the Roseburg District office illustrating designations, describing specific restrictions, and defining opportunities.

**Process for selecting a final road and trail network:**

Final route designations for the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.



## Hubbard Creek OHV Emphasis Area

**Acres:** 12,041

**OHV Designation:**

Limited to designated roads and trails

**Niche:** Offers a multiple-use trail riding experience for motorcycles, ATVs, and 4X4 vehicles.

**Management Guidelines:**

- Level 1 and 2 routes are open to Class I (ATVs), Class II (4X4s) and Class III (motorcycles) vehicles according to width. Trails under 50 inches wide are restricted to Class I and Class III vehicles.
- ATVs and motorcycles must have Oregon ATV permits.
- Non-motorized travel (horseback riding, hiking, and mountain biking) is allowed on all access routes.
- Motorized use on the trail system may be restricted during the summer due to fire hazard conditions, as determined by Douglas Forest Protective Association.

**Process for ongoing public collaboration/outreach:**

The principal venue for public collaboration on the trail system is through partnerships with the local motorcycle and 4X4 associations.

**Process for selecting a final road and trail network:**

No route designations were made in the previous planning effort since it was designated as limited to existing roads and trails. After completion the RMP revision, a road and trail inventory and designation process for the area will be developed.

**Road and trail construction and maintenance standards:**

Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users, to minimize user conflicts, promote safety for users, and conserve resource values.

## Coos Bay District

**OHV Designations:**

Limited to designated roads and trails: 318,437 acres

Closed: 3,844 acres

**Description:**

Includes all BLM-administered lands within the Coos Bay District. See additional interim guidelines for the Blue Ridge OHV Emphasis Area.

**Limited Area Management Guidelines:**

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.



- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the Coos Bay District office illustrating designations, describing specific restrictions, and defining opportunities.

**Process for selecting a final road and trail network:**

Route designations have been completed for the New River ACEC and the Blue Ridge OHV Emphasis Area. Final route designations for the rest of the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.

## Blue Ridge OHV Emphasis Area

**Acres:** 1,609

**OHV Designation:**

Limited to designated roads and trails



**Niche:** Offers a multiple-use, single-track trail riding experience for hikers, equestrians, mountain bikers, and motorcycle riders.

**Management Guidelines**

- The single-track trail system is available to Class III (motorcycles) vehicles with Oregon ATV permits and all non-motorized modes of travel.
- Motorized, mechanized, and equestrian use is prohibited between December and April to prevent excessive damage to the trail tread when soil moisture conditions are high. Motorized use on the trail system may be restricted during summer months due to fire hazard conditions.

**Process for ongoing public collaboration/outreach:**

The principal venue for public collaboration on the trail system is through local partnership relationships. A printed trail map is available to the public at the Coos Bay District office and on the Coos Regional Trail Partnership webpage. The trail system is marked on the ground with regulatory and directional signage.

**Process for selecting a final road and trail network:**

Route designations were completed through the Blue Ridge Multiple Use Trail System environmental assessment (EA OR-125-98-18). Adaptive management will be used to adjust the system for commercial timber production demands, user needs and resource protection. These modifications will be accomplished in collaboration with trail partners and users and through amendments to the Blue Ridge Trail system plan and an environmental assessment.

**Road and trail construction and maintenance standards:**

Construction and maintenance shall be done in accordance with the design features identified in the environmental assessment, standards in BLM Manual H-9114-1, and other professional sources. Trail maintenance will be a priority within this OHV emphasis area to ensure a quality riding experience for trail users and to conserve natural resource values.

## Medford District

**OHV Designations:**

Limited to designated roads and trails: 825,843 acres

Closed: 60,508 acres

**Description:**

Includes all BLM-administered lands within the Medford District. See additional interim guidelines that apply to all OHV emphasis areas within the district.

**Limited Area Management Guidelines:**

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.
- Paved roads are limited to licensed, street-legal vehicles only.
- Level 1 and 2 routes are open to Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles. Trails less than 50 inches in width are restricted to ATVs and motorcycles.



- Roads on private property that do not have a secured public right-of-way are not necessarily open to public or recreational vehicle traffic, even if they are a “continuation” of the BLM road system or a road shown on the preliminary maps.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- In the Butte Falls Resource Area, the Jackson Access and Cooperative Travel Management Area closure (32,822 acres) is in effect from mid-October through April 30. Only those roads shown in green on ODFW maps or posted with green reflectors are open to motorized vehicles during the period of the restriction.
- Vehicles may pull off roads or trails to park or allow others to pass, the minimum distance needed to allow for safe passage.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicle use and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.
- Non-motorized travel is allowed on all access routes (e.g. horseback riding, hiking, and mountain biking).

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.

**Process for selecting a final road and trail network:**

Final route designations for the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM’s geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.



## Medford District OHV Emphasis Areas

The OHV emphasis areas in the Medford District will be managed as Special Recreation Management Areas with an off-highway vehicle focus. The following interim management guidelines apply to these areas on the Medford District:

- Anderson Butte: 11,482 acres
- Coyote Creek: 14,585 acres
- Elderberry Flats: 3,393 acres
- Elliot Creek: 3,931 acres
- Quartz Creek: 8,727 acres
- Spencer Creek: 11,912 acres
- Timber Mountain/ Johns Peak: 13,919 acres

**Niche:** These areas offer a multiple-use trail riding experience for users of Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles. The transportation system of these areas also supports commercial and administrative access.

### Management Guidelines:

- Level 1 and 2 routes are open to Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles. Trails less than 50 inches wide are restricted to ATVs and motorcycles.
- ATVs and motorcycles must have valid Oregon ATV permits.
- Non-motorized travel is allowed on all access routes (e.g. horseback riding, hiking, and mountain biking).
- Motorized use on the road and trail system may be restricted during the summer due to fire hazard conditions.

### Process for ongoing public collaboration/outreach:

The principal venue for public collaboration within these areas is through local partnership relationships with local motorcycle and 4X4 associations.

### Process for selecting a final road and trail network:

Criteria shall be established for future route designations. No route designations were made in the planning effort for the previous resource management plan.

### Road and trail construction and maintenance standards:

Trail maintenance would be a priority within these areas to ensure a quality riding experience for trail users, to minimize user conflicts, promote safety for users, and conserve natural resource values.

## Klamath Falls Resource Area

### OHV Designations:

Limited to designated roads and trails: 214,010 acres

Closed: 10,971 acres

### Description:

Includes all BLM-administered lands within the Klamath Falls Resource Area.

### Limited Area Management Guidelines:

- Limited OHV areas are managed in accordance with all applicable federal and state off-highway vehicle regulations.





- Motor vehicle use will be limited to administrative, commercial, and passenger vehicle traffic where not specifically signed or gated.
- Until road and trail designations are complete, all motorized vehicles will be limited to the interim road and trail network as mapped unless closed or restricted under a previous planning effort or due to special circumstances as defined below.
- Routes may be closed or limited under seasonal or administrative restrictions. These restrictions may include, but are not limited to, fire danger, wet conditions, special requirements for wildlife species, to protect cultural resources, or for public safety.
- Vehicles may pull off roads or trails to park or allow others to pass, up to 25 feet from centerline of roads or up to 15 feet from centerline of trails.
- Limitations apply to all Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles and to all activity types (recreational, commercial, etc.) unless authorized by the BLM for administrative purposes.

**Seasonal restrictions:**

- The Eastside seasonal OHV closure is in effect from November 1 to April 15. Applies to all BLM-administered lands within deer winter range cooperative wildlife areas, including the majority of Stukel and Bryant Mountain and portions of the Gerber block as mapped.
- The Pokegema wildlife area seasonal OHV closure is in effect from November 20 to April 1.
- For designated snowmobile trails, wheeled vehicles are prohibited once grooming of trails begins for winter season.
- The OHV use may be limited in other areas on a seasonal basis due to special conditions such as temporary fire restrictions, special wildlife requirements, etc.

**Closed Area Management Guidelines:**

All motorized vehicles are prohibited from entering closed OHV areas unless authorized by the BLM for administrative purposes.

**Process for ongoing public collaboration/outreach:**

- The principal venue for public collaboration is through public outreach and scoping during future travel management planning efforts, special projects, and local partnership.
- Press releases will be sent out as needed informing the public of OHV opportunities and restrictions. Signs will be posted where appropriate.
- Upon completion of the transportation management plan, maps and brochures shall be available to the public at the main office illustrating designations, describing specific restrictions, and defining opportunities.
- The BLM will continue to participate with other land managers in the cooperative management of the Pokegema wildlife area and deer winter range areas.

**Process for selecting a final road and trail network:**

Final route designations for the district will be accomplished in a comprehensive, interdisciplinary travel and transportation management plan scheduled to be complete no later than five years after completion of the RMP revision.

The BLM's geo-database will provide information for identifying roads and trails for both motorized and non-motorized activities. On-the-ground inventories will be conducted if a reasonable determination can not be made using remote-sensing techniques. Proposed designations will be analyzed through public scoping and a NEPA analysis. Amendments to the designated system will be considered during the transportation management planning process.

**Road and trail construction and maintenance standards:**

Construction and maintenance will be done in accordance with the standards in BLM Manual H-9114-1 and other professional sources.



# Planning Frameworks for Special Recreation Management Areas (SRMAs)

This section presents district-specific management guidelines for management areas that would be carried forward under all three action alternatives. For a complete list of special recreation management areas, see the Tables section in Chapter 2. The management guidelines are presented in the order of Salem, Eugene, Roseburg, Coos Bay, Medford (the five western Oregon BLM districts), and Klamath Falls (one of the resource areas of the Lakeview District).

## Salem District

### Alsea Falls SRMA

**Primary Market Strategy: Community**

Niche: Overnight camping, picnicking, hiking and mountain biking, horse-back riding, and leisurely driving opportunities in a coastal mountain setting.

Management Objectives: Manage the area to provide overnight camping, hiking, mountain biking, and equestrian opportunities in a coastal mountain setting.

**Targeted Outcomes:**

Activities: Camping, hiking, picnicking, viewing natural landscapes, mountain biking, equestrian trail riding, and resting at a stop along a national backcountry byway

Experiences: Sense of achievement by developing personal skills and abilities; savoring the total sensory experience of a natural landscape; enjoying the closeness of family; relishing group affiliation and togetherness; bringing back pleasant memories; enjoying getting some needed physical exercise or rest; and escaping from personal-social, physical, or family pressures for awhile

Benefits: Improved mental health and health maintenance; restored body from fatigue, improved capacity for outdoor physical activity, improved fitness and health; greater family bonding, opportunity for a more well-rounded childhood development, enhanced lifestyle; and greater retention of distinctive natural landscape features

**Prescribed Setting Character:**

Physical: Primarily front country and middle country landscaping varies from un-modified forest to highly modified timber actions throughout the SRMA and along the byway

Social: Accommodates 16 families with up to 100 people in the campground and 22 families and up to 150 people in the picnic area when at full capacity. Encounters are highly expected during the high-use season. A group size of up to 10 in the rest of Alsea Falls Area SRMA with a less likelihood of encounters

Administrative: Brochures are available. Agency presence lessens as remoteness increases, mostly non-motorized recreation in and around the recreation site. The remaining SRMA is limited to mapped designated roads and trails. Resident summer staff and camp hosts during the open season. Site is closed during the low-use season of October through April, while allowing walk-in day use access during that time. Rules are clearly posted throughout the park.

**Activity Planning Framework:**

Management: Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a front and middle country recreation setting in the SRMA.

Marketing: Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area and SRMA.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain safe and enjoyable recreation experience and to conserve and restore the natural setting.

## Fishermen's Bend

**Primary Market Strategy: Community**

Niche: Offers a wide variety of safe and high-quality family and group facilities and outdoor recreational opportunities in a forested setting along the scenic North Santiam River, within 30 miles of larger rural communities and densely populated urban communities.

Management Objectives: To provide highly developed, clean, safe, enjoyable, and accessible facilities and outdoor recreation opportunities in a forested setting. To provide outdoor nature study programs and activities for children and adults.

**Targeted Outcomes:**

Activities: Individual and group camping and picnicking, non-motorized boating, fishing, nature study, water-play, biking, walking, and athletic field sports

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying easy access to natural landscapes, participating in outdoor events, getting some needed physical exercise, getting some needed physical rest, and releasing or reducing built-up mental tensions

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, greater appreciation for parks and how managers care for them, and positive economic contribution to nearby rural communities

**Prescribed Setting Character:**

Physical: The overall physical setting is rural with a relatively natural appearing mature conifer forest setting along the scenic North Santiam River. The level of development and visitor amenities is high with paved roads, developed campsites (water, sewer and electrical hook-ups), cabins, flush restrooms with showers, accessible trails, and a boat ramp. Large group camping and picnic facilities are present with athletic fields, playgrounds, and basketball courts. Nature study facilities include a nature center and interpretive nature trail.

Social: High density with family, friends, and group interactions

Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted throughout site. Nature study programs and activities for both children and adults are provided on a weekly basis.



**Activity Planning Framework:**

**Management:** Continue to manage the park's facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintain the park's desirable mature forest and native vegetation. Expand site use for environmental educational activities, especially in the shoulder season.

**Marketing:** Work with interested groups to provide visitor information both on and off site.

**Monitoring:** Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

**Administrative:** To provide high-quality visitor service and to ensure compliance with park rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide onsite management presence. To participate in partnerships that help meet management objectives.

## **Little North Santiam River**

**Primary Market Strategy: Community**

**Niche:** Offers a wide variety of safe and high-quality outdoor recreational opportunities in a forested setting along the scenic Little North Santiam River, within 40 miles of larger rural communities and densely populated urban communities. Rugged and remote backcountry experiences are available in the Elkhorn Creek Wild and Scenic River (WSR).

**Management Objectives:** To provide a wide range of outdoor recreation opportunities and protect Elkhorn Creek WSR. To provide facilities, river access and administrative control that support resource protection, visitor safety, health, and enjoyment. To provide recreation visitor with education, information and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

**Targeted Outcomes:**

**Activities:** Swimming, camping, picnicking, fishing, hiking, hunting, and recreational mining

**Experiences:** Enjoying closeness of family and friends and group affiliation and togetherness; enjoying easy access to natural landscapes, participating in outdoor events and getting some needed physical exercise; getting some needed physical rest and reducing built-up mental tensions; and enjoying more strenuous exercise and escaping crowds

**Benefits:** Improved mental health and health maintenance, stronger ties with family and friends, greater appreciation for parks and how managers care for them, personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

**Prescribed Setting Character:**

**Physical:** Modifications such as paved roads, utilities, houses, a golf course, and forest management are frequently observable along county roads and the Little North Santiam River. BLM-administered lands along Elkhorn Creek WSR are much more rugged and remote with little to no observable modifications.

**Social:** Moderate to high levels of visitor interaction occurs in most of the SRMA with very low to no encounters expected along in the Elkhorn Creek WSR.



Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted in sites and areas. Much less agency presence and signage for Elkhorn Creek WSR.

**Activity Planning Framework:**

Management: Continue to manage park's facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintain desirable mature forest and native vegetation at parks.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

Administrative: Provide high-quality visitor service and to ensure compliance with park rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide onsite management presence. Participate in partnerships that help meet management objectives.

## **Molalla River/Table Rock**

**Primary Market Strategy: Community**

Niche: Offers a wide variety of settings and recreation activities within 10 miles of a large rural community and 60 miles of large urban populations. Uplands provide year round non-motorized trail opportunities and the Molalla River is popular for summer fishing, swimming, and rafting. Table Rock Wilderness (TRW) offers more remote opportunities with scenic overlooks, mountain meadows and forested non-motorized trails.

Management Objectives: To provide the facilities and visitors services needed for resource protection and a wide spectrum of outdoor recreational and nature study opportunities in a variety of natural settings from rural to primitive and social settings from highly interactive to more remote. To provide a variety of visitor information media and support to special events that promote "Leave No Trace" use practices, public land stewardship, and partnerships.

**Targeted Outcomes:**

Activities: Hiking, biking, equestrian use, camping, picnicking, swimming, fishing, boating, hunting, and natural resource education

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying having access to hands-on outdoor natural resource educational facilities and activities, and getting some needed physical rest and reducing built-up mental tensions and escaping everyday responsibilities for awhile in both developed and remote areas

Benefits: Improved mental health and health maintenance, stronger ties with family and friends; personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

**Prescribed Setting Character:**

Physical: The entire area is characterized by a forested setting of various ages. The Molalla River is more developed where timber management, roads, designated campsites, vaulted restrooms, and signs are



frequently observable. Aquila Vista Environmental Education Site has trails, shelters, and a vaulted restroom for use in outdoor natural resource educational programs by schools and other groups. The uplands along the Molalla River are less developed with gravel roads and single-track trails and minimal signage and TRW more primitive with trailhead parking, signs, and single-track trails.

Social: Encounters with others along the Molalla River is more frequent and intensive than in the uplands along the trail system with the most remote area being within the wilderness.

Administrative: Regular patrols and visitor contact are made by agency recreation staff and law enforcement along the Molalla River with lower levels of agency presence in the uplands.

**Activity Planning Framework:**

Management: Continue to provide agency presence and facility management for resource protection and a variety of recreation opportunities. Consider new facility and program development as needed.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols, resource monitoring, and seek input from visitors.

Administrative: Complete a SRMA plan to help identify future facility and program needs. To participate in partnerships that help meet management objectives.

## Nestucca River

**Primary Market Strategy: Community**

Niche: Developed overnight camping, water-based day use recreation, and scenic driving opportunities

Management Objectives: With increasing public use of the Nestucca River corridor, it is necessary to manage the recreation resource to not only accommodate increased use but to protect or enhance recreation, watershed, and wildlife values present.

**Targeted Outcomes:**

Activities: Camping, picnicking, swimming, fishing, and scenic driving

Experiences: Relaxation, family and group bonding, escape from personal and social pressures, and opportunity to enjoy the sights and sounds nature has to offer

Benefits: Personal – better mental health and health maintenance, and restored sense of self; Psycho-physiological – enhanced feeling of freedom and refinement; Household and Community – greater family bonding, opportunity for more well-rounded childhood development, learning and passing on of outdoor skills, and fulfilling the desire of simple living; and Economic – positive contribution to regional economic stability

**Prescribed Setting Character:**

Physical: Four semi-developed campgrounds. Three with paved roads and parking surfaces and one walk-in site. The campgrounds border the Nestucca River, which is a free-flowing State Scenic Waterway through the Oregon Coast Range. The Nestucca Back Country Byway parallels the river winding through steep canyon walls of the coast range. It is within a mature forest dominated primarily by Douglas fir.



Social: Medium visitor density. The campgrounds are approximately 5 acres in size each and range between 5 and 11 sites per campground. The larger campgrounds at full capacity can accommodate 11 families.

Administrative: Self-service fee booth at information kiosk. Regularly patrolled during summer months by law enforcement and other agency staff. Rules are clearly posted at fee station/information kiosk.

**Activity Planning Framework:**

Management: Continue to provide for a semi-developed camping experience and associated facilities with an emphasis on maintaining a front country recreational setting.

Marketing: Use visitor information to disperse recreation use throughout the recreation season to reduce crowding during peak-use periods and enhance the overall visitor experience. Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area. Inform visitor how user fees are being used in the operation of the recreation area. Solicit feedback from users and user groups on how they would like to see their fees used in the future.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural environment (i.e., visitor services, law enforcement presence, restoration, permitting, and fees).

## **Sandy River/Mt. Hood Corridor**

**Primary Market Strategy: Destination**

Niche: Only 40 miles from the Portland metropolitan area, this SRMA offers a scenic corridor with a unique mix of both high-quality developed recreation and interpretive facilities and river greenway open space. Key features include the Sandy and Salmon Wild and Scenic Rivers (WSR), Wildwood Recreation Site, and the Barlow National Historic Trail.

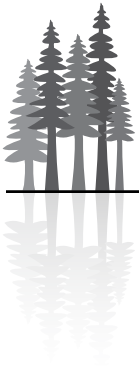
Management Objectives: At developed sites provide clean, safe, enjoyable, and accessible facilities and outdoor recreational opportunities in a forested setting, and in undeveloped areas provide less developed open space for a variety of outdoor recreation and nature study opportunities. To provide recreation visitor with education, information, and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

**Targeted Outcomes:**

Activities: Hiking, swimming, biking, fishing, non-motorized boating, individual, nature study, picnicking, scenic driving, historic study, and hunting

Experiences: Enjoying closeness of family and friends and group affiliation and togetherness, enjoying easy access to natural landscapes and getting some needed to strenuous physical exercise, enjoying having access to hands-on outdoor natural resource educational facilities and activities, and getting some needed physical rest and reducing built-up mental tensions

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, positive economic contribution to nearby rural communities



**Prescribed Setting Character:**

Physical: Modifications such as paved roads, utilities, houses, businesses, and some forest management are readily observable along U.S. Highway 26. Wildwood Recreation Site is a highly developed park located along the Salmon WSR in a forested setting that features an interpretive watershed and fisheries trail with a unique in-stream fish viewing window, an interpretive wetlands boardwalk, flush restrooms, and group facilities. The Sandy River and uplands offer less developed areas.

Social: Wildwood has more frequent and intensive interaction with some groups, while less developed areas along the Sandy River have less intensive interaction and may include low to moderate encounters with other visitors.

Administrative: Park staff presence high with seasonal staff and volunteer hosts staying onsite and conducting frequent fee compliant checks and maintaining park facilities and cleanliness. Rules are clearly posted in sites and areas.

**Activity Planning Framework:**

Management: Manage park facilities for a high level of facility maintenance, safety, cleanliness, and accessibility. To the extent possible, maintaining park's desirable mature forest and native vegetation. Continue to support environmental education activities. As needed, address management issues on less developed areas.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue recreation staff/law enforcement patrols and work with volunteers to meet resource monitoring needs and seek input from visitors.

Administrative: Complete an SRMA plan to help identify future facility and program needs. Participate in partnerships that help meet management objectives.

## **Yaquina Head Outstanding Natural Area**

**Primary Market Strategy: Destination**

Niche: Access to a unique coastal headland setting with historic lighthouse and ocean front settings for traditional recreation uses, resource appreciation, education, and interpretation

Management Objectives: Promote the conservation and development of the area's scenic, natural, and cultural resource values; protect the area's wildlife habitat; and make use of the area for education, scientific study, and public recreation activities.

**Targeted Outcomes:**

Activities: Access to the ocean for bird watching, whale and harbor seal watching, nature study, tide pooling, visiting an historic lighthouse, hiking, interpretive programs, and environmental education

Experiences: Learning about and enjoying nature, enjoying the closeness of family, relishing group affiliation and togetherness, enjoying having easy access to natural landscapes, exercise and physical fitness, escaping everyday responsibilities for awhile, learning more about wildlife and the marine environment, and learning more about northwest coastal maritime history





Benefits: Improved mental health and health maintenance; personal development and growth; supporting a more outdoor-oriented lifestyle; improved opportunity to view wildlife; improved fitness and health; greater family bonding, more well-rounded child development, enhanced lifestyle, access to low cost recreation opportunities; positive contributions to local economic stability; and maintenance of distinctive recreation setting character, greater community ownership of recreation and natural, cultural and heritage resources, and greater protection of wildlife habitats

**Prescribed Setting Character:**

Physical: Developed recreation and interpretive site with paved roads and parking lot surfaces, a large interpretive center on a marine coastal headland. Landscape varies from ocean front beach and tide pool environment to unmodified coastal forest to urban park-like settings. The overall physical setting character is rural.

Social: High visitor density – approximately 340,000 visitors annually

Administrative: Controlled access entrance station. Patrolled daily by agency staff. Rules and regulations are clearly posted throughout the park. High presence of regulatory and interpretive signs. High degree of visitor control.

**Activity Planning Framework:**

Management: Continue to provide for a high-quality day use interpretive experience and maintain the associated facilities with an emphasis on maintaining a rural recreation setting.

Marketing: Use interpretation to increase visitor awareness of coastal marine wildlife habitat and maritime history, disperse use throughout the season to reduce crowding at peak periods to enhance the overall visitor experience and lessen visitor conflicts and resource impacts.

Monitoring: Monitor visitor satisfaction on a periodic basis to determine the appropriateness of management activities, signage, fees, etc.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural and historical setting.

## Yellowstone

**Primary Market Strategy: Community**

Niche: Features the scenic Quartzville Creek Wild and Scenic River (WSR), which is easily accessed by the paved Quartzville National Back Country Byway (BCB) Road. A unique feature includes large stands of old-growth forest.

Management Objectives: To provide a wide range of outdoor recreation opportunities and protect Quartzville Creek WSR. To provide facilities, river access and administrative control that support resource protection, visitor safety, health, and enjoyment. To provide recreation visitor with education, information, and interpretation designed to encourage stewardship and minimize user impacts and conflicts.

**Targeted Outcomes:**

Activities: Hiking, biking, camping, picnicking, swimming, fishing, boating, hunting, scenic driving, recreational mining, and mining history



Experiences: Enjoying closeness of family and friends and group affiliation and togetherness and enjoying easy access to natural landscapes, enjoying having access to hands-on outdoor natural resource educational facilities and activities, getting some needed physical rest and reducing built-up mental tensions, and enjoying more strenuous exercise and exercise and escaping crowds

Benefits: Improved mental health and health maintenance, stronger ties with family and friends, personal growth and development with greater self-reliance associated with improved outdoor skills, and positive economic contribution to nearby rural communities

**Prescribed Setting Character:**

Physical: The entire area is characterized by a forested setting of various ages, but with old-growth forest dominating BLM-administered lands. Lands along Quartzville Creek Wildland Scenic River are more developed, including three developed recreation sites and other modifications such as paved roads, designated river campsites, and visitor signs. The uplands in the northern part of the SRMA are less developed with gravel roads and very little evidence of human activities except past timber management activities.

Social: The social setting along Quartzville Creek has more frequent and intensive interaction with some group interaction, while the uplands have less intensive use and lower encounters.

Administrative: Regular patrols and visitor contact are made by agency recreation staff and law enforcement along the Quartzville Creek with low levels of agency presence in uplands.

**Activity Planning Framework:**

Management: Continue to manage recreation sites for a high level of facility maintenance, and sites and the corridor for visitor safety, cleanliness, and resource protection. To the extent possible, maintain desirable mature forest and native vegetation at parks.

Marketing: Work with interested groups to provide visitor information both on and off site.

Monitoring: Continue patrolling with recreation and law enforcement staff, continue monitoring resources, and continue seeking input from visitors.

Administrative: To provide high-quality visitor service and to ensure compliance with park and corridor rules and resource protection, continue to use efficient mix of seasonal and volunteer staff to provide park and corridor management presence. To participate in partnerships that help meet management objectives.

## Eugene District

### Lower Lake Creek

**Primary Market Strategy: Destination**

Niche: Opportunities for swimming, water play, picnicking, fishing and wildlife viewing in a natural setting.

Management Objectives: Improve visitor safety and decrease health hazards; enhance visitors' recreation experience and appreciation of natural resources.

**Targeted Outcomes:**

Activities: Water play, hiking, mountain biking, primitive camping.

Experiences: Enjoy socializing with friends and families in a scenic area; Physical activity (hiking and mountain biking) in a scenic area.

Benefits: Relaxation, physical exertion; interaction with family and friends.

**Prescribed Setting Character:**

Physical: Adjacent to a state highway; rustic amenities away from developed parking lot

Social: High levels of visitation; no possibility for solitude. Crowding expected on high-use weekends.

Administrative: Regulations posted; regular visitor services and law enforcement presence.

**Activity Planning Framework:**

Management: Continue to provide for improved visitor safety and health as described in the Lower Lake Creek RAMP (1997).

Marketing: Use information and interpretation to increase visitor awareness of safety and health issues in the SRMA.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable experience.

**McKenzie River****Primary Market Strategy: Destination**

Niche: Opportunities for nonmotorized boating, fishing, environmental education.

Management Objectives: Provide river-oriented recreation opportunities in coordination with other recreation providers along the river corridor.

**Targeted Outcomes:**

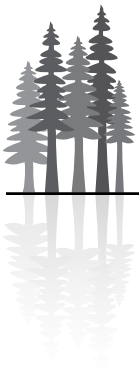
Activities: Fishing, boating, scenic viewing, resource interpretation Experiences: Water-based physical activity in a roaded natural setting Benefits: Outdoor skills development, exercise, relaxation, enjoyment of forested surroundings

**Prescribed Setting Character:**

Physical: Mostly natural appearing environment as viewed from sensitive roads and trails. Some obvious onsite controls of visitors. Access and travel is conventional motorized vehicles (e.g., sedans, RVs, etc.) and watercraft (primarily non-motorized).

Social: Visitor encounters common, but some chance for privacy

Administrative: Regular BLM staff patrols during high-use season (May- September). Interagency maintenance agreement continued to address routine maintenance needs of some developed sites.



**Activity Planning Framework:**

Management: Manage for continued water-based recreation activities. Incorporate interpretive/educational opportunities to strengthen visitor understanding and appreciation of the natural environment. Maintain river access opportunities.

Marketing: Continue to work with other agencies and private partners to promote responsible recreational use of the river corridor.

Monitoring: Monitor for visitor compliance, capacity and satisfaction. Draw upon university resources for periodic surveying.

Administrative: Provide visitor services and law enforcement presence.

## Row River Trail

**Primary Market Strategy: Destination**

Niche: Opportunities for hard surface, non-motorized trail recreation.

Management Objectives:

- Provide a broad spectrum of resource-dependent recreation opportunities to meet the needs and demands of public land visitors.
- Foster interagency efforts to improve service to the visiting public.
- Maintain high-quality recreation facilities to meet public needs and enhance the image of the agency.
- Improve public understanding and support of the Bureau by effectively communicating the agency's multiple use management programs to the recreation visitor.

**Targeted Outcomes:**

Activities: Bicycle riding, walking, horseback riding

Experiences: Physical activity in a rural setting

Benefits: Exercise, appreciation of natural surroundings, feelings of accomplishment

**Prescribed Setting Character:**

Physical: Rural—adjacent to heavily traveled paved county road

Social: Rural—small group size, but encounters with others are commonplace; traffic noise prevalent

Administrative: Rural—A substantial amount of information is provided along the trail; BLM presence daily during the high-use season.

**Activity Planning Framework:**

Management: Continue to provide hard-surface non-motorized riding opportunities; provide trailheads with parking lots and basic amenities. Provide interpretive signage along the trail.

Marketing: Include on printed and web-based media generated by BLM; work with partners to promote the trail.



Monitoring: Monitor for visitor compliance and satisfaction

Administrative: Provide visitor services and law enforcement presence. Maintain OHV closure on trail.

## Shotgun Creek

### Primary Market Strategy: Destination

Niche: Opportunities for organized group events, swimming, picnicking, and hiking.

Management Objectives:

- Provide resource-based, nonmotorized recreation activities.
- Promote organized group gatherings.
- Maintain facilities that offer convenience to visitors.
- Minimize visitor conflicts between groups.

### Targeted Outcomes:

Activities: Group events, picnicking, hiking, competitive sport activities

Experiences: Physical activity, comfort in a developed setting

Benefits: Exercise, companionship, appreciation of natural surroundings

### Prescribed Setting Character:

Physical: Natural forested setting containing facilities/amenities typical of those found in urban recreation sites, including opportunities for competitive sporting events

Social: Small to large group accommodations offered. Opportunity to observe/affiliate with others.

Administrative: BLM staff and volunteer presence daily. Low cost/low maintenance fee collection procedures established.

### Activity Planning Framework:

Management: Provide group event and nonmotorized trail opportunities

Marketing: Distribute print and internet-based media, partner with independent newspaper media to promote recreation site.

Monitoring: Monitor for visitor compliance and safety.

Administrative: Provide high level of visitor services from May-October; collect recreation use fees from May-October; maintain OHV closure; administer group shelter rental program.

## Upper Lake Creek

### Primary Market Strategy: Destination

Niche: Regionally important opportunities for fishing, horseback riding, camping, and nonmotorized boating



**Management Objectives:**

Roaded natural: Protect natural and scenic qualities of the SRMA around Hult Reservoir while allowing for rustic recreation facility development.

Semi-primitive motorized: Maintain existing semi-primitive setting, natural appearing environment, and allow for development of multiple use nonmotorized trails.

**Targeted Outcomes:**

Activities:

- Roaded natural: Fishing, camping, boating (lake), hiking, horseback riding
- Semi-primitive motorized: Hiking, horseback riding, OHV use on designated roads.

Experiences: Enjoyment of natural settings and scenic values

Benefits:

- Offer comfort in an outdoor setting
- Improved health and safety of visitors
- Enhanced appreciation of natural settings

**Prescribed Setting Character:**

Physical: RN – adjacent to all-weather paved road, small dam, bridge, and fish ladder readily apparent. SPM – roads available for motorized vehicle use are generally graveled surface, relatively high density of roads.

Social: RN – relatively small group size, but mostly within sight and sound of others; high traffic level on paved road. SPM – small group size, less likely to encounter others.

Administrative: RN – rules posted; BLM presence on most summer weekends. SPM: occasional regulatory signage; some BLM presence.

**Activity Planning Framework:**

Management: Provide for rustic day use and overnight facilities as described in the Upper Lake Creek RMP (2005).

Marketing: Provide visitor use and experience opportunity information through a variety of media including web-based, brochures and onsite information.

Monitoring: Monitor visitor satisfaction.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting (e.g., visitor services, law enforcement, volunteer organizations for trail maintenance)



# Roseburg District

## Cow Creek

### Primary Market Strategy: Community

Niche: Back Country Byway; semi-developed day-use and river access; potential for overnight camping.

### Management Objectives:

- Provide a broad spectrum of resource dependent recreation opportunities to meet the needs and demands of visitors as prescribed in the Cow Creek Rec. Area Management Plan.
- Withdraw developed sites from mineral entry. Monitor and deter vandalism.
- Operate in accord with adjacent landowners and manage backcountry byway.
- Develop camping opportunities within the scenic corridor, including the Island Recreation Site.

### Targeted Outcomes:

Activities: Driving for pleasure, watchable wildlife, historical interpretation, camping, picnicking, recreational gold panning, other river activities, biking, and hiking.

Experiences: Group and family affiliations, escape from social pressure, physical exercise, developing outdoor skills, exploration and enjoying outdoor resources and viewsheds.

#### Benefits:

Personal – Increased physical fitness, obtaining greater self confidence, savoring the senses of the natural environment, enjoying participation in desired activities in preferred outdoor setting, experiencing a greater sense of independence and exploration.

Psychological – Better mental health, reducing built up tensions, feeling of personal freedom and exhilaration, enjoying a risk taking adventure, improved outdoor skills.

Economic – Increased local tourism revenue, reduced health maintenance costs.

Environmental – Increased commitment to maintain quality natural, greater local community support to manage natural resources to be enjoyed by prosperity.

### Prescribed Setting Character:

Physical: Varies from small developed recreation sites to natural areas of river and rolling forested hills. Landscaping varies from forest to managed park like environments. The overall physical setting character is front country.

Social: The social setting varies on three areas of the SRMA: 1) Cow Creek Back Country Byway – Moderate visitor density; 2) Cow Creek River – Low visitor density; 3) Developed recreation sites – Moderate visitor density during use season.

All settings are within a narrow corridor, but due to length, crowding seems diminished.

Administrative: The SRMA is mainly accessed from the south and north ends of the byway, however, other access points are available.



**Activity Planning Framework:**

Management: Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities for preferred benefit outcomes. Strengthen partnerships with local and other federal agencies. Utilize volunteers. Maintain a middle country to rural recreation setting.

Marketing: Disseminate brochures, post information on the internet, and post news releases.

Monitoring: Conduct patrols to sites within the area. Collect visitor use statistics and user preferences. Perform safety inventories annually.

Administrative: Determine and apply administrative actions as needed to promote quality recreation experiences, protect the character of settings, minimize user conflicts, promote safety of visitors and protect the natural resources. Issue Special Recreation Permits.

## North Umpqua

**Primary Market Strategy: Destination**

Niche: Developed overnight and day-use recreation; non-motorized river recreation, undeveloped non-motorized use area, and a paved access corridor.

**Management Objectives:**

- Enhance recreation opportunities through management plans, including: North Bank Ranch, North Umpqua Wild and Scenic River, and North Umpqua National Scenic Byway.
- Provide recreational opportunities compatible with the management of Columbia White Tail deer within the North Bank Habitat Management Area.
- Maintain high-quality recreation facilities to meet public needs and provide for quality recreation experiences in preferred settings. Withdraw developed sites from mineral entry.
- Coordinate volunteer host program and recreation partnerships with Umpqua National Forest.

**Targeted Outcomes:**

Activities: Camping, picnicking, hiking, wildlife viewing, rafting, kayaking, swimming, fishing, hunting, driving for pleasure, group gatherings, collecting forest products.

Experiences: Individual, family and group affiliations, escape from personal social pressure, achievement and challenge from adventure, physical exercise, enjoying outdoor resources.

**Benefits:**

Personal – Increased physical fitness, learning outdoor skills, testing endurance, obtaining self confidence, experiencing a greater sense of independence and exploration.

Psychological – Better mental health, personal satisfaction achieved in outdoor quests, releasing or reducing built up tensions or stress, feeling of personal freedom and exhilaration.

Economic – Increased local tourism revenue, increased work productivity after experiences.

Environmental – Increased commitment to maintain quality natural settings for future recreation activities and opportunities, greater community support to manage natural resources.





### **Prescribed Setting Character:**

**Physical:** Varies from developed recreation sites to natural areas of forested to semi-forested hills. The overall physical setting character is rural.

**Social:** 1) North Umpqua River – Low visitor density on W&SR section, high use in bait fishing area of Swiftwater; 2) North Umpqua Trail – Low visitor density; 3) North Umpqua Scenic Byway – High visitor density during summer use season; 4) Developed Recreation Sites – High visitor density during camping season; 5) North Bank Ranch – Low density.

**Administrative:** The entire area is accessed through specific areas where visitors can be monitored. Regular patrols and field presence are common. Rules are posted at sites. Brochures are available. Volunteer hosts reside seasonally or year round at seven sites.

### **Activity Planning Framework:**

**Management:** Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities. Strengthen partnerships. Utilize volunteers. Maintain rural setting.

**Marketing:** Disseminate brochures, post information on the internet, post news releases. Implement tourism actions from management plans of the byway and Wild and Scenic River.

**Monitoring:** Conduct regular field patrols. Collect visitor use statistics and preferences. Conduct safety inventories. Document river activities in the annual North Umpqua Wild & Scenic River Monitoring Report.

**Administrative:** Apply administrative actions to promote quality recreation, protect settings, minimize user conflicts, promote visitor safety, and protect natural resources. Partner with the Umpqua National Forest on management of the North Umpqua Wild and Scenic River and National Scenic Byway.

## **Umpqua**

### **Primary Market Strategy: Community**

**Niche:** Developed overnight and day-use recreation sites along river corridor

### **Management Objectives:**

- Manage recreation use to protect natural resources, provide visitor safety, and minimize user conflicts. Withdraw developed sites from mineral entry.
- Maintain high-quality recreation facilities to meet public needs and provide for quality recreation experiences in a preferred setting.
- Cultivate quality volunteer hosts who provide service to users of recreation sites and river.

### **Targeted Outcomes:**

**Activities:** Camping, picnicking, wildlife viewing, water play/swimming, fishing, driving for pleasure, viewing scenery, organized group gathering and socializing, off-highway vehicles.

**Experiences:** Individual, family and group affiliations, developing outdoor skills.

**Benefits:** Personal – Increased physical fitness, learning outdoor skills, testing endurance, obtaining self confidence, enjoying desired activities in preferred outdoor setting.



Psychological – Better mental health, personal satisfaction achieved in outdoor quests, releasing or reducing built up tensions or stress, feeling of personal freedom and exhilaration.

Economic – Increased local tourism revenue, reduced health maintenance costs.

Environmental – Increased commitment to maintain quality natural settings, greater local community support to manage natural resources.

**Prescribed Setting Character:**

Physical: Varies from highly developed recreation sites to forested areas. Landscaping includes managed park like environments. The overall physical setting character is rural.

Social: The social setting varies on three areas of the SRMA: 1) The Umpqua River – Low visitor density; 2) Developed recreation sites – High visitor density during camping season.

Administrative: Parts of the SRMA are accessed through areas where visitors can be monitored. Regular patrols are common. Rules are posted at sites and brochures are available. Volunteer hosts reside year-round at two recreation sites.

**Activity Planning Framework:**

Management: Provide for quality recreation settings and facilities to support a wide variety of recreation opportunities. Utilize volunteers. Maintain a rural recreation setting.

Marketing: Provide brochures, post information on the internet, and post news releases about recreation opportunities, rules, and special events.

Monitoring: Conduct patrols to use sites and collect use statistics and preferences. Perform safety inventories annually. Monitor volunteer efforts.

Administrative: Apply administrative actions as needed to promote quality recreation experiences, protect the character of settings, minimize user conflicts, promote safety of visitors and protect the natural resources. Issue Special Recreation Permits as needed.

## Coos Bay District

### Coos Bay Shorelands

**Primary Market Strategy: Community**

Niche: Access for ocean, coastal, and bay-front dependant recreation activities.

**Management Objectives:**

- Promote awareness of and appreciation for the many resource values and recreational opportunities, and support a minimum impact land use ethic through educational programs such as Leave No Trace and Tread Lightly.
- Manage the area to provide for a range of recreational opportunities that contribute to meeting recreation demand while protecting natural, cultural, and scenic resources.
- Provide and maintain visitor facilities, services, signage, and programs that are appropriate for the area's recreational opportunity setting that serves to protect the sensitive resources.

**Targeted Outcomes:**

Activities: Access to the ocean and bay for clamming, fishing, crabbing, boating, surfing, and wind sports. Four-wheel drive and off-highway vehicle touring, hunting, hiking, horseback-riding, mushroom hunting, bird watching, dispersed camping.

Experiences: Developing outdoor skills; experiencing a greater sense of independence, exploring, closeness of family, and group affiliation; easy access to natural landscapes; exercise and physical fitness; and an ability to utilize natural resources for personal enjoyment.

Benefits: Psychological – better mental health, personal development and growth, supporting an outdoor-oriented lifestyle, and greater freedom from urban living; Household and Community – greater family bonding, more well-rounded children, enhanced lifestyle, easy access to low-cost recreation opportunities; Economic – positive contributions to local economic stability, maintenance of community's distinctive recreation- tourism market, increased desirability as a place to live or retire; Environmental – maintenance of distinctive recreation setting character, greater community ownership of recreation and natural resources, greater protection of wildlife and plant habitats from growth and development.

**Prescribed Setting Character:**

Physical: Rural to front/middle country setting comprised of sand dune, wetlands, meadows, shore pine uplands, and bay/ocean front beaches. BLM's developed site includes a boat ramp, a parking lot, restrooms, interpretive kiosk, dock, and volunteer host site.

Social: Visitor encounters can be high during peak use periods at the boat ramp. Encounters diminish along the sand roads and are rare along the non-motorized trail system.

Administrative: Primarily in the form of fences, gates and posted regulatory signs. Patrolled frequently by BLM staff and county and BLM law enforcement officers.

**Activity Planning Framework:**

Management: Provide a range of opportunities that contribute to meeting recreation demand while protecting resources. Provide and maintain visitor facilities, services, signage, and programs that are appropriate for the area's setting and serve to protect sensitive resources.

Marketing: Use information and education to lessen potential conflicts between visitors and manage impacts to natural, cultural and scenic resources.

Monitoring: Monitor visitor satisfaction and recreation-related resource impacts.

Administrative: Apply administrative actions to maintain a quality recreation experience.

## Dean Creek Elk Viewing Area

**Primary Market Strategy: Community**

Niche: Unparalleled opportunities to view a Roosevelt elk herd in a day- use wildlife observation and interpretive site.



**Management Objectives:**

- Provide safe opportunities for the public to view and study elk, other wildlife and their habitats at Dean Creek.
- Provide high-quality forage for the elk as a means of maintaining herd health and supporting public viewing opportunities.
- Provide facilities and programs that support visitor safety; wildlife viewing; and interpretive, educational and passive recreational uses, all of which are compatible with the elk and other wildlife that inhabit Dean Creek.
- Manage visitor use to avoid unacceptable conflicts with, or damage to, wildlife and their habitats. Manage visitor use so elk and other wildlife retain their wild instincts and actions, by providing them freedom to roam the entire area without human intervention.

**Targeted Outcomes:**

Activities: Wildlife viewing, photography, interpretive and educational programs.

Experiences: Learning more about wildlife and wetlands, enjoy the experience of viewing an elk herd and natural landscapes, and physical rest

Benefits: Psychological – personal appreciation and satisfaction – closer relationship with the natural world, improved opportunity to view wildlife close-up; Economic – positive contributions to regional economic stability, increased local tourism revenue, maintenance of community’s distinctive recreation-tourism character; Environmental – retention of rural landscape features, maintenance and enhancement of habitat for elk and other wildlife.

**Prescribed Setting Character:**

Physical: Developed wildlife viewing and interpretive site with paved road and parking lots, a large covered interpretive wayside and restrooms. Landscape is rural pastureland and tidally affected wetlands and forested islands on the banks of the Umpqua River.

Social: Visitors are confined to specified routes and viewing areas at Dean Creek, creating a setting with a high density of visitors, especially during peak use periods.

Administrative: Most of the property is closed to all public entry, except for the designated viewing areas. The area is regularly patrolled by law enforcement, BLM staff and volunteers. Fences and gates, posted rules, and no trespassing signs are common.

**Activity Planning Framework:**

Management: Continue to provide for a high-quality wildlife viewing and interpretive experience and maintain facilities with an emphasis on the rural recreation setting.

Marketing: Use information and interpretation to increase visitor awareness of wildlife habitat and wetland management. Work closely with the gateway community of Reedsport and other partners in the region in marketing and outreach.

Monitoring: Monitor visitor satisfaction and resource conditions based on stated objectives.

Administrative: Apply administrative actions to maintain a safe and enjoyable wildlife viewing experience while protecting the elk herd from harassment.



## Loon Lake/East Shore

### **Primary Market Strategy: Destination**

Niche: Developed overnight camping and access to water-based day use recreation.

**Management Objective:** Provide a clean, safe, enjoyable experience for visitors.

### **Targeted Outcomes:**

Activities: Camping, picnicking, beach activities, access to power boating and interpretive programs.

Experiences: Family and group affiliation, physical rest, and to escape from personal-social pressures.

Benefits: Personal – Better mental health and health maintenance; Psycho-physiological - restored body from fatigue; Household and Community – greater family bonding, opportunity for more well-rounded childhood development; learning and passing on of outdoor skills, reduced social isolation; Economic – positive contribution to regional economic stability.

### **Prescribed Setting Character:**

Physical: Developed recreation site with paved road and parking lot surfaces within a mature Douglas fir forest on the shore of a natural lake. Landscaping varies from unmodified forest to urban-like park settings. The overall physical setting character is rural.

Social: High visitor density – accommodates over 850 people within the developed 35 acre campground and day use area when at full capacity.

Administrative: Controlled access entrance station. Regularly patrolled by law enforcement and other agency staff. Resident staff during the summer recreation season. Rules are clearly posted throughout the park.

### **Activity Planning Framework:**

Management: Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a rural recreation setting.

Marketing: Use visitor information and the reservation system to disperse use and reduce crowding during peak periods to enhance the overall visitor experience at Loon Lake. Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area. Inform visitors how their fees are being used in the operation of the recreation area and solicit feedback from them on how they would like to see their fees used in the future.

Monitoring: Monitor visitor satisfaction and the natural setting values within the area.

Administrative: Apply administrative actions as needed to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting at Loon Lake (i.e., permits and fees, visitor services, law enforcement, restoration/renovation).



## New River

### **Primary Market Strategy: Community**

Niche: Opportunities to explore undeveloped coastal uplands, river and ocean-front settings for traditional recreation uses, resource appreciation, and educational and interpretive programs.

### **Management Objectives:**

- Accommodate low-impact recreational use at New River while providing a variety of experience opportunities to help meet existing and anticipated demands.
- Promote awareness and appreciation for New River's many resource values, especially those significant to its Area of Critical Environmental Concern designation.
- Provide adequate supervision, visitor facilities, services, signage, and programs to protect resources and support planned visitor use activities and levels.
- Provide reasonable access with minimal impact on resources and visitor experiences.

### **Targeted Outcomes:**

Activities: Access to the ocean and river for fishing, waterfowl hunting, and kayaking, hiking, bird watching, photography, nature study, interpretive programs and environmental education.

Experiences: Learning about and enjoy nature; developing outdoor skills; experiencing independence, enjoying the closeness of family, group affiliation, exercise; escape pressures.

Benefits: Psychological – personal development and growth, supporting an outdoor-oriented lifestyle, improved opportunity to view wildlife, greater freedom from urban living;  
Household and Community – greater family bonding, more well-rounded children, enhanced lifestyle, access to low cost recreation opportunities;  
Economic – contributions to local economic stability, maintenance of community's distinctive recreation-tourism market niche, increased desirability as a place to live, increased property values for adjacent landowners.

Environmental – maintenance of distinctive recreation setting, greater community ownership of recreation and natural resources, greater protection of habitats from development.

### **Prescribed Setting Character:**

Physical: Primarily a rural to front/middle country setting that includes diverse coastal habitats, sand dunes and ocean-front beaches. Facilities at Storm Ranch include a learning center, parking lots, restrooms, interpretive kiosk, picnic tables and a host site.

Social: Visitor encounters are highest (10-20 contacts) during peak use periods at Storm Ranch and Floras Lake. Encounters diminish significantly on the trail network and river.

Administrative: Primarily in the form of gates and posted regulatory signs. Area is closed to the public at night. Patrolled frequently by BLM staff and law enforcement. Interpretive and environmental education programs are used to increase awareness and to lessen impacts.

### **Activity Planning Framework:**

Management: Provide opportunities that contribute to meeting recreation demand while protecting resources. Provide and maintain visitor facilities, services, signage, and programs.



**Marketing:** Use information and education to lessen potential visitor conflicts and resource impacts. Exercise discretion in promoting the recreation opportunities to minimize crowding.

**Monitoring:** Monitor visitor satisfaction and recreation-related resource impacts.

**Administrative** Apply administrative actions to maintain a quality recreation experience compatible with the appropriate setting and to protect sensitive resources.

## Sixes River

### **Primary Market Strategy: Destination**

**Niche:** Developed camping, water based day-use activities, and recreational gold mining.

### **Management Objectives:**

Provide the facilities, services and administrative designations needed to manage the activities associated with recreational use.

Manage the existing recreation sites consistent with Roaded Natural to Roaded Modified management classes. Continue to provide for a range of recreation opportunities in the area, including individual to large-sized group camping and picnicking experiences within the Edson Creek Recreation Site.

### **Targeted Outcomes:**

**Activities:** Camping, picnicking, fishing, social gatherings, swimming, non-motorized boating, recreational gold panning and sluicing.

**Experiences:** Family and group affiliation; physical rest; escape from personal-social pressures; ability to collect and utilize natural resources for personal enjoyment (e.g., fishing and recreational mining).

**Benefits:** Personal - better mental health and health maintenance, greater self reliance, stronger ties with family and friends; Psycho-physiological - restored body from fatigue; Household and Community - greater family bonding, opportunity for more well-rounded childhood development, learning and passing on of outdoor skills, reduced social isolation; Economic - positive contribution to regional economic stability.

### **Prescribed Setting Character:**

**Physical:** Developed recreation sites along the banks of the Sixes River, varying from an unmodified alder and Douglas fir forest to a rural park setting.

**Social:** High visitor density in the developed campgrounds when operating at peak capacity. During the off-season visitor contacts can be less than 10 per day.

**Administrative:** Regularly patrolled by law enforcement and other agency staff. Both campgrounds are fee areas and rules are clearly posted throughout the recreation area.

### **Activity Planning Framework:**

**Management:** Continue to provide for a developed camping and day use experience and associated facilities with an emphasis on maintaining a rural recreation setting.



**Marketing:** Use information and interpretation to lessen visitor conflicts and resource impacts in the recreation area. Inform visitors how fees are being used in the operation of the recreation area and solicit feedback from them on how they would like to see their fees used in the future.

**Monitoring:** Monitor visitor satisfaction and recreation-related resource impacts based on the SRMA objectives.

**Administrative:** Apply administrative actions to maintain a safe and enjoyable recreation experience and to conserve and restore the natural setting of the Sixes River (e.g., permits and fees, visitor services, law enforcement, restoration/renovation).

## Tioga

### **Primary Market Strategy: Undeveloped**

**Niche:** Undeveloped Coast Range setting for traditional forest-based recreation activities.

**Management Objectives:** An SRMA management plan has not been developed to establish management objectives for this area.

### **Targeted Outcomes:**

**Activities:** Driving for pleasure, big game hunting, fishing, mushroom gathering, camping in developed campgrounds, primitive dispersed camping, hiking, mountain biking/bicycling.

**Experiences:** Developing skills and abilities; experiencing a greater independence, exploring, enjoying nature, utilize resources for personal enjoyment, physical fitness; escape pressures.

**Benefits:** Psychological – better mental health, personal development and growth, greater self reliance, improved outdoor skills and self confidence, stronger ties with family, friends, and the natural world, a more outdoor- oriented lifestyle, enhanced sense of personal freedom; Psycho-physiological – improved physical fitness and health, restored body from fatigue.

**Household and Community –** greater family bonding, reduced social isolation, passing on outdoor skills and values, more well-rounded children, enhanced lifestyle; **Economic –** access to low cost outdoor recreation experiences, positive contribution to local economic stability, maintenance of the region's distinctive recreation market niche and character.

### **Prescribed Setting Character:**

**Physical:** Developed recreation sites include: Park Creek Campground, Burnt Mountain Recreation Site, and the Doerner Fir Trail. The area contains tracts of substantially unmodified forest landscapes in the Cherry Creek Research Natural Area and Wilderness Instant Study Area, the Tioga Creek Area of Critical Environmental Concern and the China Wall Area of Critical Environmental Concern.

**Social:** Social encounters are very low except the Park Creek Campground during the peak of summer and fall hunting season. Visitors may encounter log trucks on the roadways and other activities commonly associated with commercial forestry practices on public and private land.

**Administrative:** Very few administrative controls except for gates and some regulatory signs. Infrequent patrol by law enforcement and other BLM employees involved in visitor services.





### **Activity Planning Framework:**

**Management:** Provide a developed camping experience at Park Creek and associated facilities with an emphasis on maintaining a front country recreation setting. Maintain existing trails and evaluate the conversion of closed roads for additional hiking, mountain biking, equestrian, and off-highway vehicle opportunities. Develop new trails to connect with existing opportunities in the area.

**Marketing:** Use information and interpretation to lessen visitor conflicts and resource impacts with an emphasis on low impact recreation practices. Provide information to visitors about forest management practices, stream restoration and wildlife habitat management efforts.

**Monitoring:** Monitor visitor satisfaction and recreation-related resource impacts.

**Administrative:** Apply administrative actions to maintain a safe and enjoyable recreation experience within the Park Creek Campground and to conserve the middle country and backcountry settings of the area. Keep administrative controls to the minimum necessary to meet objectives in order to preserve the primitive setting valued by visitors

## **Medford District**

### **Hyatt Lake-Howard Prairie Lake**

#### **Primary Market Strategy: Destination**

**Niche:** Sub-alpine plateau featuring two lakes adjacent to the Cascade/ Siskiyou National Monument.

**Management Objectives:** Address Special Recreation Management Area issues and prioritize projects in watershed analyses or separate recreation area management plans as appropriate. Prepare project plans as needed. Provide for water-based recreation opportunities, winter sports, hiking, camping, equestrian use, fishing, and sightseeing.

#### **Targeted Outcomes:**

**Activities:** Camping, fishing, swimming, hiking, winter sports, equestrian use, wildlife observation, and nature interpretation.

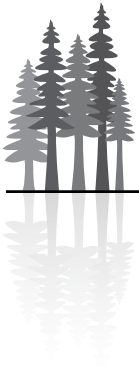
**Experiences:** Escape personal or social pressures. Relaxation in a forested mountain setting. Enjoy the company of family and friends, the use of recreation equipment, and exercising.

**Benefits:** Restored mind from unwanted stress; improved mental well being; improved skills for outdoor enjoyment; stronger ties to family and friends.

#### **Prescribed Setting Character:**

**Physical:** Sub-alpine forested plateau featuring two lakes with excellent fisheries, boating opportunities, hiking opportunities, and scenic vistas. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

**Social:** Moderate to high visitor density during peak use periods. Off-season periods offer opportunities for solitude, especially in undeveloped areas suitable for dispersed recreation. Campgrounds are generally full on weekends with much interaction between camping groups and BLM personnel.



Administrative: Most campgrounds have controlled access entrance stations with no reservations. County, state, and BLM law enforcement patrol periodically. Campground hosts provide visitor services.

Land ownership is mixed between county, state, private, and BLM.

**Activity Planning Framework:**

Management: Provide the widest array of recreation opportunities available in a forest, lake, mountain, and trail environment. Provide for winter sports opportunities. Emphasize camping and water based recreation.

Marketing: This SRMA markets itself and is a perennial favorite destination for the local population of the Rogue Basin and Klamath Basin. BLM and Jackson County distribute brochures and literature describing the attractions of the area.

Monitoring: During peak use periods, agency staff perform daily monitoring in high-use density areas, providing visitor services and noting and mitigating any resource damage. Periodic customer satisfaction surveys are conducted.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the natural character of the area.

## Pacific Crest National Scenic Trail

**Primary Market Strategy: National strategy for long-distance hikers, local strategy for short-distance hikers and equestrian users.**

Niche: This 40-mile portion of the trail offers high elevation hiking and outstanding opportunities for solitude and primitive camping along the Cascade-Siskiyou Mountains.

**Management Objectives:** Protect and preserve the physical, aesthetic, social and biological environments characteristic within the trail corridor. Provide interpretive information at all access points. Maintain trail conditions as prescribed by BLM standards. Cooperate with trail groups, other agencies, and private landowners in the overall management of the trail.

**Targeted Outcomes:**

Activities: Long distance and day hiking, equestrian use, photography, wildlife observation, sightseeing, camping, hunting, and cross-country jogging.

Experiences: Solitude and self reliance. Escape stress and pressure of the outside world. Enjoy physical exercise, challenge, and adventure of long distance wilderness hiking.

Benefits: Development of improved physical endurance. A restored mind from unwanted stress. Enhanced awareness of nature and natural processes.

**Prescribed Setting Character:**

Physical: The trail corridor is generally within a short distance of the ridge crest and proceeds below timberline through coniferous forest stands, abbreviated by occasional meadows. Water sources are generally uncommon. Frequent encounters with grazing livestock.



Social: Encounters with other hikers and equestrian riders are nominal away from trailheads.

Administrative: The trail passes through federal, state, county, and private lands. BLM's dominant management role is apparent to hikers as all signage is BLM produced. Law enforcement presence is negligible with the exception of very infrequent patrols.

**Activity Planning Framework:**

Management: Continue to monitor use patterns to detect trends and predict changes. Practice adaptive management techniques to react to changing conditions and user needs.

Marketing: Information provided at trailheads, road crossings, or at agency offices provides the user with a description of features along the trail, adjacent recreation opportunities, and information on the differing types of uses a hiker may encounter. Maintain an updated agency webpage covering trail conditions, attractions, available resources and their location. Cooperate with trail groups, managing agencies, and landowners to promote proper use.

Monitoring: Use passive electronic trail counters for visitor use information. Provide comment and message journals at trailheads. Through the trail website, encourage and request users to contact BLM and offer assessments as to trail conditions or other observations. When possible, utilize BLM staff, or volunteers to conduct foot patrols.

Administrative: Assume a proactive role in trail management, obviating any problems or conditions before any degradation of the recreation resource occurs. Use appropriate signage to alert hikers of land ownership, jurisdictional boundaries, use regulations, and emergency services.

## Rogue National Wild and Scenic River

**Primary Market Strategy: Employ a nationally based destination marketing strategy**

Niche: The Rogue River is renowned for its broad array of outstandingly remarkable values: superior fisheries, outstanding scenery, challenging white water, and historical significance all combine to make the Rogue stand out as a nationally significant component of the National Wild and Scenic Rivers System.

**Management Objectives:** Manage the designated portion of the Rogue River to protect its outstandingly remarkable values.

**Targeted Outcomes:**

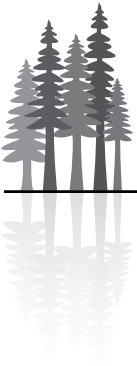
Activities: Motorized and non-motorized white water boating, camping, fishing, swimming, hiking, photography, wildlife observation, and tributary exploration.

Experiences: Family and group affiliation, physical rest, escape from personal and social pressures, experience a risk activity, develop outdoor skills, develop nautical skills, appreciate natural wonders, and enjoyment of a relatively natural and undisturbed environment.

Benefits: Better mental health, restored mind from unwanted stress, greater self reliance, improve skills for outdoor enjoyment, and enhanced awareness and understanding of nature.

**Prescribed Setting Character:**

Physical: Within the designated "Wild" section of the river, visitors experience a primitive and relatively undeveloped coastal confluence river corridor with challenging rapids requiring advanced boating skills.



Within the designated “Recreation” section, visitors experience a semi- developed shoreline with adjacent roads and dwellings, flatter terrain, and slow water.

**Social:** Within the designated “Wild” river classification, visitors encounter mostly non-motorized boating groups and shore-side campers. Encounters with others are sporadic with long time periods between contacts. Within the designated “Recreation” section, motorized tour boats are common and the dominant conveyance for visitors.

**Administrative:** BLM, state, and county jurisdictions overlap along the entire river stretch. BLM has the dominant role in administrative presence. Regular river maintenance and permit compliance trips are performed by BLM staff. County marine deputies provide the majority of law enforcement services. BLM manages 47 miles of the river’s 84-mile long designated length. The 33-mile “Wild” section is under a limited entry permit system, allowing approximately 120 people per day to proceed down river from Grave Creek to Watson Creek. Private party permits are obtained through a lottery conducted yearly. Commercial parties are allocated approximately half of these spaces based on historic use levels.

**Activity Planning Framework:**

**Management:** Manage the entire designated BLM portion according to management plans.

**Marketing:** The Rogue enjoys a national reputation for its outstanding qualities. An active website is maintained to educate potential visitors regarding the opportunities.

**Monitoring:** Visitor numbers, types of uses, physical, social and biological resource conditions are monitored according to the prescriptive measures outlined in the river’s management plans.

**Administrative:** Adaptive management is applied as necessary to ensure that the river’s outstandingly remarkable values are either maintained or enhanced.

## Anderson Butte

**Primary Market Strategy:** focused motorized vehicle recreation use.

**Niche:** This area offers a quality riding experience for users of Class I (ATVs) and Class III (motorcycles) vehicles in an area with long views and challenging terrain. While limited Class II (4WDs) opportunities currently exist, there is potential to offer quality Class II opportunities. Site-specific analysis will further determine each class’s opportunities.

**Management Objective:** Address SRMA issues associated with OHV recreation use in designating a road and trail system and facilities, including loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage.

**Targeted Outcomes:**

**Activities:** OHV riding on designated roads and trails.

**Experiences:** Use of OHV recreation equipment, enjoyment of family and friends.

**Benefits:** Improved skill in operation of OHV recreation equipment, stronger ties to family and friends, improved mental well being.

**Prescribed Setting Character:**

Physical: Forested area of low to mid elevation uplands with some longer views of the Rogue Valley view shed. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

Social: Moderate to high visitor density during peak use periods. This area is close to the urbanized Rogue Valley, therefore there are no overnight camping facilities.

Administrative: Land ownership is blocked BLM land surrounded by a mixed ownership of county, state, and private individuals. Areas adjacent to the focus area include a hiking trail, and existing and proposed RNA/ACECs with elements of T&E species, historical features and natural processes that are relevant and important.

**Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is close to an urban area.

Marketing: This SRMA markets itself and is a perennial favorite destination for the local population of the Rogue Valley.

Monitoring: During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the character of the area.

## Coyote Creek

**Primary Market Strategy: focused motorized vehicle recreation use.**

Niche: This area could potentially offer a quality riding experience for users of Class I (ATVs) and Class III (motorcycles) vehicles in an area with long views and challenging terrain. It will have limited opportunities for Class II vehicles. Site specific analysis will further determine each class's opportunities.

**Management Objective:** Address SRMA issues associated with OHV recreation use in designating a road and trail system and facilities, including loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage. There may be an opportunity to connect this area with the Elderberry Flat focus area for a longer ride or more dispersed recreational opportunity.

**Targeted Outcomes:**

Activities: OHV riding on designated roads and trails.

Experiences: use of OHV recreation equipment, enjoyment of family and friends.

Benefits: improved skill in operation of OHV recreation equipment, stronger ties to family and friends, improved mental well being.



**Prescribed Setting Character:**

Physical: Forested area of low to mid elevation uplands with some longer views of the Cow Creek and Grave Creek view shed. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

Social: Low to moderate visitor density during peak use periods. This area is located between the communities of Grants Pass and Roseburg. There are no overnight camping facilities.

Administrative: Land ownership is checkerboard BLM land surrounded by a singular ownership of industrial timberland.

**Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is between two urban areas.

Marketing: This SRMA is further from the local population of the Rogue Valley and may serve local area riders in the north part of the Medford District.

Monitoring: During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with private landowners to preserve and maintain the character of the area.

## Elderberry Flats

**Primary Market Strategy: focused motorized vehicle recreation use.**

Niche: This area offers a quality riding experience for users of Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles in a forested area with paved access and camping facilities.

**Management Objective:** Address SRMA issues associated with OHV recreation use in designating a road and trail system and facilities, including loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage. There may be an opportunity to connect this area with the Coyote Creek focus area for a longer ride or more dispersed recreational opportunity.

**Targeted Outcomes:**

Activities: OHV riding on designated roads and trails.

Experiences: use of OHV recreation equipment, enjoyment of family and friends.

Benefits: improved skill in operation of OHV recreation equipment, stronger ties to family and friends, improved mental well being.

**Prescribed Setting Character:**

Physical: Forested area of low to mid elevation valleys. The area is of rural character and is accessible by county roads, state highways, and BLM roads.



Social: Moderate to high visitor density during peak use periods. This area is further from the urbanized Rogue Valley, and camping facilities are available.

Administrative: Land ownership is checkerboard BLM land surrounded by a singular ownership of industrial timberland. A 500-kV electrical transmission corridor transects the area.

#### **Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is in a mostly rural area.

Marketing: Work with surrounding industrial landowners to promote responsible OHV use of the area. Use different medias to increase visitor awareness of soils and riparian habitat.

Monitoring: During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with private landowners to preserve and maintain the character of the area.

## **Elliot Creek**

**Primary Market Strategy: focused motorized vehicle recreation use.**

Niche: This area could potentially offer a quality riding experience for users of Class I (ATVs) and Class III (motorcycles) vehicles in an area with long views and challenging terrain. It will have limited opportunities for Class II (4WDs) vehicles. Site specific analysis will further determine each class's opportunities.

**Management Objective:** Address issues of the special recreation management area that are associated with OHV recreation use in designating a road and trail system and facilities, including loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage.

#### **Targeted Outcomes:**

Activities: OHV riding on designated roads and trails.

Experiences: Use of OHV recreation equipment, and enjoyment of family and friends.

Benefits: Improved skill in operation of OHV recreation equipment, stronger ties to family and friends, and improved mental well-being.

#### **Prescribed Setting Character:**

Physical: Forested area of low to mid elevation uplands with some longer views of the Rogue Valley view shed. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

Social: Moderate to high visitor density during peak use periods. This area is close to the urbanized Rogue Valley; therefore, there are no overnight camping facilities.



Administrative: Land ownership is blocked BLM-administered land surrounded by a mixed ownership of county, state, and private individuals.

**Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is close to an urban area.

Marketing: This special recreation management area markets itself and is a perennial favorite destination for the local population of the Rogue Valley.

Monitoring: During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the character of the area.

## Quartz Creek

**Primary Market Strategy: focused motorized vehicle recreation use.**

Niche: This area could potentially offer a quality riding experience for users of Class I (ATVs) and Class III (motorcycles) vehicles in an area with long views and challenging terrain. It will have limited opportunities for Class II (4WDs) vehicles. Site-specific analysis will further determine each class's opportunities.

**Management Objective:** Address issues of the special recreation management area that are associated with OHV recreation use in designating a road and trail system and facilities, including loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage.

**Targeted Outcomes:**

Activities: OHV riding on designated roads and trails.

Experiences: Use of OHV recreation equipment, enjoyment of family and friends.

Benefits: Improved skill in operation of OHV recreation equipment, stronger ties to family and friends, improved mental well being.

**Prescribed Setting Character:**

Physical: Forested area of low to mid elevation uplands with some longer views of the Rogue Valley view shed. The area is of a semi-developed rural character and is accessible by county roads and BLM roads.

Social: Moderate to high visitor density during peak use periods. This area is close to the urbanized Rogue Valley; therefore, there are no overnight camping facilities.

Administrative: Land ownership is blocked BLM-administered land surrounded by a mixed ownership of county, state, and private industry.



**Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is close to an urban area.

Marketing: This special recreation management area markets itself and is a perennial favorite destination for the local population of the Rogue Valley.

Monitoring: During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

Administrative: On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the character of the area.

## Spencer Creek

**Primary Market Strategy: focused motorized vehicle recreation use.**

Niche: This area could potentially offer a quality riding experience for users of Class I (ATVs) and Class III (motorcycles) vehicles in an area with long views and challenging terrain. Site-specific analysis will further determine each class's opportunities.

**Management Objective:** Address issues of the special recreation management area that are associated with OHV recreation use in designating a road and trail system and facilities, including: loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage.

**Targeted Outcomes:**

Activities: OHV riding on designated roads and trails.

Experiences: Use of OHV recreation equipment, and enjoyment of family and friends.

Benefits: Improved skill in operation of OHV recreation equipment, stronger ties to family and friends, and improved mental well-being.

**Prescribed Setting Character:**

Physical: Forested area of low to mid elevation uplands with some longer views of the Illinois Valley watershed. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

Social: Moderate to high visitor density during peak use periods. This area is close to the urbanized Rogue Valley; therefore, there are no overnight camping facilities.

Administrative: Land ownership is blocked BLM-administered land surrounded by a mixed ownership of county, state, and private individuals.

**Activity Planning Framework:**

Management: Provide a recreation opportunity available in a forest, mountain, and trail environment that is close to an urban area.



**Marketing:** This special recreation management area markets itself and is a perennial favorite destination for the local population of the Rogue Valley.

**Monitoring:** During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

**Administrative:** On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the character of the area.

## Timber Mountain/ Johns Peak

**Primary Market Strategy:** focused motorized vehicle recreation use.

**Niche:** This area offers a quality riding experience for users of Class I (ATVs), Class II (4WDs) and Class III (motorcycles) vehicles in an area with varying terrain and long views. This area has an extensive system of existing trails that, with modification, would provide a superior OHV experience for all ATV classes.

**Management Objective:** Address the issues of special recreation management areas that are associated with OHV recreation use in designating a road and trail system and facilities, including: loop routes, signage, informational opportunities, noise mitigation, road and trail construction and/ or maintenance, terrain variety, visual resource management, and prevention of user conflicts or natural resource damage.

### Targeted Outcomes:

**Activities:** OHV riding on designated roads and trails.

**Experiences:** use of OHV recreation equipment, enjoyment of family and friends.

**Benefits:** Improved skill in operation of OHV recreation equipment, stronger ties to family and friends, improved mental well being.

### Prescribed Setting Character:

**Physical:** Forested area of low to mid elevation uplands with some longer views of the Rogue Valley view shed and Siskiyou Mountains. The area is of a semi-developed rural character and is accessible by county roads, state highways, and BLM roads.

**Social:** Moderate to high visitor density during peak use periods. This area is close to the urbanized Rogue Valley; therefore, there are no overnight camping facilities.

**Administrative:** Land ownership is blocked BLM-administered land surrounded by a mixed ownership of county, state, and private individuals, including a local OHV club with developed OHV facilities and trails.

### Activity Planning Framework:

**Management:** Provide a recreation opportunity available in a forest, mountain, and trail environment that is close to an urban area.

**Marketing:** This special recreation management area markets itself and is a perennial favorite destination for the local population of the Rogue Valley. Work with surrounding industrial landowners to promote responsible OHV use of the area and connectivity of trails. Use different medias to increase visitor awareness of soils and riparian habitat.



**Monitoring:** During peak use periods, agency staff perform occasional monitoring in high-use density areas, provide law enforcement activities, and mitigate any resource damage.

**Administrative:** On BLM-administered lands, provide visitor information to ensure proper use of public lands, employ law enforcement measures as appropriate, and cooperate with county and private landowners to preserve and maintain the character of the area.

## Klamath Falls Resource Area

### Gerber

**Primary Market Strategy: Community**

**Niche:** Provide opportunities for roaded natural and semi-primitive recreation experiences.

**Management Objectives:** Manage Gerber Recreation site with camping units to accommodate overnight, day use, and mobility-impaired visitors; Frog camp day use area; and boat ramps. Manage several nearby semi-developed campsites to provide primitive camping and day use. Manage and maintain the Gerber Watchable Wildlife Area Tour. In addition, develop or enhance watchable wildlife and other interpretive sites to showcase resource management. Manage area for roaded natural and semi-primitive recreation opportunities.

**Targeted Outcomes:**

**Activities:** Camping, fishing, wildlife viewing, hunting, and OHV driving.

**Experiences:** Opportunities for solitude, achievement/stimulation, and enjoying nature.

**Benefits:** Greater self-reliance, improved outdoor skills, greater sense of adventure, and physical fitness.

**Prescribed Setting Character:**

**Physical:** Provide roaded natural and semi-primitive recreation experiences.

**Social:** Low (6 to 10 parties per day) to moderate (10 to 50 parties per day) recreation use levels (moderate near developed sites and roads, and low to moderate in other areas).

**Administrative:** Onsite regimentation and controls present, but are subtle. Camp hosts provided at Gerber Recreation site (fee site).

**Activity Planning Framework:**

**Management:** Facilities include developed and semi-developed campgrounds, day use areas, boat ramps, hiking trail, Watchable Wildlife and Klamath Basin Birding Trail viewing site. Seasonal road closure in Gerber Block from November 1 to April 15.

**Marketing:** New brochure has been developed. Area is identified on Klamath Basin Birding Trail map.

Possible enhancement measures include additional interpretive panels and sign.

**Monitoring:** Area is OHV limited to designated roads, with additional seasonal road closures in place. Miller Creek ACEC, Gerber Reservoir, Willow Valley Reservoir and several streams are closed to OHV use. Limited onsite administration (except at Gerber Recreation site where camp hosts are provided).



Administrative: Limited onsite administration, primarily at Gerber Recreation site and during regular patrols and law enforcement.

## Hamaker Mountain

### **Primary Market Strategy: Community**

Niche: Roaded natural recreation opportunities, including mountain biking, hiking, OHV, competitive hill climbs and winter sports within the Klamath Falls urban area.

**Management Objectives:** Manage SRMA for Roaded Natural recreation opportunities. Design timber management and other activities to enhance future trail and site development with an emphasis on winter sports and mountain biking. Examples of timber management activities that would enhance recreation would include the development of cleared trails suitable for downhill or cross country skiing. Trails would be replanted with vegetation to benefit wildlife and would be unavailable for future timber harvest. The identification and resolving of specific recreation management issues and prioritization of projects (developed parking areas, designated trails, etc.) will occur during watershed analysis (completed) or recreation area planning. Establish a BLM patrol during winter months to provide visitor assistance on Hamaker Mountain. Coordinate with Federal Aviation Administration (FAA) on access road plowing, maintenance, improvements. Winter recreation opportunities limited if road is not regularly plowed by FAA.

### **Targeted Outcomes:**

Activities: Winter sports, mountain biking, hiking, OHV trail riding, competitive events.

Experiences: Exercise, Escape physical pressure, enjoying nature.

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness. Close to urban area recreation opportunities.

### **Prescribed Setting Character:**

Physical: Roaded natural opportunities.

Social: About equal opportunities for affiliation with other user groups and for isolation from sights and sounds of man. Concentrations of users are low to moderate.

Administrative: Onsite controls and restrictions offer a sense of security. Rustic facilities provided.

### **Activity Planning Framework:**

Management: No facilities currently provided. New facilities to include trailheads, designated OHV routes, developed trails, group use areas and winter sports trails and parking areas. Seasonal fire restrictions limit OHV use. Opportunity to tie-in with Klamath Sportsman's Park.

Marketing: New brochure to be developed once facilities are developed and needed easements are in place. Opportunities for concession for permitted travel/shuttle service.

Monitoring: Ongoing monitoring to be conducted during spring through fall months to monitor use, facility conditions and reduce user conflicts. Monitoring of winter use when snow is adequate for recreation activities.



Administrative: OHV use limited to existing roads (existing condition). OHV use is to be limited to designated trails once OHV inventory is completed. Limited onsite administration, primarily patrols and law enforcement. ATV allocation committee grants to be pursued for facility development and law enforcement.

## Pacific Crest National Scenic Trail

### **Primary Market Strategy: Destination.**

Niche: This 0.5-mile portion of the trail offers high elevation hiking and outstanding opportunities for solitude and primitive camping along the Cascade-Siskiyou Mountains.

**Management Objectives:** Protect and preserve the physical, aesthetic, social and biological environments characteristic within the trail corridor. Provide interpretive information at all access points. Maintain trail conditions as prescribed by BLM standards. Cooperate with trail groups, other agencies, and private landowners in the overall management of the trail.

### **Targeted Outcomes:**

Activities: Long distance and day hiking, equestrian use, photography, wildlife observation, sightseeing, camping, hunting, and cross-country jogging.

Experiences: Solitude and self reliance. Escape stress and pressure of the outside world. Enjoy physical exercise, challenge, and adventure of long distance wilderness hiking.

Benefits: Development of improved physical endurance. A restored mind from unwanted stress. Enhanced awareness of nature and natural processes.

### **Prescribed Setting Character:**

Physical: The trail corridor is generally within a short distance of the ridge crest and proceeds below timberline through coniferous forest stands, abbreviated by occasional meadows. Water sources are generally uncommon. Frequent encounters with grazing livestock.

Social: Encounters with other hikers and equestrian riders are nominal away from trailheads.

Administrative: The trail passes through federal, state, county, and private lands. BLM's dominant management role is apparent to hikers as all signage is BLM produced. Law enforcement presence is negligible with the exception of very infrequent patrols.

### **Activity Planning Framework:**

Management: Maintenance for the Klamath Falls Resource Area section of the trail is coordinated by the Medford District BLM. Monitor use patterns to detect trends and predict changes. Practice adaptive management to react to changing conditions and user needs.

Marketing: Information provided at trailheads, road crossings, or at agency offices provides the user with a description of features along the trail, adjacent recreation opportunities, and information on the differing types of uses a hiker may encounter. Maintain an updated agency webpage covering trail conditions, attractions, available resources and their location. Cooperate with trail groups, managing agencies, and landowners to promote proper use.



**Monitoring:** Use passive electronic trail counters for visitor use information. Provide comment and message journals at trailheads. Through the trail website, encourage and request users to contact BLM and offer assessments as to trail conditions or other observations. When possible, utilize BLM staff, or volunteers to conduct foot patrols.

**Administrative:** Assume a proactive role in trail management, obviating any problems or conditions before any degradation of the recreation resource occurs. Use appropriate signage to alert hikers of land ownership, jurisdictional boundaries, use regulations, and emergency services.

## Stukel Mountain

### **Primary Market Strategy: Community**

**Niche:** Semi-primitive motorized and non-motorized trail opportunities within the Klamath Falls urban area. Includes proposed hiking, horseback, mountain biking, and OHV trail opportunities; and hang gliding launch area.

**Management Objectives:** Manage SRMA for semi-primitive motorized and non-motorized recreation opportunities. The identification and resolving of specific recreation management issues and prioritization of projects (designated off-highway vehicle trails, ease of public access, developed recreation sites, etc.) will occur during watershed analysis or recreation area planning. Improve main road access. Consider development of hang gliding and other facilities for day use and overnight camping. Improve legal access through easements.

### **Targeted Outcomes:**

**Activities:** Hiking, mountain biking, horseback riding, OHV tour routes.

**Experiences:** Exercise, Escape physical pressure, enjoying nature.

**Benefits:** Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness.

### **Prescribed Setting Character:**

**Physical:** Semi-primitive motorized and non-motorized opportunities.

**Social:** Concentrations of users is low except on weekends where it is moderate.

**Administrative:** Onsite regimentation and controls present, but are subtle.

### **Activity Planning Framework:**

**Management:** No facilities currently provided. New facilities to include trailheads, designated OHV routes, developed trails, camping areas and hang gliding. Seasonal road closure from Nov. 1 to April 15.

**Marketing:** New brochure to be developed once facilities are developed and needed easements are in place.

**Monitoring:** Ongoing monitoring to be conducted during spring through fall months to monitor use, facility conditions and reduce user conflicts.

**Administrative:** Limited onsite administration, primarily patrols and law enforcement.



## Upper Klamath River

**Primary Market Strategy: Destination recreation tourism.**

Niche: Outstanding summer whitewater boating, fishing and camping opportunities.

**Management Objectives:** Manage for semi-primitive motorized recreation objectives. Manage the area to emphasize whitewater boating, fishing and camping along the upper Klamath River. Improve and expand Stateline take-out, scouting trails for the Caldera and Hell's Corner rapids. Manage and maintain Topsy recreation site with camping units for overnight and day use visitors, boat ramp, the Spring Island rafting launch site, and several primitive camping sites along the Klamath River. Continue to follow the cooperative management agreement with the Pacific Power and Light Company for coordinated recreation trail and facility development. Nominate Topsy Road to the National Back Country Byway System. Maintain the Klamath River edge trail for non- motorized use.

**Targeted Outcomes:**

Activities: Whitewater boating, fishing, camping, off-highway vehicle driving, sightseeing.

Experiences: Risk taking, opportunities for solitude, achievement/ stimulation, enjoying nature.

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure.

**Prescribed Setting Character:**

Physical: Semi-primitive motorized.

Social: Low to moderate interaction, (less on weekdays, moderate on weekends).

Administrative: Onsite regimentation and controls present but subtle.

**Activity Planning Framework:**

Management: Facility development includes existing facilities (Topsy, Spring Island, Klamath River campground, Stateline, and dispersed camps). Future facilities include Bypass reach parking areas, boat launch and access trails, additional trails connecting Topsy campground with Copco village, and Keno dam area.

Marketing: New brochure to be developed in conjunction with statewide developed facility brochure marketing. Other marketing done by commercial outfitters.

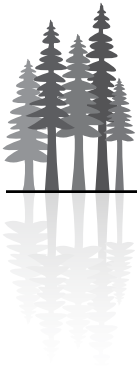
Monitoring: Ongoing monitoring for Wild and Scenic River, and outfitter/guides to be done by primarily during the summer whitewater boating season.

Administrative: Limited onsite administration, primarily at Topsy campground, Spring Island boat launch, and during regular seasonal patrols.

## Wood River Wetland

**Primary Market Strategy: Community**

Niche: Provide opportunities for roaded natural and semi-primitive recreation experiences.



**Management Objectives:** Provide opportunities for roaded natural and semi-primitive recreation experiences (opportunities to have a high degree of interaction with the natural environment; to have moderate challenge and risk and to use outdoor skills). See Wood River RMP/Environmental Impact Statement for additional management objectives and detailed guidance.

**Targeted Outcomes:**

Activities: Wildlife viewing, hiking, fishing, hunting, boating, dog walking.

Experiences: Exercise, escape physical pressure, enjoying nature.

Benefits: Greater self-reliance, improved outdoor skills, greater sense of adventure, physical fitness, rural recreation.

**Prescribed Setting Character:**

Physical: Provide roaded natural and semi-primitive recreation experiences.

Social: Low (6 to 10 parties per day) to moderate (10 to 50 parties per day) recreation use levels (moderate near developed sites and roads, and low to moderate in other areas).

Administrative: To manage the area for day use only. Recreation use and facilities would be secondary to the overall objective of wetland restoration and water quality improvement.

**Activity Planning Framework:**

Management: Facilities include a paved parking area, canoe/small boat launch, vault toilets, hiking trail, interpretive panels. Area closed to motorized use, and additional use restrictions (time of day, personal belongings, etc.).

Marketing: New brochure has been developed. Day use facilities and trail are developed, as well as interpretive panels. Future development includes additional wetland and nature trails and environmental education gathering area. Area is identified as a site on the Klamath Basin Birding Trail map and is used for environmental and classroom education.

Monitoring: Area has a self-registration form, and additional monitoring occurs throughout the year by BLM staff and volunteers.

Administrative: Area is OHV closed (except for administrative uses), closed to overnight use, area open to hunting. Limited onsite administration, primarily patrols and law enforcement.



# Appendix L

## Wilderness

### Characteristics



---

This appendix provides background on the Evaluation and Planning Process for lands with wilderness characteristics.

**In this appendix:**

Wilderness Characteristics Analysis ..... 440



# Wilderness Characteristics Analysis

## Introduction

The BLM has developed an evaluation and planning process to consider wilderness characteristics during the western Oregon plan revisions. This process has been designed to: (1) review original wilderness inventories conducted by BLM between 1978 and 1980 to ensure current and accurate information exists to analyze the environmental impacts of alternatives on BLM-administered lands with wilderness characteristics; and (2) address proposals from the public to inventory and protect BLM lands with wilderness characteristics.

The authority of the BLM to conduct wilderness reviews, including the establishment of new wilderness study areas, expired on October 21, 1993, pursuant to Section 603 of FLPMA. However, the BLM has retained authority under Section 201 of FLPMA to inventory wilderness characteristics and to consider such information during land use planning. Through this planning process, the BLM has discretion to determine which portions of BLM-administered lands with wilderness characteristics would be protected under special management. However, BLM cannot manage these areas under the non-impairment standard described in BLM's *Interim Management Policy for Lands Under Wilderness Review Handbook* (H-8550-1), which applies only to wilderness study areas.

The BLM received scoping comments from the public to inventory and protect wilderness characteristics on specific BLM lands in western Oregon (hereinafter referred to as "public wilderness proposals"). These requests have been considered along with all other resource information during this land use planning process.

Protection of wilderness characteristics on O&C lands determined to be suitable for permanent timber production is considered to be inconsistent with the O&C Act. Information about the presence or absence of wilderness characteristics on these lands, therefore, is not necessary to make land use plan decisions. However, BLM has determined where O&C lands suitable for permanent timber production overlap public wilderness proposals in order to analyze how wilderness characteristics, if present, would be affected by each alternative.

Wilderness characteristics include: naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive and unconfined recreation. These characteristics must be present in a roadless area of at least 5,000 acres or a smaller roadless area that is of sufficient size to make practical its preservation in an unimpaired condition. A consideration used in this evaluation process is when a smaller BLM roadless area adjoins an identified roadless area of the U.S. Forest Service, and their combined acreage is a minimum 5,000 acres. In this situation, a determination has been made whether or not the BLM portion contains wilderness characteristics when considered in context with the U.S. Forest Service portion.

The size of the roadless area is a critical factor in the determination of the presence or absence of individual wilderness characteristics. If the size requirement is not met, then the area cannot be considered to possess wilderness characteristics, since such characteristics are dependent on the sufficient size of the roadless area. Wilderness characteristics within areas of sufficient size are defined as follows:

**Naturalness.** Naturalness is present within an area that has been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable. Some imprints of human activity may exist if they are substantially unnoticeable. More consideration is given to "apparent naturalness" rather than "natural integrity." "Apparent naturalness" refers to whether or not an area appears to be in a natural condition to the average visitor who is not familiar with the biological composition of natural ecosystems versus human-affected ecosystems in a given area. Major influences on apparent naturalness are structures,



evidence of past significant vegetative disturbance such as logging, and other obvious surface-disturbing activities. “Natural integrity” refers to the presence or absence of ecosystems that are relatively unaffected by human activity, such as the presence of native vegetative communities and absence of invasive species.

***Outstanding Opportunities for Solitude.*** “Solitude” is defined as the state of being alone or remote from others; isolation; a lonely or secluded place. “Outstanding” is defined as standing out among others of its kind; conspicuous; prominent; superior to others of its kind; distinguished; excellent. Presence of this wilderness characteristic considers an individual’s opportunity to avoid the sights, sounds, and evidence of other people in the area. Factors that affect opportunities for solitude are the size and configuration of the unit; vegetative and topographic screening; and the ability of visitors to find a secluded spot, even when others are present in the area. It does not consider the sights and sounds of human activity outside of the unit’s boundaries, unless they are so extremely imposing that they cannot be ignored.

***Outstanding Opportunities for Primitive and Unconfined Recreation.*** Primitive and unconfined recreation includes activities that provide dispersed, undeveloped recreation that does not require facilities or motorized equipment. Some examples include, but are not limited to: hiking, backpacking, fishing, hunting, caving, horseback riding, rock climbing, river running, cross-country skiing, and bird watching. An area may possess outstanding opportunities for a primitive and unconfined type of recreation either through the diversity in the number of primitive and unconfined recreational activities possible, or the outstanding quality of one opportunity.

The following includes a step-by-step evaluation and planning process that was used to: (1) review past wilderness inventories; (2) screen public wilderness proposals; (3) evaluate public wilderness proposals; (4) determine if proposed management would be applied to protect select units of BLM-administered lands with wilderness characteristics; and (5) analyze each alternative’s effect on all BLM-administered lands with wilderness characteristics.

## **Step 1. Review past wilderness inventories.**

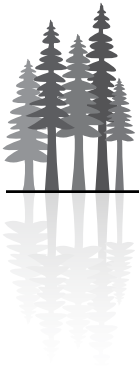
The BLM reviewed existing published wilderness inventory reports and maps that were prepared as a result of the original inventories conducted between 1978 and 1980, under Section 603 of FLPMA. This review enabled BLM to determine if public wilderness proposals contained any new information that was not considered as part of the original inventories.

## **Step 2. Screen public wilderness proposals.**

All public wilderness proposals were organized by BLM district. These proposals were mapped in GIS and then overlaid with O&C lands suitable for permanent timber production. All proposals were considered in the evaluation process; however, portions of those that occur on O&C lands suitable for permanent timber production were not considered further for protection.

## **Step 3. Evaluate public wilderness proposals.**

The BLM then determined if lands specified in each public wilderness proposal overlap the boundary of an original wilderness inventory unit, and if so, if any wilderness characteristics were identified in the original inventory of those lands. If necessary, original inventories were updated. If an inventory was not previously completed for a portion of BLM-administered lands contained within a public wilderness proposal, then an assessment was completed to determine if wilderness characteristics currently exist. In most cases, this assessment was completed using existing field knowledge of an area and remote-sensing techniques such as: digital ortho photography, forest operations inventory data, and ground transportation road network



data. On-the-ground evaluations were conducted if a reasonable determination could not be made using these techniques. Evaluation reports that summarize these results were developed for all public wilderness proposals. These reports were the basis for making a final determination of which BLM-administered lands contain wilderness characteristics.

## **Step 4. Determine if proposed management would be applied to protect selected lands with wilderness characteristics.**

The BLM districts selected one of the following outcomes for each unit of BLM-administered lands that was determined to contain wilderness characteristics: (1) emphasize the protection of wilderness characteristics as a priority over other uses, excluding portions that occur on O&C lands suitable for permanent timber production; or (2) emphasize other uses as a priority over protecting wilderness characteristics.

## **Step 5. Analyze each alternative's effect on BLM lands with wilderness characteristics.**

See the *Planning Criteria* for the process used to analyze each alternative's effect on BLM-administered lands with wilderness characteristics.

# Appendix M

## Grazing



---

This appendix provides the background information regarding standards for range improvements, grazing allotments, and standards for rangeland health. These topics are referenced in *Chapters 1-3*.

**In this appendix:**

Standard Procedures and Design Elements for Range Improvements within the Medford District and Klamath Falls Resource Area . . . . .	444
Grazing Allotments in the Klamath Falls Resource Area and Medford District . . . . .	450
Standards for Rangeland Health . . . . .	461



# Standard Procedures and Design Elements for Range Improvements within the Klamath Falls Resource Area and Medford District

The following standard procedures and design elements would be adhered to in implementation of the proposed construction of range improvements within the Klamath Falls Resource Area and Medford District:

- Inventories and surveys for cultural resources, threatened and endangered species, and special status species would be conducted prior to authorization of any project construction, and appropriate mitigation implemented to reduce or eliminate potential effects.
- Surface disturbance at all project sites would be held to a minimum. Disturbed soil would be rehabilitated to blend into surrounding soil surface and reseeded as needed with a mixture of native grasses, forbs, shrubs, and trees as applicable to replace ground cover, reduce soil loss from wind and water erosion, and discourage the potential establishment of any invasive, non-native plant species.
- Where possible, existing roads and trails would provide access for range improvement construction. If needed, unimproved trails and tracks would be created to reach construction sites and provide access for future maintenance of the improvements. Locate unimproved trails or tracks outside riparian management areas where workable.

All range improvements would be constructed in accordance with USDI BLM Manual 1741-1 (Fencing), USDI BLM Manual 1741-2 (Water Developments) and Oregon Water Resources Department for water developments.

Additional design features specific to the individual types of improvements are described below.

## Reservoirs

- Development of reservoirs would involve the construction of pits and dams to impound water for livestock and wildlife use as shown in *Figure M-1*.
- Pits would be in dry lake beds or other natural depressions. Dams would be constructed in drainages; or to one side of a drainage, with a diversion ditch constructed into the impoundment area.
- Water right applications would be coordinated as needed with applicable agencies, irrigation districts, and other interested parties.
- A water right permit would be obtained from the Oregon Water Resources Department prior to construction.
- Water storage capacity would not exceed 3.0 acre-feet.
- Dams would be located, if possible, to take advantage of natural spillway sites; otherwise a spillway would be constructed around the dam for the reservoir. The slopes of the dam must be a minimum 3 to 1 on the upstream face and minimum of 2 to 1 on the downstream face. Minimum width of the top of all dams would be 12 feet.
- The spillway would be designed to withstand the 50-year flood flow without overtopping the dam. It should also direct the pass flow downstream to prevent erosion of the embankment.
- Fill material, if needed, would come from the impoundment area and/or a borrow area for dams.



- Excavated material from pits would be piled adjacent to the pit. The potential for erosion of the excavated material into the pit would be eliminated. Topsoil would be stockpiled and used to rehabilitate the borrow areas.
- All brush, stumps, roots, and organic matter would be cleared from the borrow area and beneath the dam. Only fill materials consisting of non-organic and cohesive soils adjusted in moisture to optimum water content would be used for construction of the dam. Individual layers would not exceed 8 inches in thickness and would be compacted with a sheep'sfoot roller or similar equipment. Fill material should be placed in thin layers parallel with the long axis of the dam.

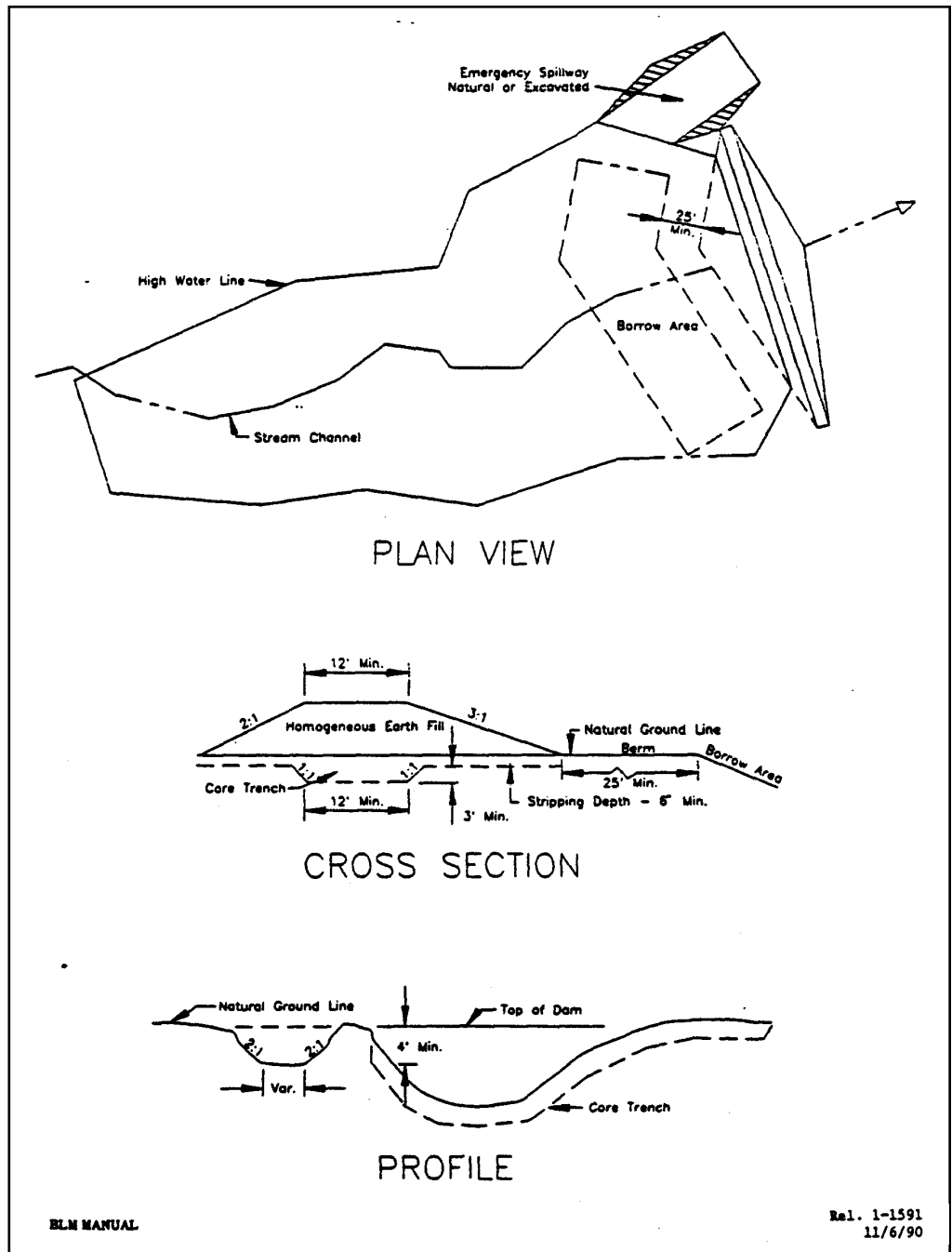


FIGURE M-1.  
RESERVOIR  
STANDARDS

BLM MANUAL

Re1. 1-1591  
11/6/90



## Spring Developments

- The spring source would be fenced to prevent livestock grazing and trampling.
- Escape ramps would be installed in all water troughs to allow wildlife to escape.
- Overflow from troughs would be piped away from the developed source area.

## Fencing

- Fences would be designed to prevent the passage of livestock without stopping the movement of wildlife as shown in *Figure M-2*.
- Wire spacing would follow the specifications found in *Figure M-3*. The majority of fences would be constructed as follows: four wire with the bottom wire 16-18 inches off the ground with the sequence of the remaining three wires above this being 6 inches, 6 inches, and 12 inches; the maximum height of the fence (ground to top wire) would be 42 inches.
- The bottom wire on all fencing would be two-strand smooth wire, not barbed, to facilitate antelope crossings.
- Steel “t-post” spacing would be between 16 feet and 24 feet, depending on local conditions.
- Brace posts, tree scabs, and/or rock jacks (rock cribs) would be constructed to enhance fence integrity with one at least every 0.25 mile.
- No woven wire “sheep” fences would be constructed on public lands.
- Brushing and tree limb removal will be limited to only that necessary for surveying, placement, and construction of a fence.
- Where fences cross existing roads, either gates or cattleguards would be installed.
- Where workable, fence construction would be located outside riparian management areas.

*Table M-1* lists the proposed range improvements in the Klamath Falls Resource Area.





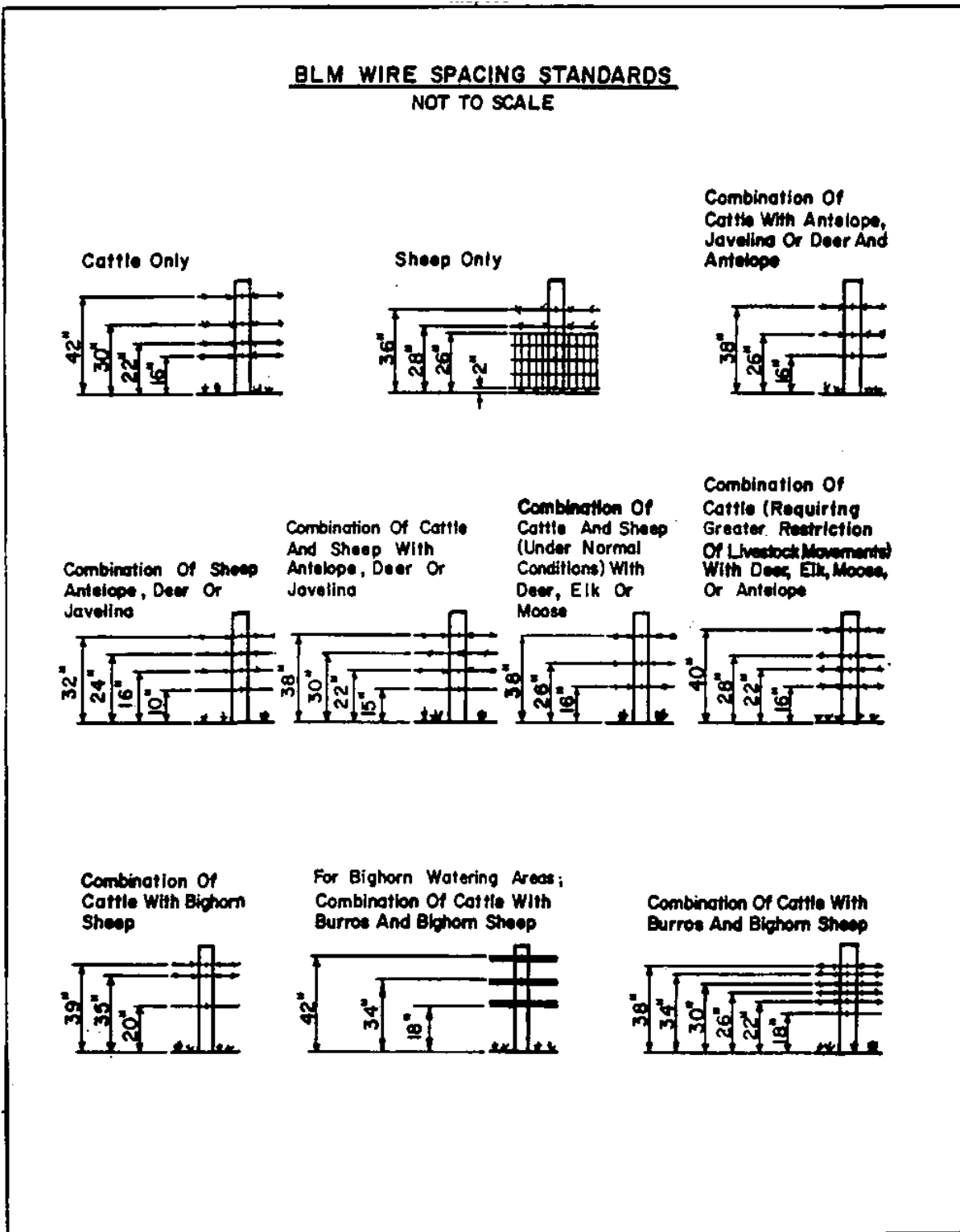
FIGURE M-2. FENCE STANDARDS

<u>BLM Fence Standards for Livestock and Wildlife</u>						
<u>Kinds of Use Combinations</u>						
<u>Kinds of Livestock and Wild Burros</u>	<u>Predominant Big Game Wildlife Species</u>	<u>Number Wires</u>	<u>Max. Fence Height in Inches</u>	<u>Wire Spacing (From Ground Up, in Inches)</u>	<u>Wire Type</u>	<u>No. Stays Between Line Posts w/Spacing of 16.5' - 30'</u>
<u>STANDARD BUREAU FENCES:</u>						
Cattle	None	4	42	16, 6, 8, 12	Barbed.	1 to 4
Sheep	None	-	36	2, 24 (Woven) 2, 8	Woven, barbed.	
<u>STANDARD BUREAU MODIFICATIONS TO MEET MULTIPLE-USE NEEDS:</u>						
Cattle (only)	Antelope, Javelina, or Deer and Antelope.	3	38	16, 10, 12	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' -- 1 or 2 w/post spacing of 30'.
Sheep (only)	Antelope, Javelina or Deer	4	32	12, 6, 6, 6 16.5' -- 1 or 2	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' -- 1 to 3 w/post spacing of 30'.
Cattle and Sheep (Use only where sheep control is necessary.)	Antelope Javelina or Deer	4	38	13, 7, 8, 8	Bottom strand smooth, others barbed.	One w/post spacing of 16.5' -- 1 to 3 w/post spacing of 30'.
Cattle and Sheep (normal conditions)	Deer, Elk Moose, or Antelope.	3	38	16, 10, 12	Bottom strand smooth, others barbed.	1 to 4
Cattle and sheep (Requires greater restriction of livestock movements.)	Deer, Elk, Moose, or Antelope.	4	40	16, 6, 6, 12	Barbed.	1 to 4
Cattle	Bighorn Sheep*	3	39	20, 15, 4	Barbed.	1 to 4
Cattle, Wild Burros	Bighorn Sheep* (Use around watering area)	-	42	18 to bottom rail; 34 and 42 to top of middle and top rails.	Rails 2"-3" diameter.	Line Post spacing 10 feet
Cattle, Wild Burros	Bighorn Sheep*	6	38	18, 4, 4, 4 4, 4	Bottom strand smooth, others barbed.	1 to 2

\*These fences also meet antelope, and deer standards.



FIGURE M-3. WIRE SPACING



**TABLE M-1. PROPOSED KLAMATH FALLS RANGE IMPROVEMENTS BY ALLOTMENT**

Allotment	Allotment Number	Type of Improvement	Number	Approximate Location
		Reservoirs	2 each	T41S, R5E, S.11; T40S, R5E, S.35
Edge Creek*	00102	Fencing	3 miles	T41S, R5E, S.11,12; T41S, R6E, S.4,5,6,7,8
Buck Mountain	00103	Fencing	2 miles	T39S, R5E, S.11,13
Buck Lake	00104	Fencing	2 miles	T38S, R5E, S.15,28,29; T38S, R6E, S.20
Dixie*	00107	Fencing	2 miles	T41S, R5E, S.5,7; T41S, R4E, S.1,2,12
Grubb Springs	00147	Reservoirs	2 each	T39S, R6E, S. 7, 15
Stock Drive	00802	Fencing	1 mile	T39S, R11E, S.31
J Spring	00803	Fencing	1 mile	T38S, R14E, S.32
Barnwell	00807	Reservoirs	2 each	T39S, R11.5E, S.4,8
		Reservoir	1 each	T38S, R11.5E, S.5
Drew	00817	Fencing	2 miles	T38S, R11.5E, S.5,6; T37S, R11.5E, S.31,32
North Horsefly	00821	Reservoir	1 each	T37S, R14E, S.16
Stukel-O'Neill	00822	Fencing	3 miles	T39S, R10E, S.25,26; T40S, R10E, S.1,2
		Reservoir	1 each	T37S, R14E, S.4,9
North Horsefly	00823	Fencing	2 miles	T37S, R14E, S.4,9
Haskins	00826	Fencing	1 mile	T38S, R11.5E, S.29,30
Stukel-High	00827	Reservoir	1 each	T39S, R11.5E, S.30,31
Horton	00829	Reservoir	1 each	T39S, R11.5E, S.15
Ketcham	00835	Fencing	1 mile	T39S, R11E, S.19
		Reservoir	1 each	T39S, R11E, S.21,27,28
Harpold Chaining	00836	Fencing	2 mile	T39S, R11E, S.21,27,28
Windy Ridge	00838	Reservoirs	2 each	T39S, R11.5E, S.24,25
Bryant-Loveness	00839	Fencing	2 miles	T41S, R13E, S.5,6,7,8,17
Short Lake	00842	Fencing	2 miles	T39S, R11E, S.27,28
		Reservoirs	2 each	T40S, R9E, S.15,21,22
OK	00846	Fencing	2 miles	T40S, R9E, S.15,21,22,27,28
Swede Cabin	00847	Fencing	2 miles	T36S, R15E, S.28,30,32
		Reservoirs	2 each	T39S, R11E, S.29,30,31,32
Harpold Ridge	00851	Fencing	2 miles	T39S, R11E, S.29,30,31,32
		Reservoirs	2 each	T40S, R11E, S.5,6,7,8
Rodgers	00852	Fencing	3 miles	T40S, R11E, S.5,6,7,8,9,10
		Fencing	1 mile	T38S, R11E, S.26,35
McCartie	00860	Reservoir	1 each	T38S, R11E, S.26,35
Yainax	00861	Fencing	1 mile	T38S, R11E, S.1,12,13
		Reservoir	1 each	T41S, R13E, S.7
Mills Creek	00865	Fencing	2 miles	T41S, R13E, S.7
		Reservoir	1 each	T40S, R15E, S.17,18
Bear Valley	00876	Fencing	2 miles	T40S, R14.5E, S.24,25; T40S, R15E, S.19,30,31
DeVaul	00879	Fencing	1 mile	T39S, R13E, S.10,11,15
Goodlow	00881	Fencing	1 mile	T39S, R13E, S.9,10,15
Horton	00883	Reservoir	1 each	T39S, R12E, S.22
		Reservoir	1 each	T39S, R13E, S.27,28
Panky Basin	00884	Fencing	1 mile	T39S, R13E, S.27,28
Dry Prairie	00885	Reservoirs	2 each	T38S, R13E, S.27,34,36
Rock Creek	00888	Fencing	2 miles	T41S, R15E, S.9,17
Timber Hill	00889	Reservoirs	2 each	T41S, R14.5E, S.11,12,14,23
Williams	00892	Fencing	2 miles	T39S, R12E, S.10,15

\*Located Within the Pokegama Herd Management Area  
Totals - 29 reservoirs and 48 miles of fencing



# Grazing Allotments in the Klamath Falls Resource Area and Medford District

The Final EIS provides a summary of the number and acres of grazing allotments for the Klamath Falls Resource Area and the Medford District. *Table M-2* and *Table M-3* contain detailed information about these grazing allotments, including proposed improvements.



TABLE M-2. KLAMATH FALLS RESOURCE AREA GRAZING ALLOTMENTS

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Chase Mountain	00101	8,823	195	0	5/15-8/13	C	2001	Not Meeting Standards; Grazing is not a factor.	Yearly	None
Edge Creek	00102	8,860	207	0	5/1-9/1	I	2000	Not Meeting Standards; Grazing is not a factor.	Deferred-Rotation	Proposed Range Improvement, Common Allotment, Exlosures or Other Areas Closed to Grazing, Portion Proposed for Closure
Buck Mountain <sup>1</sup>	00103	7,022	204	0	5/15-9/1	I	2000	Not Meeting Standards; Grazing is not a factor.	Yearly	Proposed Range Improvement
Buck Lake	00104	11,971	280	0	6/15-10/15	C	2000	Not Meeting Standards; Grazing is not a factor.	Yearly	Proposed Range Improvement, Common Allotment, Exlosures or Other Areas Closed to Grazing
Johnson Prairie	00105	120	12	0	5/1-10/1	C	2000	Not Meeting Standards; Grazing is not a factor.	Yearly	None
Dixie <sup>1</sup>	00107	2,287	320	100	5/1-8/15	I	2002	Not Meeting Standards; Grazing is a factor.	Yearly	Proposed Range Improvement Exlosures or Other Areas Closed to Grazing
Dry Lake	00140	145	10	0	5/1-6/30	C	2001	Not Meeting Standards; Grazing is not a factor.	Yearly	None
Chicken Hills	00141	3,422	80	0	5/15-9/15	C	2001	Not Meeting Standards; Grazing is not a factor.	Yearly	None
Long Lake	00142	363	18	0	6/16-9/30	C	2000	Meeting All Standards	Yearly	None
Grubb Springs	00147	3,524	130	0	5/1-9/30	C	2000	Not Meeting Standards; Grazing is not a factor.	Yearly	Proposed Range Improvement



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Adams	00800	40	6	0	4/15-7/15	C	2005	Not Meeting Standards, Grazing is a factor	Yearly	None
Haught	00801	400	27	0	5/1-7/31	C	Not Completed	Not Completed	Yearly	None
Stock Drive	00802	40	2	0	5/1-6/30	C	2007	Meeting All Standards	Yearly	Proposed Range Improvement
J Spring	00803	320	7	0	5/1-6/30	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Bar CL	00804	480	20	22	5/1-5/31	C	Not Completed	Not Completed	Yearly	None
SE 80	00805	80	8	0	5/1-10/31	C	2006	Meeting All Standards	Yearly	None
Two Mile	00806	577	56	0	5/1-9/30	C	2006	Not Meeting Standards; Grazing is not a factor.	Yearly	None
Barnwell	00807	1,708	75	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Lee	00808	40	10	0	6/1-8/15	C	Not Completed	Not Completed	Yearly	None
Brown	00809	80	30	0	6/1-8/30	C	Not Completed	Not Completed	Yearly	None
Brenda	00810	185	18	0	5/16-6/30	C	2006	Meeting All Standards	Yearly	None
Cheyne	00811	875	51	0	5/1-6/15	C	2004	Meeting All Standards	Yearly	None
Stukel-Coffin	00812	760	55	0	5/1-7/1	C	2002	Meeting All Standards	Yearly	None
Cunningham	00814	840	108	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	None
Stukel-Dehlinger C.	00815	1,680	240	0	4/15-8/8	I	2002	Meeting All Standards	Yearly	None
Stukel-Dehlinger H.	00816	440	30	0	5/10-8/10	C	2002	Meeting All Standards	Yearly	None
Drew	00817	720	72	0	5/1-6/30	C	2005	Meeting All Standards	Yearly	Proposed Range Improvement
Dupont	00819	79	7	0	4/15-6/1	C	Not Completed	Not Completed	Yearly	None
North Horsefly	00821	988	68	0	5/1-6/15	C	2007	Meeting All Standards	Yearly	Proposed Range Improvement



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Stukel-O'Neill	00822	3,122	210	0	5/1-7/15	I	2002	Meeting All Standards	Yearly	Proposed Range Improvement Enclosures or Other Areas Closed to Grazing
North Horsefly	00823	920	60	0	6/16-8/1	C	2007	Meeting All Standards	Yearly	Proposed Range Improvement
Jeld-Wen	00824	240	36	0	6/1-7/15	C	2006	Meeting All Standards	Yearly	None
Naylox	00825	760	76	0	5/1-6/30	C	2005	Meeting All Standards	Yearly	None
Haskins	00826	560	80	0	5/1-7/15	C	2004	Meeting All Standards	Yearly	Proposed Range Improvement
Stukel-High	00827	239	17	0	5/1-6/15	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Stukel-Hill	00828	960	60	0	5/1-6/15	C	2002	Meeting All Standards	Yearly	None
Horton	00829	760	26	0	4/21-6/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Hungry Hollow	00830	280	40H	0	6/1-8/30	C	2005	Meeting All Standards	Yearly	Proposed for Conversion from Horse to Cattle
Warlow	00831	460	50	0	5/1-9/30	C	2007	Meeting All Standards	Yearly	None
Jespersion	00832	1578	158	0	5/1-7/1	C	Not Completed	Not Completed	Yearly	None
Kellison	00834	335	19	0	5/1-6/13	C	2004	Not Meeting Standards; Grazing is a factor.	Yearly	None
Ketcham	00835	320	20	0	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Harpold Chaining	00836	900	96	0	5/1-5/30	C	2007	Not Meeting Standards; Grazing is a factor.	Yearly	Proposed Range Improvement
Bryant-Horton	00837	1,249	130	0	6/1-7/9	C	2006	Meeting All Standards	Yearly	None
Windy Ridge	00838	600	52	0	5/1-5/31	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bryant-Loveness	00839	3,440	490	0	5/1-6/30	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bryant-Lyon	00840	565	38	0	5/1-9/30	C	Not Completed	Not Completed	Yearly	None



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Marshall	00841	348	14	0	4/21-5/30	C	Not Completed	Not Completed	Yearly	None
Short Lake	00842	440	40	0	5/1-6/30	C	2005	Not Meeting Standards; Grazing is a factor.	Yearly	Proposed Range Improvement
McAuliffe	00843	80	10	0	4/16-6/15	C	Not Completed	Not Completed	Yearly	None
Paddock	00844	440	31	0	5/1-6/30	M	2003	Meeting All Standards	Deferred-Rotation	None
Klamath Hills	00845	500	55	0	4/1-5/31	C	Not Completed	Not Completed	Yearly	None
OK	00846	1,260	105	35	5/1-6/15	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Swede Cabin	00847	1,921	108	0	5/1-6/15	I	2007	Meeting All Standards	Yearly	Proposed Range Improvement
Pope	00848	724	48	0	5/1-7/31	C	2007	Meeting All Standards	Yearly	None
Rajnus Bros.	00849	240	16	0	5/1-6/17	C	Not Completed	Not Completed	Yearly	None
Wilkinson	00850	400	18	0	5/1-6/5	C	Not Completed	Not Completed	Yearly	None
Harpold Ridge	00851	1,043	108	0	4/21-6/30	M	2006	Meeting All Standards	Yearly	Proposed Range Improvement
Rodgers	00852	2,355	235	0	5/1-7/1	I	2003	Meeting All Standards	Yearly	Proposed Range Improvement Exlosures or Other Areas Closed to Grazing
7C	00853	688	104	0	5/1-6/30	C	2007	Meeting All Standards	Yearly	None
Jump	00854	200	20	0	5/1-5/30	C	2007	Meeting All Standards	Yearly	None
Bryant-Smith	00855	1,140	109	0	5/15-8/31	C	2007	Meeting All Standards	Yearly	None
Bryant-Stastny	00856	440	70	0	5/10-9/30	C	2007	Meeting All Standards	Yearly	None
Bryant-Taylor	00857	1,080	74	0	4/15-9/30	C	2007	Meeting All Standards	Yearly	None
Swan Lake Rim	00858	6,448	300	0	5/1-6/30	M	2006	Meeting All Standards	Rest-Rotation	Common Allotment
Cunard	00859	370	60/H	0	5/1-7/31	C	2002	Meeting All Standards	Rest-Rotation	Proposed for Conversion from Horse to Cattle
McCartie	00860	545	83	0	5/1-5/30	C	2004	Meeting All Standards	Rest-Rotation	Proposed Range Improvement





Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Yainax Butte	00861	2,520	120	0	7/1-9/30	M	2005	Meeting All Standards	Deferred-Rotation	Proposed Range Improvement Enclosures or Other Areas Closed to Grazing
Klamath Forest Estates	00862	2,520	47	0	5/1-5/31	M	2005	Meeting All Standards	Yearly	None
Wirth	00863	1,200	100	0	4/15-10/15	C	Not Completed	Not Completed	Yearly	None
Rajnus & Son	00864	1,440	110	0	5/1-6/30	C	2007	Not Meeting Standards; Grazing is a factor.	Yearly	None
Mills Creek	00865	280	40	0	5/1-6/14	C	Not Completed	Not Completed	Yearly	Proposed Range Improvement
Bear Valley	00876	5,018	415	0	7/1-8/9	I	2000/2003	Meeting All Standards	Deferred-Rotation	Proposed Range Improvement, Common Allotment, Enclosures or Other Areas Closed to Grazing
Bumpheads	00877	9,220	420	265	4/21-6/30	I	2003	Not Meeting Standards; Grazing is a factor.	Deferred-Rotation	Enclosures or Other Areas Closed to Grazing
Campbell	00878	1,465	47H	13	5/1-10/26	C	2002	Meeting All Standards	Yearly	Proposed for Conversion from Horse to Cattle
DeVaul	00879	240	12	15	5/1-8/30	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Goodlow	00881	285	32	52	5/1-8/31	C	2003	Meeting All Standards	Yearly	Proposed Range Improvement
Horsefly	00882	26,356	2656	2075	4/15-6/30, 10/1-11/15	I	1999/2003	Meeting All Standards	Rest-Rotation/High Intensity-Short Duration	Enclosures or Other Areas Closed to Grazing, Common Allotment
Horton	00883	800	58	211	4/21-5/20	C	2002	Meeting All Standards	Yearly	Proposed Range Improvement
Pankey Basin	00884	282	43	38	5/15-8/31	C	2003	Not Meeting Standards; Grazing is a factor.	Yearly	Proposed Range Improvement Enclosures or Other Areas Closed to Grazing



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>1</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Dry Prairie	00885	7,231	642	358	5/1-9/30	I	1999/2003	Meeting All Standards	Rest-Rotation	Exclosures or Other Areas Closed to Grazing, Common Allotment, Proposed Range Improvement
Horse Camp Rim	00886	9,180	445	281	5/1-7/31	I	2003	Meeting All Standards	Rest-Rotation	Exclosures or Other Areas Closed to Grazing
Pitchlog	00887	9,280	434	796	5/10-6/30	I	1999/2003	Meeting All Standards	Rest-Rotation/ High Intensity-Short Duration	Exclosures or Other Areas Closed to Grazing
Rock Creek	00888	2,750	216	639	5/1-5/31	I	2003	Meeting All Standards	Rest-Rotation	Proposed Range Improvement
Timber Hill	00889	2,937	270	134	6/21-7/31	I	1999/2003	Meeting All Standards	Yearly	Proposed Range Improvement
Willow Valley	00890	20,460	1225	506	4/15-6/30	I	2000/2003	Not Meeting Standards, Grazing is a factor	Rest-Rotation	Exclosures or Other Areas Closed to Grazing, Common Allotment
Williams	00892	1,790	75	0	5/1-5/31	M	2004	Meeting All Standards	Yearly	Proposed Range Improvement
Fields	00893	180	6	0	4/21-5/20	C	2005	Meeting All Standards	Yearly	None
Voight	00894	112	8	0	5/1-6/15	C	2003	Meeting All Standards	Yearly	None
Harpold Canyon	00895	760	76	0	5/1-9/30	C	2006	Meeting All Standards	Yearly	None
McFall	00896	600	60	0	5/1-6/30	C	2006	Meeting All Standards	Yearly	Common Allotment
Bly Mountain	01800	120	9	0	6/1-8/31	C	Not Completed	Not Completed	Yearly	None
Wood River	30855	2,970	0	0	N/A	N/A	2000	Not Meeting Standards; Grazing is not a factor	N/A	Exclosures or Other Areas Closed to Grazing
<b>Total Acres &amp; AUMs</b>		<b>204,815</b>	<b>13,178</b>	<b>5,540</b>						

<sup>1</sup>All or a portion of the allotment is located within the Cascade-Siskiyou National Monument

<sup>2</sup>Active Preference is cattle AUMs, unless specified as H for domestic horse use.

<sup>3</sup>Selective Management Categories: Improve (I)-managed to resolve a high level of resource conflicts and concerns and receive the highest priority for funding and management actions; Maintain (M)-managed to maintain satisfactory resource conditions and will be actively managed to ensure that resource values do not decline; Custodial (C)-managed custodially to protect resource conditions and values.



TABLE M-3. MEDFORD DISTRICT GRAZING ALLOTMENTS

Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Lost Creek	10001	11,518	382	0	04/16-10/31	I	2001	Not Meeting Standards, Grazing is not a factor	Yearly	Common Allotment
Flat Creek	10002	12,421	328	0	05/01-10/15	C	2000	Not Meeting Standards, Grazing is not a factor	Yearly	None
Longbranch	10004	320	22	0	04/16-05/15	C	2002	Meeting All Standards	Yearly	Portion Proposed for Closure
Meadows	10007	1,564	92	0	04/16-06/30	I	2003	Meeting All Standards	Yearly	None
Neil-Tarbell	10008	552	56	0	04/16-05/31	C	2003	Meeting All Standards	Yearly	None
North Sams Valley	10009	120	8	0	06/16-07/31	C	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None
Upper Table Rock	10012	1,240	66	0	05/01-05/30	I	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Clear Creek	10013	3,790	45	0	05/16-10/31	C	2002	Meeting All Standards	Yearly	None
Lick Creek	10015	202	15	0	04/16-05/15	C	2003	Meeting All Standards	Yearly	None
Brownsboro Park	10016	381	68	0	04/16-05/31	I	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None
Kanuthan Fields	10017	2,419	177	0	04/16-05/31	I	2002	Not Meeting Standards, Grazing is not a factor	Yearly	None
Sugarloaf	10019	1,566	15	0	04/16-06/30	C	2002	Meeting All Standards	Yearly	None
Section 9	10021	404	25	0	04/16-06/30	C	2003	Meeting All Standards	Yearly	None



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Section 7	10022	371	11	0	04/16-05/31	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Bull Run	10023	40	5	0	06/01-06/30	C	2003	Meeting All Standards	Yearly	None
Big Butte	10024	22,118	1,663	0	04/16-06/30	I	2000	Not Meeting Standards, Grazing is not a factor	Deferred-Rotation	Common Allotment
Reese Creek	10027	40	7	0	05/01-06/30	C	1999	Meeting All Standards	Yearly	Common Allotment
Derby Road Sawmill	10029	521	45	0	04/16-07/15	C	2003	Meeting All Standards	Yearly	None
Summit Prairie	10031	30,743	1,165	0	04/16-09/30	I	2000	Not Meeting Standards, Grazing is not a factor	Deferred-Rotation	Common Allotment
Vestal Butte	10035	2,240	120	0	04/16-06/15	I	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Bear Mountain	10037	1,008	81	0	04/16-05/31	I	2002	Meeting All Standards	Yearly	None
Crowfoot	10038	7,393	365	0	04/15-06/30	I	2003	Meeting All Standards	Yearly	None
Crowfoot Creek	10039	521	70	0	04/16-06/30	C	1999	Meeting All Standards	Yearly	None
Cobleigh Road	10040	80	7	0	06/01-07/15	C	2003	Meeting All Standards	Yearly	None
Moser Mountain	10041	40	3	0	04/16-04/30	C	2003	Meeting All Standards	Yearly	None
Devon South	10043	402	33	0	04/16-06/30	C	1999	Meeting All Standards	Yearly	None
Salt Creek	10044	462	85	0	04/16-06/30	I	2002	Meeting All Standards	Yearly	None
Jenny Creek <sup>1</sup>	10108	1,417	115	0	05/16-09/10	I	Not Completed	Not Completed	Deferred-Rotation	
Agate <sup>1</sup>	10109	82	9	0	05/01-09/15	C	Not Completed	Not Completed	Yearly	



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
Soda Mountain <sup>1</sup>	10110	35,619	1,794	0	05/01-10/15	I	Not Completed	Not Completed	Deferred-Rotation	Common Allotment
Cove Creek	10112	1,207	75	0	05/01-06/15	I	Not Completed	Not Completed	Yearly	None
Buckpoint	10114	3,835	150	0	05/01-06/15	C	Not Completed	Not Completed	Yearly	None
Keene Creek <sup>1</sup>	10115	23,643	1,612	0	05/01-10/15	I	Not Completed	Not Completed	Yearly	Common Allotment
Howard Prairie	10116	320	60	0	10/16-11/15	M	Not Completed	Not Completed	Yearly	None
Siskiyou <sup>1</sup>	10118	2,163	200	0	05/01-09/15	I	Not Completed	Not Completed	Yearly	
Grizzly	10119	5,167	378	0	06/01-10/15	I	1999	Not Meeting Standards, Grazing is not a factor	Yearly	Common Allotment
Lake Creek Spring	10121	4,679	447	0	05/16-07/15	I	Not Completed	Not Completed	Yearly	None
Lake Creek Summer	10122	5,561	550	0	07/16-10/15	I	Not Completed	Not Completed	Yearly	None
Deer Creek-Reno Lease	10124	4,025	314	0	05/01-09/30	C	Not Completed	Not Completed	Yearly	None
Heppsie Mountain	10126	4,076	294	0	05/01-10/15	I	2007	Not Meeting Standards, Grazing is not a factor	Yearly	None
Antelope Road	10132	200	19	0	04/16-06/30	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	None
Brownsboro	10133	80	7	0	04/01-06/15	C	2003	Not Meeting Standards, Grazing is a factor	Yearly	None
Yankee Reservoir	10134	120	15	0	05/01-06/15	I	2003	Not Meeting Standards, Grazing is a factor	Yearly	None
Canal	10136	440	58	0	05/01-06/15	C	2003	Not Meeting Standards, Grazing is a factor	Yearly	None
Box R Ranch <sup>1</sup>	10137	88	5	0	10/01-02/28	C	Not Completed	Not Completed	Yearly	None
Cove Ranch	10143	80	20	0	07/01-11/30	C	Not Completed	Not Completed	Yearly	None



Allotment Name	Allotment Number	BLM Acres	Active Grazing Preference (AUMs) <sup>2</sup>	Suspended Grazing Preference (AUMs)	Season-of-Use	Selective Management Category <sup>3</sup>	Rangeland Health Assessment Completed	Rangeland Health Assessment Finding	Grazing System	Other Information
North Cove Creek	10148	281	20	0	07/16-09/15	C	Not Completed	Not Completed	Yearly	None
Deadwood <sup>1</sup>	20106	8,004	788	0	06/16-08/15	I	Not Completed	Not Completed	Yearly	Common Allotment
Poole Hill	20113	1,760	25	0	10/01-10/15	C	2007	Not Meeting Standards, Grazing is not a factor	Yearly	None
Conde Creek	20117	5,346	591	0	06/16-09/30	I	Not Completed	Not Completed	Yearly	Common Allotment
Billy Mountain	20203	4,758	175	0	04/16-06/30	I	1999	Not Meeting Standards, Grazing is not a factor	Yearly	None
Lower Big Applegate	20206	11,712	258	0	04/16-06/15	I	Not Completed	Not Completed	Yearly	None
Foots Creek	20219	115	12	0	05/01-06/30	C	1999	Meeting All Standards	Yearly	None
Ferns Lease	20224	246	28	0	05/01-06/15	C	Not Completed	Not Completed	Yearly	None
Deer Creek	20308	887	77	0	04/01-12/15	C	2003	Not Meeting Standards, Grazing is not a factor	Yearly	Portion Proposed for Closure
<b>Total Acres &amp; AUMs</b>		<b>228,387</b>	<b>13,055</b>	<b>0</b>						

<sup>1</sup>All or a portion of the allotment is located within the Cascade-Siskiyou National Monument.

<sup>2</sup>Active Preference is cattle AUMs.

<sup>3</sup>Selective Management Categories: Improve (I)-managed to resolve a high level of resource conflicts and concerns and receive the highest priority for funding and management actions; Maintain (M)-managed to maintain satisfactory resource conditions and will be actively managed to ensure that resource values do not decline; Custodial (C)-managed custodially to protect resource conditions and values.



# Standards for Rangeland Health

The following section contains the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington*. These standards and guidelines are referenced in *Chapters 2, 3, and 4* of this Final EIS. Livestock grazing would be managed in accordance with these standards and guidelines.



**STANDARDS FOR RANGELAND HEALTH  
AND  
GUIDELINES FOR LIVESTOCK  
GRAZING MANAGEMENT  
FOR  
PUBLIC LANDS ADMINISTERED BY THE  
BUREAU OF LAND MANAGEMENT  
IN THE STATES OF OREGON AND  
WASHINGTON  
AUGUST 12, 1997**

---

**Table of Contents**

Introduction	1
Fundamentals of Rangeland Health	1
Standards for Rangeland Health	2
Standards and Guidelines in Relation to the Planning Process	3
Indicators of Rangeland Health	4
Assessments and Monitoring	5
Measurability	5
Implementation	6
Standards for Rangeland Health	7





Standard 1 Watershed Function – Uplands	7
Standard 2 Watershed Function - Riparian/Wetland Areas	9
Standard 3 Ecological Processes	11
Standard 4 Water Quality	13
Standard 5 Native, T&E, and Locally Important Species	14
Guidelines for Livestock Grazing Management	15
General Guidelines	15
Livestock Grazing Management	15
Facilitating the Management of Livestock Grazing	17
Accelerating Rangeland Recovery	17
Glossary	19

---

## **Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington**

### **Introduction**

These Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington were developed in consultation with Resource Advisory Councils and Provincial Advisory Committees, tribes and others. These standards and guidelines meet the requirements and intent of 43 Code of Federal Regulations, Subpart 4180 (Rangeland Health) and are to be used as presented, in their entirety. These standards and guidelines are intended to provide a clear statement of agency policy and direction for those who use public lands for livestock grazing, and for those who are responsible for their management and accountable for their condition. Nothing in this document should be interpreted as an abrogation of Federal trust responsibilities in protection of treaty rights of Indian tribes or any other statutory responsibilities including, but not limited to, the Taylor Grazing Act, the Clean Water Act, and the Endangered Species Act.

### **Fundamentals of Rangeland Health**

The objectives of the rangeland health regulations referred to above are: "to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; . . . and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands."



To help meet these objectives, the regulations on rangeland health identify fundamental principles providing direction to the States, districts, and on-the-ground public land managers and users in the management and use of rangeland ecosystems.

A hierarchy, or order, of ecological function and process exists within each ecosystem. The rangeland ecosystem consists of four primary, interactive components: a physical component, a biological component, a social component, and an economic component. This perspective implies that the physical function of an ecosystem supports the biological health, diversity and productivity of that system. In turn, the interaction of the physical and biological components of the ecosystem provides the basic needs of society and supports economic use and potential.

The Fundamentals of Rangeland Health stated in 43 CFR 4180 are:

1. Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity and the timing and duration of flow.
2. Ecological processes, including the hydrologic cycle, nutrient cycle and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.
3. Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established Bureau of Land Management objectives such as meeting wildlife needs.
4. Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal Proposed, Category 1 and 2 Federal candidate and other special status species.

The fundamentals of rangeland health combine the basic precepts of physical function and biological health with elements of law relating to water quality, and plant and animal populations and communities. They provide direction in the development and implementation of the standards for rangeland health.

## **Standards for Rangeland Health**

The standards for rangeland health (standards), based on the above fundamentals, are expressions of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems. Although the focus of these standards is on domestic livestock grazing on Bureau of Land Management lands, on-the-ground decisions must consider the effects and impacts of all uses.

Standards that address the physical components of rangeland ecosystems focus on the roles and interactions of geology and landform, soil, climate and water as they govern watershed function



and soil stability. The biological components addressed in the standards focus on the roles and interactions of plants, animals and microbes (producers, consumers and decomposers), and their habitats in the ecosystem. The biological component of rangeland ecosystems is supported by physical function of the system, and it is recognized that biological activity also influences and supports many of the ecosystem's physical functions.

Guidance contained in 43 CFR 4180 of the regulations directs management toward the maintenance or restoration of the physical function and biological health of rangeland ecosystems. Focusing on the basic ecological health and function of rangelands is expected to provide for the maintenance, enhancement, or creation of future social and economic options.

The standards are based upon the ecological potential and capability of each site. In assessing a site's condition or degree of function, it must be understood that the evaluation compares each site to its own potential or capability. Potential and capability are defined as follows:

**Potential**-The highest level of condition or degree of function a site can attain given no political, social or economic constraints.

**Capability**-The highest level of condition or degree of function a site can attain given certain political, social or economic constraints. For example, these constraints might include riparian areas permanently occupied by a highway or railroad bed that prevent the stream's full access to its original flood plain. If such constraints are removed, the site may be able to move toward its potential.

In designing and implementing management strategies to meet the standards of rangeland health, the potential of the site must be identified, and any constraints recognized, in order that plan goals and objectives are realistic and physically and economically achievable.

## **Standards and Guidelines in Relation to the Planning Process**

The standards apply to the goals of land use plans, activity plans, and project plans (Allotment Management Plans, Annual Operating Plans, Habitat Management Plans, etc.). They establish the physical and biological conditions or degree of function toward which management of publicly-owned rangeland is to be directed. In the development of a plan, direction provided by the standards and the social and economic needs expressed by local communities and individuals are brought together in formulating the goal(s) of that plan.

When the standards and the social and economic goals of the planning participants are woven together in the plan goal(s), the quantifiable, time specific objective(s) of the plan are then developed. Objectives describe and quantify the desired future conditions to be achieved within a specified timeframe. Each plan objective should address the physical, biological, social and economic elements identified in the plan goal.



Standards apply to all ecological sites and land forms on public rangelands throughout Oregon and Washington. The standards require site-specific information for full on-ground usability. For each standard, a set of indicators is identified for use in tailoring the standards to site-specific situations. These indicators are used for rangeland ecosystem assessments and monitoring and for developing terms and conditions for permits and leases that achieve the plan goal.

Guidelines for livestock grazing management offer guidance in achieving the plan goal and objectives. The guidelines outline practices, methods, techniques and considerations used to ensure that progress is achieved in a way, and at a rate, that meets the plan goal and objectives.

## **Indicators of Rangeland Health**

The condition or degree of function of a site in relation to the standards and its trend toward or away from any standard is determined through the use of reliable and scientifically sound indicators. The consistent application of such indicators can provide an objective view of the condition and trend of a site when used by trained observers.

For example, the amount and distribution of ground cover can be used to indicate that infiltration at the soil surface can take place as described in the standard relating to upland watershed function. In applying this indicator, the specific levels of plant cover necessary to support infiltration in a particular soil should be identified using currently available information from reference areas, if they exist; from technical sources like soil survey reports, Ecological Site Inventories, and Ecological Site Descriptions, or from other existing reference materials. Reference areas are lands that best represent the potential of a specific ecological site in both physical function and biological health. In many instances potential reference areas are identified in Ecological Site Descriptions and are referred to as "type locations." In the absence of suitable reference areas, the selection of indicators to be used in measuring or judging condition or function should be made by an interdisciplinary team of experienced professionals and other trained individuals.

Not all indicators identified for each standard are expected to be employed in every situation. Criteria for selecting appropriate indicators and methods of measurement and observation include, but are not limited to: 1. the relationship between the attribute(s) being measured or observed and the desired outcome; 2. the relationship between the activity (e.g., livestock grazing) and the attribute(s) being measured or observed; and 3. funds and workforce available to conduct the measurements or observations.

## **Assessments and Monitoring**

The standards are the basis for assessing and monitoring rangeland condition and trend. Carrying out well-designed assessment and monitoring is critical to restoring or maintaining healthy rangelands and determining trends and conditions.

Assessments are a cursory form of evaluation based on the standards that can be used at different landscape scales. Assessments, conducted by qualified interdisciplinary teams (which may



include but are not limited to physical, biological and social specialists, and interagency personnel) with participation from permittees and other interested parties, are appropriate at the watershed and sub-watershed levels, at the allotment and pasture levels and on individual ecological sites or groups of sites. Assessments identify the condition or degree of function within the rangeland ecosystem and indicate resource problems and issues that should be monitored or studied in more detail. The results of assessments are a valuable tool for managers in assigning priorities within an administrative area and the subsequent allocation of personnel, money and time in resource monitoring and treatment. The results of assessments may also be used in making management decisions where an obvious problem exists.

Monitoring, which is the well documented and orderly collection, analysis and interpretation of resource data, serves as the basis for determining trends in the condition or degree of function of rangeland resources and for making management decisions. Monitoring should be designed and carried out to identify trends in resource conditions, to point out resource problems, to help indicate the cause of such problems, to point out solutions, and/or to contribute to adaptive management decisions. In cases where monitoring data do not exist, professional judgment, supported by interdisciplinary team recommendation, may be relied upon by the authorized officer in order to take necessary action. Review and evaluation of new information must be an ongoing activity.

To be effective, monitoring must be consistent over time, throughout administrative areas, and in the methods of measurement and observation of selected indicators. Those doing the monitoring must have the knowledge and skill required by the level or intensity of the monitoring being done, as well as the experience to properly interpret the results. Technical support for training must be made available.

## **Measurability**

It is recognized that not every area will immediately meet the standards and that it will sometimes be a long-term process to restore some rangelands to properly functioning condition. It is intended that in cases where standards are not being met, measurable progress should be made toward achieving those standards, and significant progress should be made toward fulfilling the fundamentals of rangeland health. Measurability is defined on a case-specific basis based upon the stated planning objectives (i.e., quantifiable, time specific), taking into account economic and social goals along with the biological and ecological capability of the area. To the extent that a rate of recovery conforms with the planning objectives, the area is allowed the time to meet the standard under the selected management regime.

## **Implementation**

The material contained in this document will be incorporated into existing Land Use Plans and used in the development of new Land Use Plans. According to 43 CFR 4130.3-1, permits and leases shall incorporate terms and conditions that ensure conformance with 43 CFR 4180. Terms and conditions of existing permits and leases will be modified to reflect standards and guidelines at the earliest possible date with priority for modification being at the discretion of the authorized



officer. Terms and conditions of new permits and leases will reflect standards and guidelines in their development.

Indicators identified in this document will serve as a focus of interpretation of existing monitoring data and will provide the basis of design for monitoring and assessment techniques, and in the development of monitoring and assessment plans.

The authorized officer shall take appropriate action as soon as practicable but not later than the start of the next grazing year upon determining, through assessment or monitoring by experienced professionals and interdisciplinary teams, that a standard is not being achieved and that livestock are a significant contributing factor to the failure to achieve the standards and conform with the guidelines.

---

## **Standards for Rangeland Health**

### **Standard 1 Watershed Function – Uplands**

**Upland soils exhibit infiltration and permeability rates, moisture storage and stability that are appropriate to soil, climate and landform.**

#### **Rationale and Intent**

This standard focuses on the basic physical functions of upland soils that support plant growth, the maintenance or development of plant populations and communities, and promote dependable flows of quality water from the watershed.

To achieve and sustain rangeland health, watersheds must function properly. Watersheds consist of three principle components: the uplands, riparian/wetland areas and the aquatic zone. This standard addresses the upland component of the watershed. When functioning properly, within its potential, a watershed captures, stores and safely releases the moisture associated with normal precipitation events (equal to or less than the 25 year, 5 hour event) that falls within its boundaries. Uplands make up the largest part of the watershed and are where most of the moisture received during precipitation events is captured and stored.

While all watersheds consist of similar components and processes, each is unique in its individual makeup. Each watershed displays its own pattern of landform and soil, its unique climate and weather patterns, and its own history of use and current condition. In directing management toward achieving this standard, it is essential to treat each unit of the landscape (soil, ecological site, and watershed) according to its own capability and how it fits with both smaller and larger units of the landscape.



A set of potential indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The appropriate indicators to be used in determining attainment of the standard should be drawn from the following list.

### **Potential Indicators**

Protection of the soil surface from raindrop impact; detention of overland flow; maintenance of infiltration and permeability, and protection of the soil surface from erosion, consistent with the potential/capability of the site, as evidenced by the:

- amount and distribution of plant cover (including forest canopy cover);
- amount and distribution of plant litter;
- accumulation/incorporation of organic matter;
- amount and distribution of bare ground;
- amount and distribution of rock, stone, and gravel;
- plant composition and community structure;
- thickness and continuity of A horizon;
- character of micro-relief;
- presence and integrity of biotic crusts;
- root occupancy of the soil profile;
- biological activity (plant, animal, and insect); and
- absence of accelerated erosion and overland flow.

Soil and plant conditions promote moisture storage as evidenced by:

- amount and distribution of plant cover (including forest canopy cover);
- amount and distribution of plant litter;
- plant composition and community structure; and
- accumulation/incorporation of organic matter.

---

## **Standard 2 Watershed Function - Riparian/Wetland Areas**

**Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.**

### **Rationale and Intent**

Riparian-wetland areas are grouped into two major categories: 1. lentic, or standing water systems such as lakes, ponds, seeps, bogs, and meadows; and 2. lotic, or moving water systems such as rivers, streams, and springs. Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Riparian areas commonly occupy the transition zone between the uplands and surface water bodies (the aquatic zone) or permanently saturated wetlands.



Properly functioning condition of riparian and wetland areas describes the degree of physical function of these components of the watershed. Their functionality is important to water quality in the capture and retention of sediment and debris, the detention and detoxification of pollutants, and in moderating seasonal extremes of water temperature. Properly functioning riparian areas and wetlands enhance the timing and duration of streamflow through dissipation of flood energy, improved bank storage, and ground water recharge. Properly functioning condition should not be confused with the Desired Plant Community (DPC) or the Desired Future Condition (DFC) since, in most cases, it is the precursor to these levels of resource condition and is required for their attainment.

A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The criteria are based upon the potential (or upon the capability where potential cannot be achieved) of individual sites or land forms.

### **Potential Indicators**

Hydrologic, vegetative, and erosional/depositional processes interact in supporting physical function, consistent with the potential or capability of the site, as evidenced by:

- frequency of floodplain/wetland inundation;
- plant composition, age class distribution, and community structure;
- root mass;
- point bars revegetating;
- streambank/shoreline stability;
- riparian area width;
- sediment deposition;
- active/stable beaver dams;
- coarse/large woody debris;
- upland watershed conditions;
- frequency/duration of soil saturation; and
- water table fluctuation.

Stream channel characteristics are appropriate for landscape position as evidenced by:

- channel width/depth ratio;
- channel sinuosity;
- gradient;
- rocks and coarse and/or large woody debris;
- overhanging banks;
- pool/riffle ratio;
- pool size and frequency; and
- stream embeddedness.

---

## **Standard 3 Ecological Processes**





**Healthy, productive and diverse plant and animal populations and communities appropriate to soil, climate and landform are supported by ecological processes of nutrient cycling, energy flow and the hydrologic cycle.**

**Rationale and Intent**

This standard addresses the ecological processes of energy flow and nutrient cycling as influenced by existing and desired plant and animal communities without establishing the kinds, amounts or proportions of plant and animal community compositions. While emphasis may be on native species, an ecological site may be capable of supporting a number of different native and introduced plant and animal populations and communities while meeting this standard. This standard also addresses the hydrologic cycle which is essential for plant growth and appropriate levels of energy flow and nutrient cycling. Standards 1 and 2 address the watershed aspects of the hydrologic cycle.

With few exceptions, all life on earth is supported by the energy supplied by the sun and captured by plants in the process of photosynthesis. This energy enters the food chain when plants are consumed by insects and herbivores and passes upward through the food chain to the carnivores. Eventually, the energy reaches the decomposers and is released as the thermal output of decomposition or through oxidation.

The ability of plants to capture sunlight energy, to grow and develop, to play a role in soil development and watershed function, to provide habitat for wildlife and to support economic uses depends on the availability of nutrients and moisture. Nutrients necessary for plant growth are made available to plants through the decomposition and metabolization of organic matter by insects, bacteria and fungi, the weathering of rocks and extraction from the atmosphere. Nutrients are transported through the soil by plant uptake, leaching and by rodent, insect and microbial activity. They follow cyclical patterns as they are used and reused by living organisms.

The ability of rangelands to supply resources and satisfy social and economic needs depends on the buildup and cycling of nutrients over time. Interrupting or slowing nutrient cycling can lead to site degradation, as these lands become increasingly deficient in the nutrients plants require.

Some plant communities, because of past use, frequent fire or other histories of extreme or continued disturbance, are incapable of meeting this standard. For example, shallow-rooted winter-annual grasses that completely dominate some sites do not fully occupy the potential rooting depth of some soils, thereby reducing nutrient cycling well below optimum levels. In addition, these plants have a relatively short growth period and thus capture less sunlight than more diverse plant communities. Plant communities like those cited in this example are considered to have crossed the threshold of recovery and often require great expense to be recovered. The cost of recovery must be weighed against the site's potential ecological/economic value in establishing treatment priorities.

The role of fire in natural ecosystems should be considered, whether it acts as a primary driver or only as one of many factors. It may play a significant role in both nutrient cycling and energy flows.



A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met.

### **Potential Indicators**

Photosynthesis is effectively occurring throughout the potential growing season, consistent with the potential/capability of the site, as evidenced by plant composition and community structure.

Nutrient cycling is occurring effectively, consistent with the potential/capability of the site, as evidenced by:

- plant composition and community structure;
- accumulation, distribution, incorporation of plant litter and organic matter into the soil;
- animal community structure and composition;
- root occupancy in the soil profile; and
- biological activity including plant growth, herbivory, and rodent, insect and microbial activity.

---

## **Standard 4 Water Quality**

**Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.**

### **Rationale and Intent**

The quality of the water yielded by a watershed is determined by the physical and chemical properties of the geology and soils unique to the watershed, the prevailing climate and weather patterns, current resource conditions, the uses to which the land is put and the quality of the management of those uses. Standards 1, 2 and 3 contribute to attaining this standard.

States are legally required to establish water quality standards and Federal land management agencies are to comply with those standards. In mixed ownership watersheds, agencies, like any other land owners, have limited influence on the quality of the water yielded by the watershed. The actions taken by the agency will contribute to meeting State water quality standards during the period that water crosses agency administered holdings.

### **Potential Indicators**

Water quality meets applicable water quality standards as evidenced by:

- water temperature;
- dissolved oxygen;
- fecal coliform;
- turbidity;
- pH;



- populations of aquatic organisms; and
  - effects on beneficial uses (i.e., effects of management activities on beneficial uses as defined under the Clean Water Act and State implementing regulations).
- 

## **Standard 5 Native, T&E, and Locally Important Species**

**Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform.**

### **Rationale and Intent**

Federal agencies are mandated to protect threatened and endangered species and will take appropriate action to avoid the listing of any species. This standard focuses on retaining and restoring native plant and animal (including fish) species, populations and communities (including threatened, endangered and other special status species and species of local importance). In meeting the standard, native plant communities and animal habitats would be spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability. Plant populations and communities would exhibit a range of age classes necessary to sustain recruitment and mortality fluctuations.

### **Potential Indicators**

Essential habitat elements for species, populations and communities are present and available, consistent with the potential/capability of the landscape, as evidenced by:

- plant community composition, age class distribution, productivity;
- animal community composition, productivity;
- habitat elements;
- spatial distribution of habitat;
- habitat connectivity; and
- population stability/resilience

## **Sage-Grouse Management Guidelines**

---

## **Guidelines for Livestock Grazing Management**

Guidelines for livestock grazing management offer guidance in achieving plan goals, meeting standards for rangeland health and fulfilling the fundamentals of rangeland health. Guidelines are applied in accordance with the capabilities of the resource in consultation, cooperation, and coordination with permittees/lessees and the interested public. Guidelines enable managers to



adjust grazing management on public lands to meet current and anticipated climatic and biological conditions.

## **General Guidelines**

1. Involve diverse interests in rangeland assessment, planning and monitoring.
2. Assessment and monitoring are essential to the management of rangelands, especially in areas where resource problems exist or issues arise. Monitoring should proceed using a qualitative method of assessment to identify critical, site-specific problems or issues using interdisciplinary teams of specialists, managers, and knowledgeable land users.

Once identified, critical, site-specific problems or issues should be targeted for more intensive, quantitative monitoring or investigation. Priority for monitoring and treatment should be given to those areas that are ecologically at-risk where benefits can be maximized given existing budgets and other resources.

## **Livestock Grazing Management**

1. The season, timing, frequency, duration and intensity of livestock grazing use should be based on the physical and biological characteristics of the site and the management unit in order to:
  - a. provide adequate cover (live plants, plant litter and residue) to promote infiltration, conserve soil moisture and to maintain soil stability in upland areas;
  - b. provide adequate cover and plant community structure to promote streambank stability, debris and sediment capture, and floodwater energy dissipation in riparian areas.
  - c. promote soil surface conditions that support infiltration;
  - d. avoid sub-surface soil compaction that retards the movement of water in the soil profile;
  - e. help prevent the increase and spread of noxious weeds;
  - f. maintain or restore diverse plant populations and communities that fully occupy the potential rooting volume of the soil;
  - g. maintain or restore plant communities to promote photosynthesis throughout the potential growing season;
  - h. promote soil and site conditions that provide the opportunity for the



- establishment of desirable plants;
- i. protect or restore water quality; and
  - j. provide for the life cycle requirements, and maintain or restore the habitat elements of native (including T&E, special status, and locally important species) and desired plants and animals.
2. Grazing management plans should be tailored to site-specific conditions and plan objectives. Livestock grazing should be coordinated with the timing of precipitation, plant growth and plant form. Soil moisture, plant growth stage and the timing of peak stream flows are key factors in determining when to graze. Response to different grazing strategies varies with differing ecological sites.
  3. Grazing management systems should consider nutritional and herd health requirements of the livestock.
  4. Integrate grazing management systems into the year-round management strategy and resources of the permittee(s) or lessee(s). Consider the use of collaborative approaches (e.g., Coordinated Resource Management, Working Groups) in this integration.
  5. Consider competition for forage and browse among livestock, big game animals, and wild horses in designing and implementing a grazing plan.
  6. Provide periodic rest from grazing for rangeland vegetation during critical growth periods to promote plant vigor, reproduction and productivity.
  7. Range improvement practices should be prioritized to promote rehabilitation and resolve grazing concerns on transitory grazing land.
  8. Consider the potential for conflict between grazing use on public land and adjoining land uses in the design and implementation of a grazing management plan.

### **Facilitating the Management of Livestock Grazing**

1. The use of practices to facilitate the implementation of grazing systems should consider the kind and class of animals managed, indigenous wildlife, wild horses, the terrain and the availability of water. Practices such as fencing, herding, water development, and the placement of salt and supplements (where authorized) are used where appropriate to:
  - a. promote livestock distribution;



- b. encourage a uniform level of proper grazing use throughout the grazing unit;
  - c. avoid unwanted or damaging concentrations of livestock on streambanks, in riparian areas and other sensitive areas such as highly erodible soils, unique wildlife habitats and plant communities; and
  - d. protect water quality.
2. Roads and trails used to facilitate livestock grazing are constructed and maintained in a manner that minimizes the effects on landscape hydrology; concentration of overland flow, erosion and sediment transport are prevented; and subsurface flows are retained.

### **Accelerating Rangeland Recovery**

1. Upland treatments that alter the vegetative composition of a site, like prescribed burning, juniper management and seedings or plantings must be based on the potential of the site and should:
  - a. retain or promote infiltration, permeability, and soil moisture storage;
  - b. contribute to nutrient cycling and energy flow;
  - c. protect water quality;
  - d. help prevent the increase and spread of noxious weeds;
  - e. contribute to the diversity of plant communities, and plant community composition and structure;
  - f. support the conservation of T&E, other special status species and species of local importance; and
  - g. be followed up with grazing management and other treatments that extend the life of the treatment and address the cause of the original treatment need.
2. Seedings and plantings of non-native vegetation should only be used in those cases where native species are not available in sufficient quantities; where native species are incapable of maintaining or achieving the standards; or where non-native species are essential to the functional integrity of the site.
3. Structural and vegetative treatments and animal introductions in riparian and wetland areas must be compatible with the capability of the site, including the system's hydrologic regime, and contribute to the maintenance or restoration of



properly functioning condition.

---

## Glossary

**Appropriate action**-implementing actions pursuant to subparts 4110, 4120, 4130 and 4160 of the regulations that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines. (see **Significant progress**)

**Assessment**-a form of evaluation based on the standards of rangeland health, conducted by an interdisciplinary team at the appropriate landscape scale (pasture, allotment, sub-watershed, watershed, etc.) to determine conditions relative to standards.

**Compaction layer**-a layer within the soil profile in which the soil particles have been rearranged to decrease void space, thereby increasing soil bulk density and often reducing permeability.

**Crust, Abiotic**-(physical crust) a surface layer on soils, ranging in thickness from a few millimeters to a few centimeters, that is much more compact, hard and brittle, when dry, than the material immediately beneath it.

**Crust, Biotic**-(microbiotic or cryptogamic crust) a layer of living organisms (mosses, lichens, liverworts, algae, fungi, bacteria, and/or cyanobacteria) occurring on, or near the soil surface.

**Degree of function**-a level of physical function relative to properly functioning condition commonly expressed as: properly functioning, functioning-at-risk, or non-functional.

**Diversity**-the aggregate of species assemblages (communities), individual species, and the genetic variation within species and the processes by which these components interact within and among themselves. The elements of diversity are: 1. community diversity (habitat, ecosystem), 2. species diversity; and 3. genetic diversity within a species; all three of which change over time.

**Energy flow**-the processes in which solar energy is converted to chemical energy through photosynthesis and passed through the food chain until it is eventually dispersed through respiration and decomposition.

**Groundwater**-water in the ground that is in the zone of saturation; water in the ground that exists at, or below the water table.

**Guideline**-practices, methods, techniques and considerations used to ensure that progress is made in a way and at a rate that achieves the standard(s).



**Gully**-a channel resulting from erosion and caused by the concentrated but intermittent flow of water usually during and immediately following heavy rains.

**Hydrologic cycle**-the process in which water enters the atmosphere through evaporation, transpiration, or sublimation from the oceans, other surface water bodies, or from the land and vegetation, and through condensation and precipitation returns to the earth's surface. The precipitation then occurring as overland flow, stream flow, or percolating underground flow to the oceans or other surface water bodies or to other sites of evapo-transpiration and recirculation to the atmosphere.

**Indicators**-parameters of ecosystem function that are observed, assessed, measured, or monitored to directly or indirectly determine attainment of a standard(s).

**Infiltration**-the downward entry of water into the soil.

**Infiltration rate**-the rate at which water enters the soil.

**Nutrient cycling**-the movement of essential elements and inorganic compounds between the reservoir pool (soil, for example) and the cycling pool (organisms) in the rapid exchange (i.e., moving back and forth) between organisms and their immediate environment.

**Organic matter**-plant and animal residues accumulated or deposited at the soil surface; the organic fraction of the soil that includes plant and animal residues at various stages of decomposition; cells and tissues of soil organisms, and the substances synthesized by the soil population.

**Permeability**-the ease with which gases, liquids or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.

**Properly functioning condition**-Riparian-wetland: adequate vegetation, landform, or large (coarse) woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid in flood plain development; improve flood-water retention and ground water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse channel and ponding characteristics to provide the habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The result of interaction among geology, soil, water, and vegetation.

Uplands: soil and plant conditions support the physical processes of infiltration and moisture storage and promote soil stability (as appropriate to site potential); includes the production of plant cover and the accumulation of plant residue that protect the soil surface from raindrop impact, moderate soil temperature in minimizing frozen soil conditions (frequency, depth, and duration), and the loss of soil moisture to evaporation; root growth and development in the support of permeability and soil aeration. The result of interaction among geology, climate, landform, soil, and organisms.





**Proper grazing use**-grazing that, through the control of timing, frequency, intensity and duration of use, meets the physiological needs of the desirable vegetation, provides for the establishment of desirable plants and is in accord with the physical function and stability of soil and landform (properly functioning condition).

**Reference area**-sites that, because of their condition and degree of function, represent the ecological potential or capability of similar sites in an area or region (ecological province); serve as a benchmark in determining the ecological potential of sites with similar soil, climatic, and landscape characteristics.

**Rill**-a small, intermittent water course with steep sides; usually only a few inches deep.

**Riparian area**-a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and stream, glacial potholes, and shores of lakes and reservoirs with stable water levels area typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil. Includes, but is not limited to, jurisdictional wetlands.

**Significant progress**-when used in reference to achieving a standard: (actions), the necessary land treatments, practices and/or changes to management have been applied or are in effect; (rate), a rate of progress that is consistent with the anticipated recovery rate described in plan objectives, with due recognition of the effects of climatic extremes (drought, flooding, etc.), fire, and other unforeseen naturally occurring events or disturbances. Monitoring reference areas that are ungrazed and properly grazed may provide evidence of appropriate recovery rates. (See Proper Grazing Use)

**Soil density**-(bulk density)-the mass of dry soil per unit bulk volume.

**Soil moisture**-water contained in the soil; commonly used to describe water in the soil above the water table.

**Special status species**-species proposed for listing, officially listed (T/E), or candidates for listing as threatened or endangered by the Secretary of the Interior under the provisions of the Endangered Species Act; those listed or proposed for listing by the State in a category implying potential endangerment or extinction; those designated by each Bureau of Land Management State Director as sensitive.

**Species of local importance**-species of significant importance to Native American populations (e.g., medicinal and food plants).

**Standard**-an expression of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems.



**Uplands**-lands that exist above the riparian/wetland area, or active flood plains of rivers and streams; those lands not influenced by the water table or by free or unbound water; commonly represented by toe slopes, alluvial fans, and side slopes, shoulders and ridges of mountains and hills.

**Watershed**-an area of land that contributes to the surface flow of water past a given point. The watershed dimensions are determined by the point past, or through which, runoff flows.

**Watershed function**-the principal functions of a watershed include the capture of moisture contributed by precipitation; the storage of moisture within the soil profile, and the release of moisture through subsurface flow, deep percolation to groundwater, evaporation from the soil, and transpiration by live vegetation.

**Wetland**-areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.



**A  
New Map of  
TEXAS OREGON  
AND  
CALIFORNIA**

WITH THE REGIONS ADJOINING  
CORRECTED  
FROM THE MOST RECENT AUTHORITIES.  
**PHILADELPHIA**  
Published by S. Augustus Mitchell  
N.E. CORNER OF MARKET & SEVENTH STREETS.  
1846

**United States Department of the Interior**  
**Bureau of Land Management**  
**Oregon State Office**  
333 S.W. 1st Avenue  
Portland, Oregon 97204

---

**OFFICIAL BUSINESS**  
**PENALTY FOR PRIVATE USE, \$300**



BLM/OR/WA/PL-08/096+1792

**PRIORITY MAIL**  
**POSTAGE AND FEES PAID**  
Bureau of Land Management  
Permit No. G-76

The background of the page is a light gray topographic map. It shows contour lines, a grid, and various geographical features. The map is oriented vertically, matching the text layout. The text is centered horizontally on the page.

# **Final Environmental Impact Statement**

**for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management - Salem, Eugene, Roseburg, Coos Bay, and Medford Districts, and the Klamath Falls Resource Area of the Lakeview District**

**Vol. III**

**SPINE TEXT**