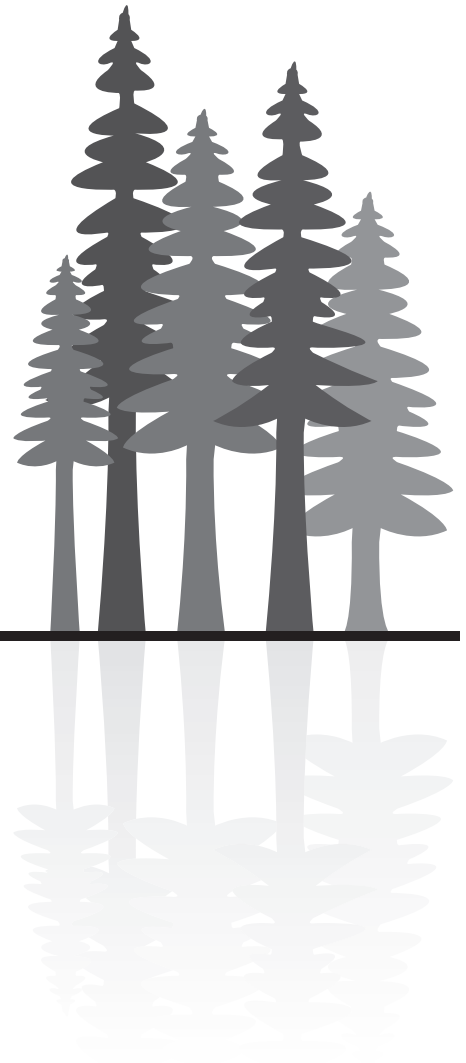
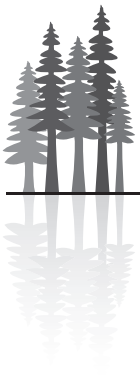


# Appendix A

## Guidance for Use of The Resource Management Plan







# Appendix A - Guidance for Use of the Resource Management Plan

This section provides guidance on how the resource management plan will be implemented, evaluated, and changed by the district.

## Requirement for Further Environmental Analysis

The BLM makes many types of decisions. It is important to distinguish between land use plan decisions and implementation decisions because: (1) the administrative remedies and the timing of those remedies differ; (2) the NEPA analysis necessary to support implementation decisions is generally more site specific than the analysis necessary to support land use plan decisions; (3) the authority to make these types of decisions varies; and (4) the scope and effect of each type of decisions would be considered during the compliance and consultation proceedings required under various environmental laws.

- Land use plan decisions consist of desired outcomes (goals, standards, objectives), allowable uses (land use allocations, levels of use, restrictions on uses), and management direction necessary to achieve the outcomes.
- Implementation decisions are actions to implement land use plans. These types of decisions are based on site-specific planning and NEPA analyses. Examples of implementation decisions include: offering a specific tract of timber for sale, applying a vegetation treatment, offering a specific oil or gas lease for sale, application for a permit to drill (APDs), selling an individual grazing lease or processing a specific permit application, designating specific roads and trails as open or closed to motorized travel, or completing a specific land exchange.

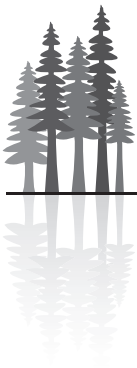
This resource management plan only provides direction for the management of natural resources on BLM-administered lands. This plan does not authorize the implementation of any specific project-level actions. Decisions on which projects, including specific on-the-ground locations and timing of a project, will be made subsequent to the adoption of this Resource Management Plan. Decisions on specific projects will be made by BLM employees delegated to make those decisions after compliance with National Environmental Policy Act and required consultation has been completed.

## Plan Evaluation

Evaluation is the process of reviewing the land use plan to determine whether plan decisions are being implemented as expected, and whether the associated NEPA analyses are still valid. Based on this evaluation, a determination is made as to whether a plan amendment or revision is warranted. Land use plans are evaluated to determine if:

- Decisions remain relevant to current issues.
- Decisions are effective in achieving (or making progress toward achieving) desired objectives.
- Any decisions need to be revised.
- Any decisions need to be dropped from further consideration.
- Any areas require new decisions.

The plan will be formally evaluated every 5 years, or as necessitated by changed circumstances or significant new information. These evaluations will focus on issues resulting from monitoring or new information.



The evaluation will also review major assumptions regarding the level of management activities used in the analysis of effects for the Final Environmental Impact Statement for the Revisions of the Western Oregon BLM Districts. Much of the data needed for evaluating these assumptions related to anticipated levels of activity will be collected through program reporting associated with the RMP monitoring plan.

Unscheduled plan evaluations could be conducted to address certain unanticipated events or new information that calls into question the underlying analysis and decisions of the plan. These unscheduled plan evaluations may examine a single or relatively narrow aspect of the resource management plan.

## **Plan Maintenance**

Land use plan decisions can be maintained to reflect minor changes in data. Maintenance is limited to further refining, documenting, or clarifying a previously approved decision. Plan maintenance will not expand the scope of resource uses or restrictions or change the terms, conditions, and decisions of the approved plan. Plan maintenance may be used to adjust the annual sustained yield capacity based on updated data.

## **Plan Amendments**

New information, updated analyses, or new resource use or protection proposals may require amending or revising land use plans and updating implementation decisions. Re-examining existing plan decisions, or the analysis in the FEIS for the Revision of the Resource Management Plans for the Western Oregon BLM Districts, will be appropriate if new information or circumstance has come to light that could significantly alter the underlying conclusions of the FEIS regarding environmental consequences or the ability to achieve management objectives.

Plan amendments change one or more of the terms, conditions, or decisions of an approved land use plan. Plan amendments are most often prompted by the need to:

- Consider a proposal or action that does not conform to the plan.
- Implement new or revised policy that changes land use plan decisions, such as an approved conservation agreement between the BLM and the USFWS.
- Respond to new, intensified, or changed uses on public land.
- Consider significant new information from resource assessments, plan evaluations, monitoring, or scientific studies.

Plan amendments will follow BLM planning regulations and can be accompanied by either an environmental assessment or environmental impact statement.

## **Plan Revisions**

Resource management plan revisions involve preparation of a new plan to replace an existing one. Resource management plan revisions will be necessary if monitoring and evaluation findings, new data, new or revised policy, or changes in circumstances indicate that decisions for an entire plan or a major portion of the plan would no longer serve as a useful guide for resource management. Plan revisions are accomplished through the BLM planning regulations and are accompanied by an environmental impact statement.



## Valid Existing Rights

Considering the intermingled nature of the O&C lands in the planning area, an immense number of rights-of-way, leases, corridors, and other established legal rights have been granted over the years in establishing an effective cooperative management framework among a variety of owners. Perhaps the most extensive and unique rights are the reciprocal rights-of-way agreements established with dozens of adjacent landowners to provide for the logical, effective, and efficient development of access on the intermingled lands. Mining claims, water rights, and county roads are other examples. When implementing resource management plans, it is recognized there are some instances when actions that may occur on public lands are subject to these valid existing rights. In those cases, authorization for implementing an action may be subject to approval by the holders of valid existing rights and may not be discretionary to the BLM.

## Management of Newly Acquired Lands

Lands may come under BLM administration through exchange, donation, purchase, revocation of withdrawals to other federal agencies, or relinquishment of Recreation and Public Purpose leases. Discretionary acquisitions (such as exchanges) will be guided by the *Lands Acquisition Criteria*, based on resource values of high public interest. (**Note:** See *Appendix F – Lands* for the *Lands Acquisition Criteria*.)

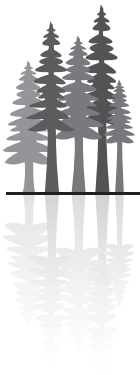
Newly acquired or administered lands or interests in lands will be managed for their highest potential or for the purposes for which they are acquired. For example, lands acquired within the boundary of a “special management area” with Congressional or resource management plan allocations/direction will be managed in conformance with management objectives and guidelines for that area. Lands acquired outside of designated special management areas will be managed in the same manner as comparable or adjacent BLM-administered lands. In western Oregon, this implies forest management activities, including timber harvest, management of the mineral estate, standard operating procedures, and pre-committed mitigation measures.

If lands with unique or fragile resource values are acquired outside of special management areas, it may be appropriate to protect those values until the next plan revision. Lands acquired adjacent to or within existing or proposed withdrawals identified in this plan that possess similar critical resource values will be proposed for withdrawal. Newly acquired lands, regardless of status, will be subject to non-discretionary access rights provided for under the terms and conditions of most reciprocal right-of-way agreements and permits.

In accordance with Section 205 (e) of FLPMA (P.L. 99-632), lands acquired by the BLM in exchange for O&C or Coos Bay Wagon Road (CBWR) lands will have the same status and be administered in accordance with the same provisions of law applicable to those lands disposed of; and those newly acquired lands will be designated as O&C or CBWR lands, as appropriate, and managed under the sustained yield principles as prescribed in the Act of August 28, 1937 and other laws applicable to the O&C or CBWR lands. Additionally, lands acquired using proceeds generated from the disposal of O&C or CBWR lands under the authority of the Federal Land Transaction Facilitation Act (Public Law 106-248) will also take on the same status as the lands from which the funds were generated (O&C or CBWR) and will likewise be managed in accordance with the Act of August 28, 1937 and other applicable laws.

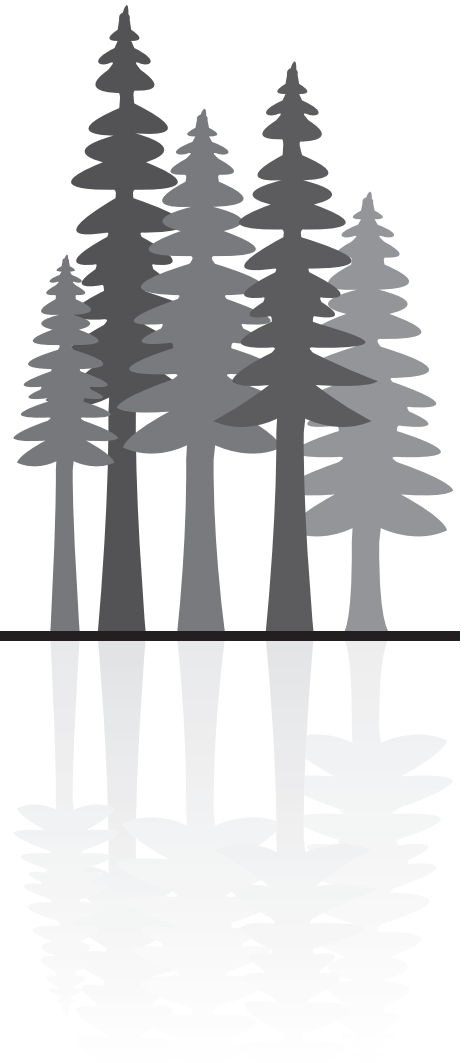
Lands acquired by the BLM that take on the status of either O&C or CBWR will require classification in accordance with the Act of June 9, 1916 as to power-site, timberlands, or agricultural lands. Lands classified as timberland or agriculture will be open to exploration, location, entry and disposition under the general mining laws in accordance with the Act of April 8, 1948. Lands acquired by the BLM under Section 205 or 206 of FLPMA take on the status of “acquired lands,” and therefore will not be available for location, lease, or sale until the land is formally opened to such entry.

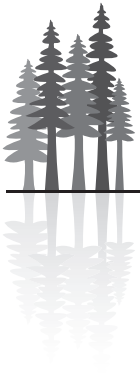
Land acquisitions resulting in net adjustments in the commercial forestland base may be made without adjusting the allowable sale quantity or amending the resource management plan, unless the cumulative effects of all changes indicate that the decadal allowable sale quantity for any sustained yield unit should be modified by more than 10 percent of the allowable sale quantity.



# Appendix B

## Monitoring









# Appendix B - Monitoring

## Monitoring Plan for the Klamath Falls Resource Area Resource Management Plan

The monitoring plan for the Klamath Falls Resource Area Resource Management Plan is carefully designed to avoid prohibitive costs and effectively answer monitoring questions and reporting levels of activities. It is not necessary or desirable to monitor every activity and management action or objective of a resource management plan.

Monitoring for the resource management plan will examine if activities are in accordance with management direction (implementation monitoring), if management objectives are being met or are likely to be met (effectiveness monitoring), and if management objectives and management actions are based on correct assumptions (validation monitoring). Most monitoring will be designed to provide information as to whether activities are in accordance with management direction.

Some management objectives and management direction in the Klamath Falls Resource Area Resource Management Plan are not measurable or quantifiable, or do not have a standard or threshold of acceptability, and therefore will not lend themselves to being addressed through monitoring questions which are almost always dependent on a quantifiable basis of measurement. The level of activity for certain management directions that do not have standards or thresholds of acceptability will be monitored in the form of a program reporting item.

In some cases, where monitoring indicates very high compliance with the plan, the frequency or interval of monitoring will subsequently be adjusted for cost and time efficiency.

Sampling or evaluation of a subset of actions will be employed to avoid unnecessary detail and unacceptable costs. Projects to be monitored will be selected on the basis of those that will yield a greater amount of information or be more beneficial. For example, a random sample may result in monitoring of a relatively small straightforward project that will yield limited information, whereas a more sophisticated or complex project might be available for monitoring that will yield more information or be more effective. Sampling will be done at the level of the entire administrative unit to which the resource management applies (e.g., Klamath Falls Resource Area).

The monitoring questions will be evaluated at each monitoring interval to ascertain if the questions, reporting, methods, sample size, or intervals need to be changed. Such changes to the monitoring plan will be accomplished through plan maintenance.

Monitoring results will be reported annually in a Monitoring Report and published as part of the Annual Program Summary. The Monitoring Report will report, track, and assess the progress of plan implementation; state the findings and conclusions made through monitoring; and serve as a report to managers and the public. Monitoring reports will also include any discussions and analysis of non-compliance and recommendations for corrective action.

The use of this monitoring plan will provide a basis for consistent and coordinated monitoring, and allow Klamath Falls Resource Area information to be compiled and considered at the scale of the entire western Oregon planning area.



## **Other Monitoring**

The monitoring plan for the Klamath Falls Resource Area Resource Management Plan is designed to focus specifically on monitoring the resource management plan itself and is not intended as an overarching plan that addresses all ongoing monitoring and research efforts. This monitoring plan does not attempt to address science questions or issues of a regional or interagency scale. There are many ongoing regional, interagency, and research (science-based) efforts in which the BLM participates that address these broader issues. Although these other efforts in which the BLM participates often have important implications for BLM-administered lands and resources in western Oregon, they will be addressed externally from this monitoring plan.

## **Plan Evaluations**

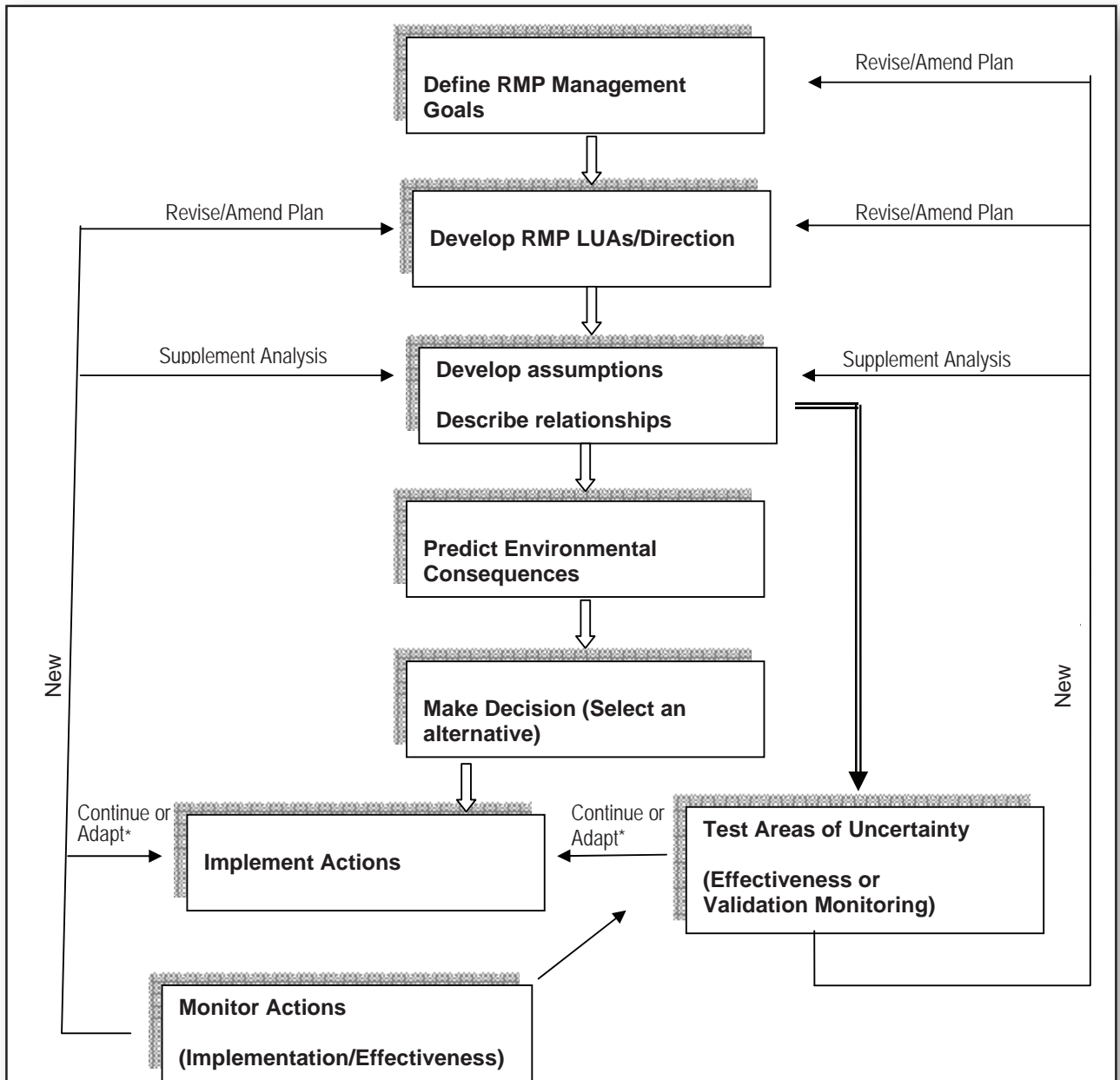
Plan evaluations will occur at 5-year intervals. In addition to the monitoring results, many of the underlying assumptions regarding levels of activities and anticipated environmental consequences will be examined at the time of the 5-year plan evaluation to determine if the plan objectives are being met or are likely to be met. The evaluation will also assess whether changed circumstances or new information have created a situation in which the expected impacts or environmental consequences of the plan are significantly different than those anticipated in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts (published in October 2008). The plan evaluation will make a finding of whether or not a plan amendment or plan revision is warranted.



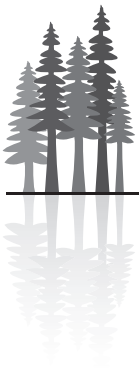
# Adaptive Management

Adaptive management is not a stand-alone program or process. Adaptive management for the Klamath Falls Resource Area Resource Management Plan will be integrated into NEPA and land use planning processes. See *Figure B-1 (Land use planning, monitoring, and adaptive management)*. Identified outcomes for the resource management plan are described in the plan's management objectives. Resource management plan monitoring will determine if the objectives are being met or are likely to be met.

**FIGURE B-1. LAND USE PLANNING, MONITORING, AND ADAPTIVE MANAGEMENT**



\*When monitoring shows the plan is being implemented as written, continue to implement. Where management direction specifically describes the conditions where adaptation is allowable without supplementing, revising, or amending the plan, then adapt the actions. Additionally, the monitoring plan should consider the areas of uncertainty and the sensitivity of assumptions and relationships.



In addition to monitoring results, new information or changed circumstances will be evaluated as to whether changes in resource management plan decisions or changes in supporting NEPA analyses are warranted. Adaptive management tools and procedures that will be used to make changes in the plan in response to monitoring information, new information, or changed circumstances include: plan maintenance, plan evaluations, plan amendments and plan revisions. In addition to these planning instruments, NEPA documentation may be necessary. The NEPA procedures relevant to adaptive management will include the use of categorical exclusions, determination of NEPA adequacy reviews, environmental assessments, and environmental impact statements. Unscheduled plan evaluations can be conducted to address certain unanticipated events or new information that could call into question the underlying analysis and decisions of the plan.

In some instances, management direction provides for a range of activities or resource uses. In these cases, levels of activities or resource uses will vary within the range prescribed by the management action without the use of planning steps or NEPA analyses. The level of activities will be adapted within the range given by management action, depending on variation in resource needs or organizational capability.

In addition to the constraints or latitude provided by management direction, the ability to adapt or change management without the use of planning steps or NEPA analyses will be restricted by how much of a departure would be from analytical assumptions in the environmental impact statement. This is because the conclusions regarding environmental consequences are derived from analytical assumptions. Analytical assumptions include such things as levels or methods of activities, number of acres treated, and miles of roads maintained.

If, as a result of the need for adaptive management changes, implementation of the resource management plan would so alter the methods or levels of activities to the degree that the environmental consequences might be substantively different than those anticipated in the environmental impact statement, then formal planning steps and NEPA procedures will be required. The determination as to when formal planning steps and NEPA procedures will be required will be made through the plan evaluation process. Plan evaluations could include an overall resource management plan evaluation such as occurs at five-year intervals or a narrowly focused evaluation of a specific aspect of the resource management plan. Plan evaluations will be scheduled at 5-year intervals. Unscheduled plan evaluations can be conducted to address certain unanticipated events or new information, such as a very large wildfire.

Adaptive management will also be applied by acting on information found through the monitoring questions. Adaptive management associated with monitoring will include corrective actions precipitated by findings of non-compliance. Corrective action precipitated by monitoring can range from simple changes in administrative procedures, refinements of the plan through plan maintenance, or more substantive changes through plan amendments.



# Monitoring Questions

Monitoring of certain questions will not take place in the early years of implementation, because projects would not yet have been completed and, therefore, would not be ready for monitoring. Although incomplete projects may be informally examined by managers to assess progress towards implementing management actions and achieving objectives, the evaluation of incomplete projects will not be part of formal plan monitoring. Not all programs or resources have monitoring questions.

## Late-Successional Management Area

- M1. Monitoring Question:** Has the level of northern spotted owl suitable habitat for nesting, roosting, or foraging and marbled murrelet nesting habitat in the Late-Successional Management Areas (LSMAs) been maintained or increased?

Monitoring Requirement: Report acres of management activities and natural disturbance that have reduced the level of habitat in the Late-Successional Management Areas. Report acres of thinning harvest and other silvicultural treatments designed to promote development of habitat in the Late-Successional Management Areas.

Monitoring Interval: Five years.

- M2. Monitoring Question:** Are snags and coarse woody debris retained during thinning harvest in the Late-Successional Management Areas in accordance with the resource management plan?

Monitoring Requirement: At least one completed thinning project in a Late-Successional Management Area. Projects must have been thinned at least five years prior to monitoring.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M3. Monitoring Question:** Is timber salvaged after stand-replacing disturbance to recover economic value in the Late-Successional Management Areas?

Monitoring Requirement: 100% of stand-replacing disturbances over 10 acres.

Monitoring Interval: Annual.

- M4. Monitoring Question:** Are snags and coarse woody debris retained during salvage in Late-Successional Management Areas in accordance with the resource management plan?

Monitoring Requirement: 100% of natural disturbance events. The entire disturbed area will not necessarily need to be evaluated. A sample or subset of the disturbed area may be evaluated.

Monitoring Interval: Annual.

## Riparian Management Area

**Water Quality:** Surrogates for water quality will be evaluated (e.g., shade – Riparian Management Area width). In addition, water quality will be monitored through Water Quality Management Plans. Although monitoring through Water Quality Management Plans will apply to only those stream miles listed as 303(d) waters, these streams are among the higher priority waters to be monitored.



- M5. Monitoring Question:** Is the width of the Riparian Management Areas established adjacent to regeneration timber harvest areas in accordance with the resource management plan?

Monitoring Requirement: All streams within at least one completed timber sale.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M6. Monitoring Question:** When thinning treatments are applied in Riparian Management Areas along perennial and intermittent fish-bearing streams, is a minimum of 50% canopy closure retained? Are thinning treatments excluded within 60 feet on either side of the edge of the stream channel as measured from the ordinary high water line?

Monitoring Requirement: All streams treated within at least one completed thinning timber sale.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M7. Monitoring Question:** Are thinning treatments excluded within 35 feet on either side of the edge of the stream channel as measured from the ordinary high water line of intermittent non-fish bearing streams?

Monitoring Requirement: Up to 0.25 mile of stream within thinning projects completed within the past year will be evaluated.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M8. Monitoring Question:** Were Best Management Practices that were identified as applicable (as indicated through NEPA decision record or contract stipulations) applied during project implementation?

Monitoring Requirement: At least three projects with identified Best Management Practices will be evaluated. Projects from any land use allocation may be selected for evaluation.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M9. Monitoring Question:** For streams with ESA-listed or anadromous fish species, is livestock restricted from riparian areas until 30 days following the emergence of salmonids from spawning beds?

Monitoring Requirement: 100% of streams with ESA-listed or anadromous fish species within grazing allotments.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

**Note:** Monitoring questions M10, M11, M12, and M13 apply to the Eastside Non-Forest Lands of the Klamath Falls Resource Area.

- M10. Monitoring Question:** Has the amount of streams in proper functioning condition been maintained or increased?



Monitoring Requirement and Monitoring Interval: Monitoring and reporting will be through the use of the statewide report, Table 1 from USDI TR-1737-9 1993 (or similar), of lotic and lentic water bodies in properly functioning; functioning at risk with trend up, down or not apparent; and not properly functioning. (**Note:** Table 1 is available online, with instructions, at <http://www.blm.gov/nstc/library/techref.htm> and is also provided below for reference purposes.)

**TABLE 1. FUNCTIONING CONDITION STATUS**

State: \_\_\_\_\_

Habitat Types	Proper Functioning Condition	Functional – At Risk			Non-functional	Unknown	Total
		Trend Up	Trend Not Apparent	Trend Down			
Riverine Miles (Lotic)							
Nonriverine Acres (Lentic)*							

\*Report only acres associated with lentic riparian-wetland areas. Do not include acres associated with lotic riparian-wetland areas.

**M11. Monitoring Question:** For streams with ESA-listed or anadromous fish species, are livestock restricted from riparian areas until 30 days following the emergence of salmonids from spawning beds?

Monitoring Requirement: 100% of streams with ESA-listed or anadromous fish species within grazing allotments.

Monitoring Interval: Annually for first three years of RMP implementation, and then every three years if results show 100% compliance.

## Eastside Forest Management Area

**M12. Monitoring Question:** Are snags and coarse woody debris retained in accordance with resource management plan requirements?

Monitoring Requirement: At least one completed timber sale will be evaluated.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.



## Uneven-Age Management Area and Eastside Forest Management Area

**M13. Monitoring Question:** Is a relative density (Curtis) of 25 and 55 (for Eastside Forest Management Area a relative density of 15 to 55) inclusive of any group selections maintained during group selection, commercial thinning, or density management conducted for the removal and sale of timber and biomass? (The overstory component of the stand will be used to measure relative density.)

Monitoring Requirement: One completed timber sale will be evaluated.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

## Deferred Timber Management Area

**M14. Monitoring Question:** Has the level of older, more structurally complex, multi-layered conifer forests been maintained until the year 2023?

Monitoring Requirement: Report acres of management activities and natural disturbance that has reduced the acres of the Deferred Timber Management Area.

Monitoring Interval: Every five years.

## Uneven-Age Management Area

**M15. Monitoring Question:** Has the allowable sale quantity been offered for sale within the variation provided for in the plan?

Monitoring Requirement: Report annual sale quantity offered for sale and the cumulative total since approval of the plan.

Monitoring Interval: Annual.

## Timber Management Area

**Note:** Monitoring question M16 does not apply to the Klamath Falls Resource Area.

**M16. Monitoring Question:** Has timber volume from regeneration harvest and commercial thinning been offered for sale in the quantities specified in the resource management plan?

Monitoring Requirement: Report volume of regeneration harvest and volume of commercial thinning offered for sale.

Monitoring Interval: Annual.

## Air

**M17. Monitoring Question:** Have smoke intrusions occurred in areas designated as Class I for air quality and non-attainment occurred as a result of BLM prescribed fire?





Monitoring Requirement: Report intrusions through Oregon Department of Forestry data.

Monitoring Interval: Annual.

## Areas of Critical Environmental Concern and Research Natural Areas

**M18. Monitoring Question:** Are important and relevant values being maintained or restored?

Monitoring Requirement: Report 20% of the Areas of Critical Environmental Concern and Research Natural Areas.

Monitoring Interval: The monitoring of Areas of Critical Environmental Concern and Research Natural Areas will be rotated, providing for 100% of the areas to be monitored over a 5-year period.

## Botany

**M19. Monitoring Question:** Is management of species that are listed under the Endangered Species Act consistent with recovery plans and designated critical habitat?

Monitoring Requirement: All completed projects that “may affect” listed species will be reviewed after completion.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

**M20. Monitoring Question:** Have protection measures maintained populations of BLM special status plant and fungi species?

Monitoring Requirement: 20% of completed projects in which protection measures were implemented to accommodate BLM special status plant and fungi species will be reviewed. If less than five projects are completed, monitor at least one completed project.

Monitoring Interval: Annual.

## Cultural and Paleontological Resources Including American Indian Traditional Uses

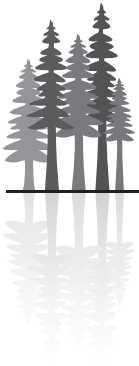
**M21. Monitoring Question:** Were sites located within project areas after the commencement of ground-disturbing activities?

Monitoring Requirement: At least 20% of management activities that involve ground disturbance that have been completed within the past year will be evaluated.

Monitoring Interval: Annual.

**M22. Monitoring Question:** Have ground-disturbing actions avoided sites that are listed (or eligible for listing) on the National Register of Historic Places?

Monitoring Requirement: 100 percent of avoided listed or eligible sites that lie within the boundaries



of a ground-disturbing project after the project is completed.

Monitoring Interval: Annually when listed or eligible sites are present and avoidance prescribed.

- M23. Monitoring Question:** Are sites with scientific value salvaged prior to disturbance (when disturbance cannot be practically avoided) through practices such as data recovery, including excavation, relocation, or documentation?

Monitoring Requirement: 100 percent of data recovery actions undertaken to salvage site data at risk of loss from ground disturbing management activities that have been completed within the past year.

Monitoring Interval: Annual.

- M24. Monitoring Question:** Are cultural and paleontological resources that are threatened by natural processes or human activity excavated and the data recovered where warranted by the scientific importance of the site?

Monitoring Requirement: 100 percent of management activities that have been completed within the past year.

Monitoring Interval: Annual.

## Energy and Minerals

- M25. Monitoring Question:** Has the level of opportunities for the exploration and development of locatable, leasable, and salable energy and mineral resources, and for casual mineral prospecting, been maintained?

Monitoring Requirement: Report new withdrawals.

Monitoring Interval: Five years.

## Fire and Fuels Management

- M26. Monitoring Question:** What is the net change in fire hazard to communities at risk, and risk of uncharacteristic wildfires as indicated by changes in fire regime condition class caused by fuel treatments and timber harvest?

Monitoring Requirement: Report total acres and wildland urban interface acres of positive and negative change in fire regime condition class resulting from fuel treatments and timber harvest.

Monitoring Interval: Annually for the Klamath Falls Resource Area.

## Grazing

- M27. Monitoring Question:** Has the condition of public rangelands been maintained or improved compared to the baseline year of 2008?

Monitoring Requirement and Monitoring Interval: Grazing allotments are assigned to one of three management categories: (I) Improve (M) Maintain, and (C) Custodial. In "I" category allotments,



examine trend plots every five years, determine condition every 10 years, and record utilization data every other year. In “M” allotments, determine trend and condition every 5-10 years, and utilization every 5 years. Monitoring in “C” allotments is limited to periodic inventories and observations to measure long-term resource condition changes.

- M28. Monitoring Question:** Are areas disturbed by natural and human-induced events (including wildland fire, prescribed burns, timber-management treatments, and juniper cuts) rested from livestock grazing and resumed after soil and vegetation has recovered sufficient to support livestock grazing (except where grazing would either not impede site recovery, or where grazing could be used as a tool to aid in achieving recovery objectives)?

Monitoring Requirement: Ten percent of disturbance events.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

## Hazardous Materials

- M29. Monitoring Question:** Has the response to hazardous material incidents included cleanup, proper notifications, criminal investigations, and site assessments as applicable?

Monitoring Requirement: 100 percent of hazardous material incidents.

Monitoring Interval: Annual.

- M30. Monitoring Question:** Are hazardous materials stored, treated, and disposed of in accordance with applicable laws and regulations?

Monitoring Requirement: 100 percent of hazardous materials that are stored, treated, or disposed of in the Klamath Falls Resource Area.

Monitoring Interval: Annual.

## Lands, Realty, Access, and Transportation

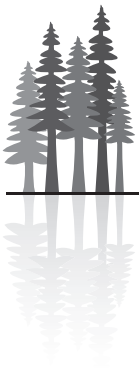
- M31. Monitoring Question:** Have the acres of O&C lands of all classifications and the acres of O&C and public domain lands that are available for harvesting been reduced through disposal, exchange, or purchase?

Monitoring Requirement: Review of all O&C lands records through the Oregon State Office. Total net change in land tenure of O&C lands in the planning area will be evaluated at 10-year intervals keyed from 1998, the date of the legislation that provides for no net loss of O&C lands.

Monitoring Interval: Three years.

## Recreation

- M32. Monitoring Question:** Are special recreation management areas managed in accordance with their planning frameworks?



Monitoring Requirement: Report on 20% of the special recreation management areas.

Monitoring Interval: Annual. The monitoring of special recreation management areas will be rotated so that over a five-year period 100% of the areas will be monitored.

## Visual Resource Management

**M33. Monitoring Question:** Is the level of change in character for the areas designated to be managed as VRM I, II, and III consistent with resource management plan requirements?

Monitoring Requirements: Twenty percent of activities that have the potential to affect the existing character in VRM I, II, and III.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

## Wild Horses

**M34. Monitoring Question:** Is the population of wild horses maintained at the appropriate management level of 30 to 50 head?

Monitoring Requirement: Population survey or census.

Monitoring Interval: Five years.

**M35. Monitoring Question:** Are horses from other herd areas periodically introduced to the Pokegama herd to maintain the genetic diversity of the herd?

Monitoring Requirement: Report all introductions.

Monitoring Interval: Five years.

**M36. Monitoring Question:** Are water developments maintained or established to provide season-long water for wild horses within the herd management area?

Monitoring Requirement: 100 percent of water developments.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

## Wilderness Characteristics

**Note:** Monitoring question M37 does not apply to the Klamath Falls Resource Area.

**M37. Monitoring Question:** Are wilderness characteristics maintained in accordance with resource management plan requirements?

Monitoring Requirements: Report all management activities that would adversely affect wilderness characteristics to be maintained under the RMP, Wilderness Study Areas and Wilderness Areas.

Monitoring Interval: Three years.



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## Wild and Scenic Rivers

- M38. Monitoring Question:** Are the outstandingly remarkable values of designated wild and scenic river corridors (including those classified as wild, scenic, or recreational) being maintained?

Monitoring Requirements: 100 percent of BLM-authorized activities that have the potential to affect the outstandingly remarkable values of wild and scenic rivers.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

## Wildlife

- M39. Monitoring Question:** Is management of species that are listed under the Endangered Species Act consistent with recovery plans and designated critical habitat?

Monitoring Requirement: At least five completed projects that “may affect” listed species will be evaluated.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.

- M40. Monitoring Question:** Has seasonal motor vehicle use been restricted for deer and elk in areas identified in the RMP?

Monitoring Requirements: Review of Klamath Falls Resource Area records.

Monitoring Interval: Annual. Every three years if three consecutive years of monitoring show 100% compliance.



## Program Reporting Items

Program reporting items involve activities that are either related to: (1) certain analytical assumptions that are pertinent to non-specific management actions; or (2) analytical assumptions pertinent to the analysis of environmental consequences. Not all programs or resources have reporting items.

### Late-Successional Management Area

- R1. **Program Reporting Item:** Report the acres of thinning harvest applied to promote mature or structurally complex forests in the Late-Successional Management Areas. Reporting will be annual.

### Riparian Management Area

- R2. **Program Reporting Item:** Report the number of fish-passage blockages that have been corrected and the number of resulting miles of stream habitat that are newly accessed. Reporting will be annual.
- R3. **Program Reporting Item:** Report the acres of thinning and other silvicultural treatments to promote development of large trees. Reporting will be annual.
- R4. **Program Reporting Item:** Report the miles of permanent road construction, road renovation, road improvement, and road decommissioning. Reporting will be annual.
- R5. **Program Reporting Item:** Report the overall level of stream and riparian restoration activities (such as placement of large wood and boulders in streams, planting, thinning, etc.). Report the level of stream restoration activities in high intrinsic potential streams, or streams with high priority fish populations. Reporting will be annual.

**Note:** Program Reporting Items R6-R8 apply to Eastside Non-Forest lands of the Klamath Falls Resource Area.

- R6. **Program Reporting Item:** Report the number of fish-passage blockages that have been corrected and the number of resulting miles of stream habitat that are newly accessed. Reporting will be annual.
- R7. **Program Reporting Item:** Report miles of road restoration and road decommissioning. Reporting will be annual.
- R8. **Program Reporting Item:** Report the overall level of stream and riparian restoration activities such as placement of large wood and boulders in streams. Report the level of stream restoration activities in high intrinsic potential streams or streams with high priority fish populations. Reporting will be annual.

### Eastside Forest Management Area

- R9. **Program Reporting Item:** Report the acres of group selection, commercial thinning, density management, and regeneration harvest. Reporting will be annual.



## Uneven-Age Timber Management Area

- R10. **Program Reporting Item:** Report the acres of group selection, commercial thinning, density management, and regeneration harvest. Reporting will be annual.

## Timber Management Area and Uneven Age Timber Management Area

- R11. **Program Reporting Item:** Report the acres of stand conversion from undesirable tree species or an inadequate stocking of commercially desirable tree species. Reporting will be annual.
- R12. **Program Reporting Item:** Report the acres of precommercial thinning, fertilization and pruning. Reporting will be annual.

**Note: Program Reporting Item R13 do not apply to the Klamath Falls Resource Area.**

- R13. **Program Reporting Item:** Report the acres of regeneration harvest and commercial thinning offered for sale. Reporting will be annual.
- R14. **Program Reporting Item:** Report the volume of non-ASQ timber offered for sale. Reporting will be annual.

## Botany

- R15. **Program Reporting Item:** Report the acres of activities designed to maintain or restore natural plant communities on non-forest and non-commercial lands. Reporting will be annual.

## Invasive Plants

- R16. **Program Reporting Item:** Report the acres of manual, mechanical, cultural, chemical, and biological treatments used to manage invasive plant infestations. Reporting will be annual.

## Energy and Minerals

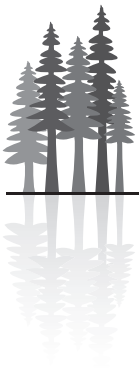
- R17. **Program Reporting Item:** Report number of biomass utilization projects. Reporting will be annual.

## Fire and Fuels Management

- R18. **Program Reporting Item:** Report number of acres of hazardous fuels treatments.

## Grazing

- R19. **Program Reporting Item:** Report the findings of grazing allotments towards meeting the *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*. Reporting will be annual.



- R20. **Program Reporting Item:** Report the acres of prescribed livestock grazing used to control invasive plants, reduce fire danger, or accomplish other management objective. Reporting will be annual.
- R21. **Program Reporting Item:** Report the acres or number of range improvements. Reporting will be annual.

## Socioeconomic

- R22. **Program Reporting Item:** Report the payments to counties associated with BLM-administered lands including O&C, Coos Bay Wagon Roads, and Public Domain lands. Reporting will be annual.
- R23. **Program Reporting Item:** Report receipts from timber sales, special forest products, recreation and permits. Reporting will be annual.
- R24. **Program Reporting Item:** Report appropriations; number of full time and temporary employees; and major new facility developments or improvements. Reporting will be annual.

## Recreation

- R25. **Program Reporting Item:** Report the number of service-oriented and outreach programs, including interpretation and education provided to visitors.
- R26. **Program Reporting Item:** Report the status of development of comprehensive travel management plans for off-highway vehicle areas and off-highway vehicle emphasis areas.

## Research

- R27. **Program Reporting Item:** Provide a narrative update on status, goals, and findings of research projects in support of the management of lands and resources administered by the BLM.

## Special Forest Products

- R28. **Program Reporting Item:** Report the number of permits for harvest and collection of special forest products. Reporting will be annual.

## Soils

- R29. **Program Reporting Item:** Report the number of projects and acres in which there was greater than 15 percent of the acres treated that had detrimental soil disturbance resulting from ground-based timber harvest. Reporting will be based on evaluation of at least 20% of the total ground based timber harvest acres. Reporting will be annual. Fifteen percent detrimental soil disturbance is not a plan decision (management direction), but rather an approximate level used as analytical assumption in the Final Environmental Impact Statement for the Revisions of the Resource Management Plans of the Western Oregon Bureau of Land Management Districts (published October 2008). Detrimental soil disturbance in this context means areas in which the top soil has been removed, the subsoil structure severely altered and the slash deeply incorporated into the soil and which have not been or will not be ameliorated.

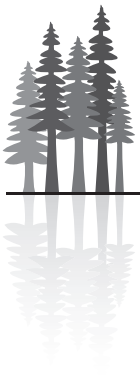




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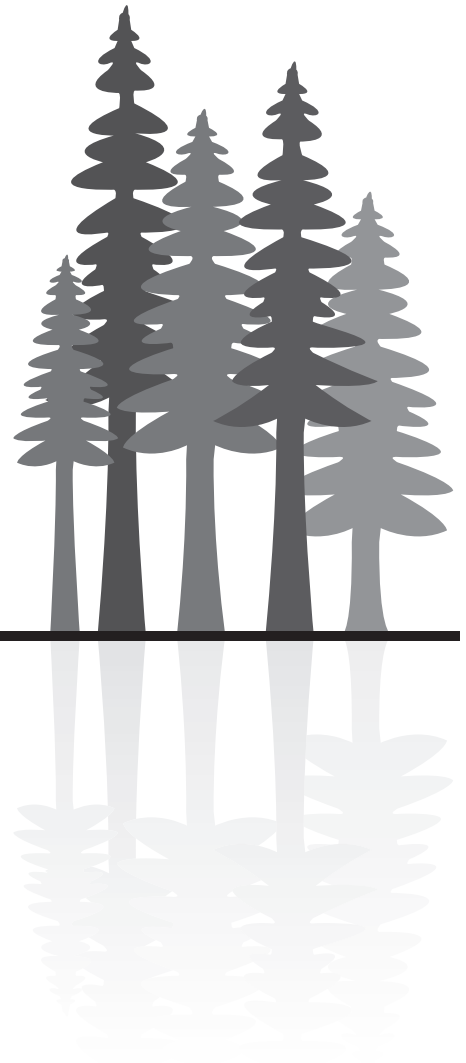
## Wildlife

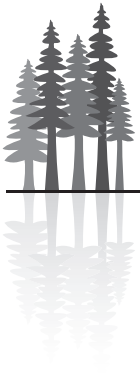
- R30. **Program Reporting Item:** Report number of deer and elk forage planting projects. Reporting will be annual.
  
- R31. **Program Reporting Item** (pertinent to Klamath Falls Resource Area): Report acres of thinning or removal of encroaching western juniper to maintain and improve forage for big game. Reporting will be annual.



# Appendix C

## Best Management Practices







# 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).

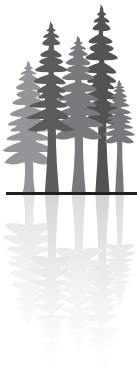
The BMPs are methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. The BMPs include, but are not limited to, avoidance, structural and nonstructural treatments, operations, and maintenance procedures. 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 decision-makers using input from 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 resource professionals (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 C-1. 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



Klamath Falls District ROD and RMP

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



*Klamath Falls District ROD and RMP*

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
R 23	Low traffic roads should be outloped, 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 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



Klamath Falls District ROD and RMP

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



Klamath Falls District ROD and RMP

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 lesson 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



Klamath Falls District ROD and RMP

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 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
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





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
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
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



Klamath Falls District ROD and RMP

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<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
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



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<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>	<p>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.</p>	<p>Biocriteria                      OAR 340-041-0011                      Statewide Narrative Criteria Sediment, Adverse Deposits                      OAR 340-041-0007                      Turbidity                      OAR 340-041-0036</p>
R 88	<p>Suspend stormproofing work if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.</p>	<p>Coarse and Fine Sediment: Surface erosion with delivery to waterbodies, floodplains and wetlands.</p>	<p>Biocriteria                      OAR 340-041-0011                      Statewide Narrative Criteria Sediment, Adverse Deposits                      OAR 340-041-0007                      Turbidity                      OAR 340-041-0036</p>



Klamath Falls District ROD and RMP

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            Statewide Narrative Criteria Sediment, Adverse Deposits            OAR 340-041-0007            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            Statewide Narrative Criteria Sediment, Adverse Deposits            OAR 340-041-0007            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            Statewide Narrative Criteria Sediment, Adverse Deposits            OAR 340-041-0007            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            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>



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



Klamath Falls District ROD and RMP

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>	<p>Coarse and Fine Sediment: Water concentration eroding compacted surfaces resulting to sediment delivery to waterbodies, floodplains and wetlands.</p>	<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>	<p>Coarse and Fine Sediment: Mass wasting resulting in sediment delivery to waterbodies, floodplains and wetlands.</p>	<p>Biocriteria            OAR 340-041-0011            Statewide Narrative Criteria Sediment, Adverse Deposits            OAR 340-041-0007            Turbidity            OAR 340-041-0036</p>
R 100	<p>Suspend decommissioning activities if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.</p>	<p>Coarse and Fine Sediment: Surface erosion delivering to waterbodies, floodplains and wetlands.</p>	<p>Biocriteria            OAR 340-041-0011            Statewide Narrative Criteria Sediment, Adverse Deposits            OAR 340-041-0007            Turbidity            OAR 340-041-0036</p>
<b>Water Source Development and Use</b>			
R 101	<p>Construct water sources during the lowest flows (generally, August through October).</p>	<p>Coarse and Fine Sediment, and Aquatic Habitat:            Changing or removing stream habitat and associated stream turbidity.</p>	<p>Biocriteria            OAR 340-041-0011            Turbidity            OAR 340-041-0036</p>
R 102	<p>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.</p>	<p>Coarse and Fine Sediment, and Toxins:            Road surfacing, washing into the stream during storms.</p>	<p>Turbidity            OAR 340-041-0036</p>
R 103	<p>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.</p>	<p>Coarse and Fine Sediment, and Toxins:            Road fill washout, leading to stream sedimentation</p>	<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	<p>Direct pass through flow and/or overflow from in-channel and off-channel water developments back into the stream .</p>	<p>Low Flows:            Decreasing low flows, potentially causing increased stream water temperatures, and decreased stream oxygen levels.</p>	<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 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.	Dissolved Oxygen OAR 340-041-0016 Temperature OAR 340-041-0028
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 C-2. 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
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





BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
<b>Ground-Based Harvesting</b>			
TH 7	Exclude equipment from Riparian Management Area retention areas (60 feet 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
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



Klamath Falls District ROD and RMP

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
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 C-5.	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 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



BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
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 C-3. 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 C-4. 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) 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.</p> <p>Construct firelines by hand on all slopes greater than 35 percent.</p> <p>Use erosion control techniques such as tilling, waterbarring, or debris placement on firelines. Construct waterbars on tractor and hand firelines.</p> <p>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)</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>
<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)</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>
<b>Mechanical and Manual Fuel Treatments</b>			
F 7	<p>No mechanical fuel reduction equipment within 60' of streams, unless prescribed for restoration.</p> <p>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)</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>
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)</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>
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)</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>
F 10	<p>Maintain and refuel equipment (e.g., drip torches, chainsaws) 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>Keep wildland fire chemicals further than 300 feet from lakes, ponds, seeps, and perennial and intermittent streams (FA-IM-2008-029).</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 absorb 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 C-5. WATERBAR SPACING BY GRADIENT AND EROSION CLASS**

Gradient	Waterbar Spacing (feet) <sup>a</sup> Per Erosion Class <sup>b</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>a</sup> Spacing is determined by slope distance and is the maximum allowed for the grade.

<sup>b</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 C-6. 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 C-7. 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 dependent 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



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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 C-8. 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 C-9. 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



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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 C-10. 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>			
SP 1	<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 quantities, 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 absorb 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 to 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>



*Klamath Falls District ROD and RMP*

<b>BMP Number</b>	<b>Best Management Practices</b>	<b>Input Variables and Causal Mechanisms</b>	<b>Water Quality Standards and Regulations</b>
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 C-11. 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
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



*Klamath Falls District ROD and RMP*

BMP Number	Best Management Practices	Input Variables and Causal Mechanisms	Water Quality Standards and Regulations
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
RST 16	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).	Coarse and Fine Sediment: Soil erosion with potential transport to the channel and floodplain.	Turbidity OAR-340-041-0036



## 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)**

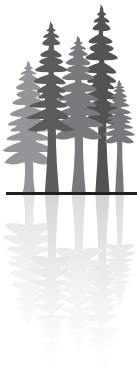
“(9) Road building and maintenance activities must be conducted in a manner so as to keep waste materials out of public waters and minimize erosion of cut banks, fills, and road surfaces.”

#### **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);



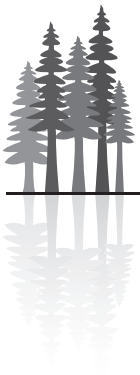
- (3) For waterbodies identified by the Department as providing cool- water aquatic life, the dissolved oxygen may not be less than 6.5 mg/l as an absolute minimum. At the discretion of the Department, when the Department determines that adequate information exists, the dissolved oxygen may not fall 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)**

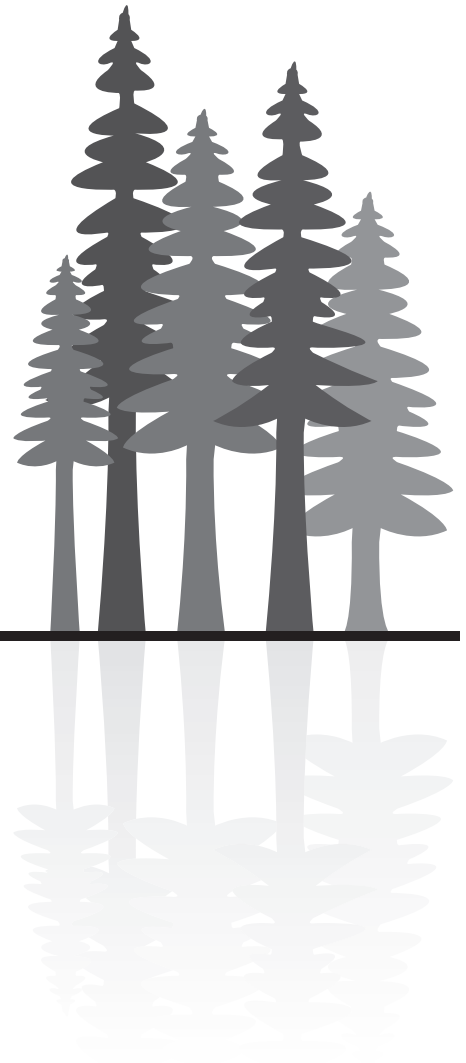
“No more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity”

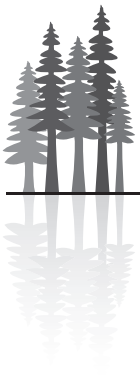




# Appendix D

## Areas of Critical Environmental Concern







# Areas of Critical Environmental Concern

The two tables in this appendix contain detailed information about Areas of Critical Environmental Concern (ACEC) in the Klamath Falls Resource Area of the Lakeview BLM District. *Table D-1* includes information about the categories of Relevant and Important Values and any management direction that applies to the areas. *Table D-2* contains more specific information about the Relevant and Important Values for each ACEC.

**TABLE D-1. MANAGEMENT DIRECTION FOR AREAS OF CRITICAL ENVIRONMENTAL CONCERN, KLAMATH FALLS RESOURCE AREA**

ACEC Name	Relevant and Important Value Category	Management Direction If Designated			
		Off-Highway Vehicle Designation	Leasable Mineral Entry	Locatable / Salable Mineral Entry	Timber Harvest
Bumpheads	Scenic, cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
Miller Creek	Scenic, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
Old Baldy Research Natural Area	Natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
Tunnel Creek	Fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None
Upper Klamath River	Historic, cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	Forest health treatments
Upper Klamath River Addition	Historic, cultural, scenic, fish and wildlife, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	Forest health treatments
Wood River Wetland	Cultural, fish and wildlife, natural processes	Closed	Open - No Surface Occupancy	Proposed Closed	None
Yainax Butte	Cultural, natural processes	Limited to designated roads	Open - No Surface Occupancy	Proposed Closed	None

**TABLE D-2. SPECIFIC RELEVANT AND IMPORTANT VALUES FOR ACECS IN THE KLAMATH FALLS RESOURCE AREA**

Relevant and Important Value Category		Fish and Wildlife	Natural Process or System	Natural Hazard
ACEC Name	Historic, Cultural, Scenic			
Bumpheads	Numerous, undisturbed prehistoric sites		Western juniper/Idaho fescue ( <i>Juniperus occidentalis</i> / <i>Festuca idahoensis</i> ) plant community that has been naturally somewhat isolated from grazing	
Miller Creek	Deep canyon within high desert plateau	Riparian habitat for migratory songbirds and raptors	Old-growth ponderosa pine community, perennial stream within high desert environment	
Old Baldy RNA			Natural Heritage cells: high elevation white fir communities with Shasta red fir, mountain hemlock, Pacific silver fir, and Western white pine; Southern Oregon Cascades chaparral.	
Tunnel Creek		Oregon spotted frog (BS)	Lodgepole pine swamp with bog blueberry ( <i>Vaccinium uliginosum</i> ) and sedges. Riparian and wetland processes. English sundew ( <i>Drosera anglica</i> ), an insectivorous plant, is listed as endangered by the state of Maine and as threatened by the state of Wisconsin.	
Upper Klamath River	Historic road, prehistoric cultural artifacts/sites. The Klamath River Canyon holds great spiritual and religious significance for the Klamath Tribe and the Shasta Nation. The unique landform, diverse vegetation, water, and a low level of adverse cultural modifications has been given a Scenic Quality A classification.	Lost River and shortnose suckers (FE), Klamath largescale sucker, native inland redband trout, bald eagle (BS) nests, Townsend's big-eared bat (BS).	Unique plant communities bisecting the Cascade Mountains which range from montane conifer forest communities to high desert communities, and from riparian communities to oak savannah communities. Red-root yampah ( <i>Perideridia erythrorhiza</i> a BS plant species).	
Upper Klamath River Addition	Historic road, prehistoric cultural artifacts/site. The Klamath River Canyon holds great spiritual and religious significance for the Klamath Tribe and the Shasta Nation. The unique landform, diverse vegetation, water, and a low level of adverse cultural modifications has been given a Scenic Quality "A" classification.	Lost River and shortnose suckers (FE), Klamath largescale sucker, native inland redband trout, and bald eagle (BS) nests.	Unique plant communities bisecting the Cascade Mountains, and that range from montane conifer forest communities to high desert communities, and from riparian communities to oak savannah communities. Red-root yampah ( <i>Perideridia erythrorhiza</i> ), a BS plant species).	
Wood River Wetland	Native American village and wocus gathering sites.	Lost River suckers (FE), bald eagle (BS) foraging and nesting, Oregon spotted frogs (BS), yellow rails, wild trout, migratory waterfowl	Complex of wetland plant communities	
Yainax Butte	Yainax Butte is considered to be a very important place in the traditional beliefs of the Klamath Tribes, and is likely eligible for inclusion to the National Register of Historic Properties as a Traditional Cultural Property.		Unusual variation of bitterbrush/bluebunch wheatgrass plant community; blue-leaved penstemon ( <i>Penstemon glaucinus</i> ), a BS plant species	

FT – Federal threatened species  
 FE – Federal endangered species  
 FC – Federal candidate species  
 BS – Bureau sensitive species  
 ONHP – Oregon Natural Heritage Program  
 WSR – Wild and Scenic River





