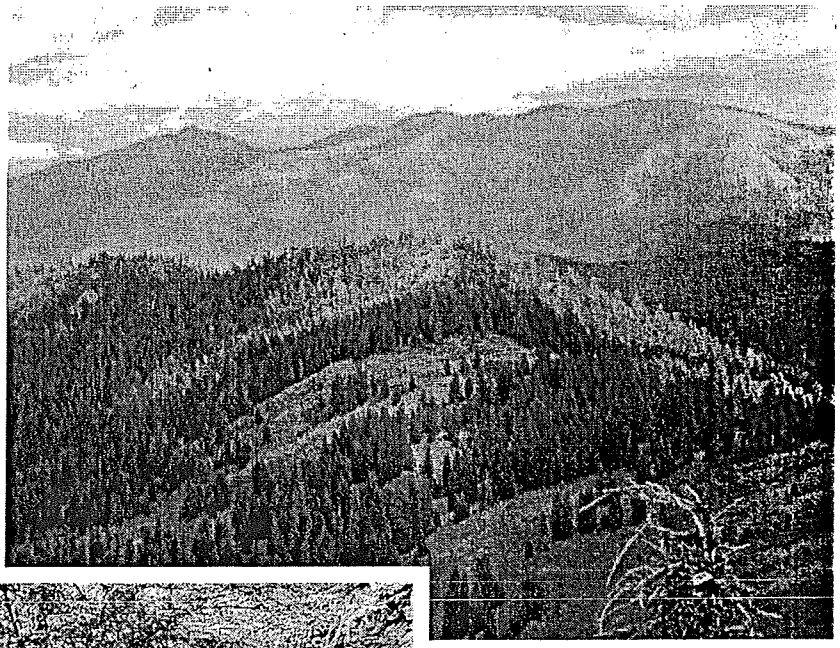
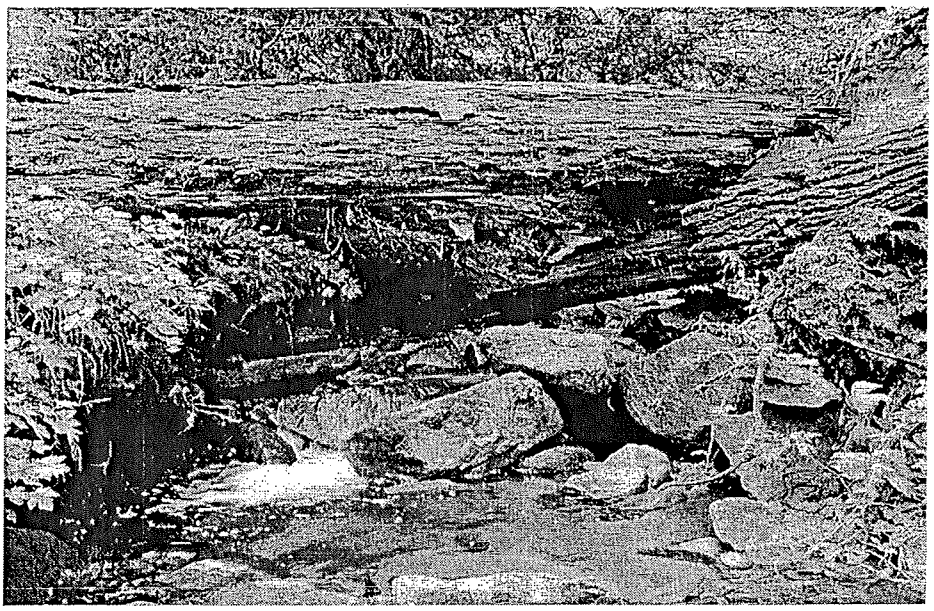
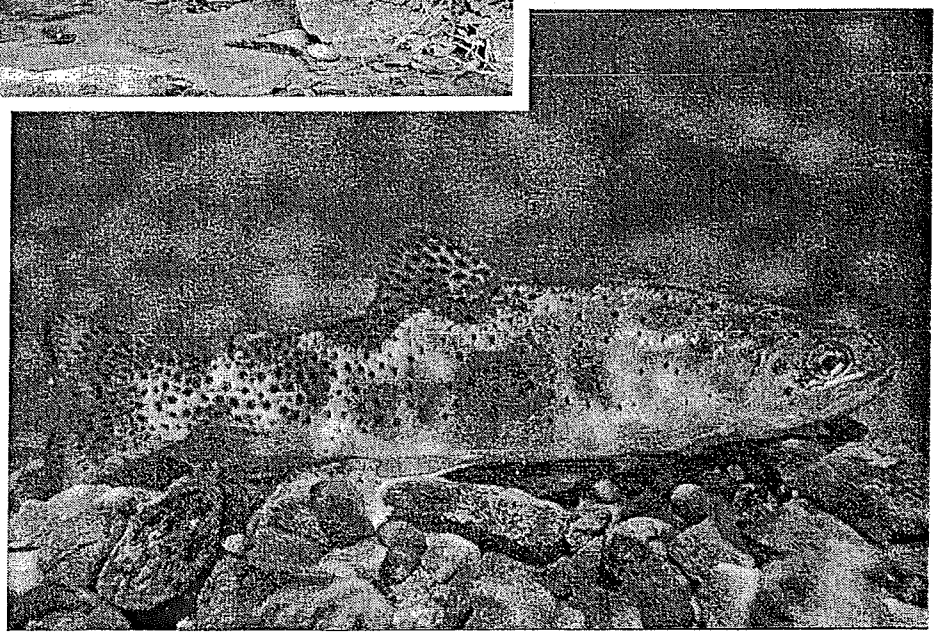
Sufficiency Analysis:

A Statewide Evaluation of Forest Practices Act Effectiveness in Protecting Water Quality







by:
Oregon Department
of Forestry
and
Oregon Department of
Environmental Quality

The Oregon Department of Forestry and Department of Environmental Quality Sufficiency Analysis: A Statewide Evaluation of FPA Effectiveness in Protecting Water Quality is available at ODF's website:

http://www.odf.state.or.us/DIVISIONS/protection/forest_practices

Or at DEQ's website:

http://www.deq.state.or.us/wq/nonpoint/nonpoint.htm

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EXECUTIVE SUMMARY

Background

In recent years, increased attention has been given to the development of Total Maximum Daily Loads (TMDLs) and the listing of 303(d) water quality limited streams[1] in the state of Oregon under the Clean Water Act. This has presented new opportunities for the Oregon Department of Forestry (ODF) and the Department of Environmental Quality (DEQ) to move forward together to address water quality issues on non-federal forestlands. To adequately address these issues, the ODF and DEQ have agreed through an April 1998 Memorandum of Understanding (MOU) to jointly evaluate the sufficiency of the Forest Practices Act (FPA) to protect water quality. The MOU outlines five specific water quality parameters that will be addressed: temperature, sedimentation, turbidity, aquatic habitat modification, and bio-criteria.

The purpose of this sufficiency analysis, as described the MOU (Appendix D) is to determine:

(a) The adequacy of the FPA pursuant to ORS 527.765 in the achievement and maintenance of water quality standards, with due consideration to regional and local variation in effects;
(b) If forest practices contribute to identified water quality problems in listed water quality limited streams; and
(c) If so, to determine whether existing forest practice rules provide sufficient control to assure that water quality standards will be met so that waters can be removed from the 303(d) list.

Consistent with the MOU, water quality parameters not specifically addressed in the sufficiency analysis "are generally not attributable to forest management practices as regulated by the EPA." Given the lack of any significant information on "other" parameters that might be influenced by current practices since the drafting of the MOU, the ODF and DEQ have agreed that an evaluation of parameters beyond those specifically listed in the MOU is not warranted at the time of this evaluation. The intent of the MOU and the focus of this report is on those parameters where it is known that forest practices have in some cases caused documented changes in water quality conditions.

The overall goal of the water protection rules as stated in Oregon Administrative Rules (OAR 629-635-0100 (7)) is to provide resource protection during operations adjacent to and within streams, lakes, wetlands and riparian management areas so that, while continuing to grow and harvest trees, the protection goals for fish, wildlife, and water quality are met.

> (a) The protection goal for water quality (as prescribed in ORS 527.765) is to ensure through the described forest practices that, to the maximum extent practicable, non-point source discharges of pollutants[2] resulting from forest operations do not impair the achievement and maintenance of the water quality standards.

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[1] Water quality limited streams are those waters included on the 303(d) list maintained by the DEQ. These are waterbodies currently identified as not meeting water quality standards (see Appendix E).
[2] Non-point source discharges are those originating from diffuse sources across the landscape and cannot be traced to a single point or descrete activity.

(b) The protection goal for fish is to establish and retain vegetation consistent with the vegetation retention objectives described in OAR 629-640-0000 (streams), OAR 629-645-0000 (significant wetlands), and OAR 629-650-0000 (lakes) that will maintain water quality and provide aquatic habitat components and functions such as shade, large woody debris, and nutrients." OAR 629-635-0100 (7)

State policy on water pollution control for state and private forestlands originates from the Environmental Quality Commission (EQC) and applicable administrative statutes:

"To protect, maintain and improve the quality of the waters of the state for public water supplies, for the propagation of wildlife, fish and aquatic life and for domestic, agricultural, industrial, municipal, recreational and other legitimate beneficial uses." [ORS 468B.015(2)]

"Implementation of any limitations or controls applying to nonpoint source discharges or pollutants resulting from forest operations are subject to ORS 527.765 and 527.770." [ORS 468B.110 (2)]

Consistent with these statutes, the FPA is Oregon's water quality standard compliance mechanism with respect to forest operations on state and private forestlands:

"The State Board of Forestry shall establish best management practices and other rules applying to forest practices as necessary to insure that to the maximum extent practicable nonpoint source discharges of pollutants resulting from forest operations on forestlands do not impair the achievement and maintenance of water quality standards established by the Environmental Quality Commission for the waters of the state. Such best management practices shall consist of forest practices rules adopted to prevent or reduce pollution of waters of the state. Factors to be considered by the board in establishing best management practices shall include, where applicable, but not be limited to:

(a) Beneficial uses of waters potentially impacted;
(b) The effects of past forest practices on beneficial uses of water;
(c) Appropriate practices employed by other forest managers;
(d) Technical, economic and institutional feasibility; and
(e) Natural variations in geomorphology and hydrology." [ORS 527.765 (1)]

"A forest operator conducting, or in good faith proposing to conduct, operations in accordance with best management practices currently in effect shall not be considered in violation of any water quality standards." [ORS 527.770]

These Oregon administrative rules are designed to achieve water quality goals consistent with the relevant statutes, ORS 468B.015(2), 468B.110 (2), 527.765, and 527.770 cited above. It is in this regulatory and policy context that applicable water quality standards and the FPA are implemented to address water quality protection for waters of the state.

Most of the parameters addressed in this sufficiency analysis are inter-related, and forest management activities often have the potential to affect more than one parameter at the same

time. For example, habitat can be modified with changes in sedimentation and turbidity, and sedimentation can influence stream temperature by altering channel dimensions and subsurface hydrology, thus affecting the net heat load to the stream. It is logical to take a holistic approach and consider water quality conditions as a result of all the parameters interacting collectively rather than attempting to consider each parameter wholly independent of the others. Accordingly, this report takes a broad approach to examining the sufficiency of the FPA and considers the multiple factors and functions by evaluating water quality standards primarily through the FPA rule objectives.

Given the consistency between the FPA and state water quality statutes and their respective administrative rules, achieving FPA goals, as articulated in the administrative rules, will ensure achieving and maintaining water quality goals and water quality standards to the maximum extent practicable. This sufficiency analysis will therefore consider the adequacy of the rules in achieving the objectives and goals of the FPA. If current practices are meeting FPA objectives and goals, state water quality standards will be met as well. If the ODF and DEQ find FPA objectives and goals are not being met, the BOF will create or modify statewide or regional rules, or design other effective measures to address the water quality impairment.

In analyzing natural resource data and attempting to draw specific cause-and-effect conclusions between human activities and natural resource conditions, the quality and/or quantity of data necessary for a high level of scientific certainty is often not available. This effort at evaluating the sufficiency of the FPA is no exception. Available data pertinent to direct cause-and-effect linkages between the FPA and quantitative water quality conditions is very limited.

There are at least two general points of view regarding such scientific uncertainty. One is to assert that since it cannot be determined with certainty that a set of practices *is* achieving a given water quality standard, a conservative approach should be taken and the rules changed to provide a higher level of protection in case a significant risk does, in fact, exist. Another view is to assert that since it cannot be determined with certainty that a set of practices *is not* achieving a given water quality standard, there is no reason for a change in practices until further monitoring and/or research can prove that a significant risk does, in fact, exist. Both points of view are valid when scientific findings are uncertain, and values and beliefs play a large role in how these points of views utilize limited scientific information.

One task of the ODF and DEQ sufficiency analysis is to present and analyze all of the applicable science and information. Following the completion of this analysis, the Board of Forestry will consider the recommendations in light of the relevant social, economic, and environmental context of the FPA. The goal of this approach is to utilize the recommendations so that outcomes are consistent with both the scientific information and the existing socio-economic framework of the FPA.

Social, Economic, and Environmental Framework

For the report recommendations to be acted upon following its completion, a review of the legal and policy setting, Oregon's forest land base, and forest ecosystem dynamics will need to be considered by the Board of Forestry in reviewing the adequacy of the FPA in meeting water

quality standards "to the maximum extent practicable" as defined by state statute. Appendix A provides this review and describes the overall context in which the FPA operates. There are different environmental, social, and economic implications, depending on the interpretation of "maximum extent practicable," and these implications should be considered for this evaluation to result in an outcome that does not create unintended negative consequences for resource protection. For example, increased forestry regulations in Washington state, combined with development pressures, are partly responsible for ten-times the area of forestlands being converted to other land uses as compared to Oregon over the last decade. While these increased regulations may have resulted in some increase in resource protection for forestlands at a site-specific level, it may have been at the cost of losing an area of land (400,000 acres) to other uses that may not provide as high a level of resource protection as forestlands. Taking into account the social, economic, and environmental aspects in evaluating FPA-sufficiency early on can help to avoid this type of unintended negative consequence, while also ensuring that statutory obligations are met.

Current Scientific Knowledge

Appendix B is a review and summary of the current scientific findings and monitoring results relevant to specific forest practice issues directly related to achieving water quality goals. Each of the water quality parameters that are the subjects of this report are linked to specific forest practice issues that address those parameters. The forest practice issues reviewed here include stream temperature, large wood, forest roads, landslides, and fish passage. The technical information included in this section of the report is used as the basis of the evaluations and recommendations developed in the remainder of this report, and they are referenced accordingly.

Description of Pollution Control Mechanisms

Appendix C describes the current pollution control mechanisms implemented to meet or exceed current water quality standards. These mechanisms include both the FPA and Oregon Plan voluntary measures. They are organized under the same forest practice issues outlined in Appendix B.

Evaluation

The following conclusions apply to all applicable standards (temperature, sedimentation, turbidity, aquatic habitat modification, and bio-criteria).

Site-Specific Evaluation

Current protection requirements may be inadequate in the following areas:

- Standards for some medium and small Type F streams in western Oregon may result in short-term temperature increases at the site level. However, the significance and scope of this increase is uncertain, and it may be offset at the landscape scale by other factors. Relevant to

the habitat modification standard and criteria, large wood potential for some of these streams are less than what was assumed under the 1994 rules.

- Standards for some small Type N streams may result in short-term temperature increases at the site level that may be transferred downstream (this may impact water temperature and cold-water refugia) to fish-bearing streams. The significance and scale of this change is uncertain, and it may be offset at the landscape scale. Relevant to the habitat modification standard and criteria, large wood potential delivered by debris torrents (typically in areas of very steep topography) along these streams may be less than optimal.

For large Type F streams, shade levels appear to be adequate, and large wood outputs for these streams is consistent with that assumed under the 1994 rules.

With the exception of the issue of wet-weather hauling and steep-slope ground skidding and those areas noted above, the FPA appears to be adequate when implemented successfully.

Holistic Evaluation

Over time and space the forested landscape changes. Disturbance is an important process for maintaining productivity and resetting the environment, but it can also have a number of impacts to water quality parameters. Human activities can alter the frequency and magnitude of disturbance relative to historical patterns. While some human activities, like timber harvesting, may be more frequent than historical rates of disturbance, harvesting may also be less intense of a disturbance as compared to, for example, historical wildfire. Other impacts, like fire suppression, may reduce the frequency of disturbance, but result in somewhat more intense disturbances when fires do occur. The frequency and intensity of the event can influence vegetative and other disturbance recovery. Human activities to reduce adverse effects, therefore, need to be evaluated against historical patterns of disturbance.

The current distribution of forest stand age classes, the levels of tree stocking in managed plantations, and fire suppression have resulted in well-stocked, dense, closed canopy conifer stands across a larger portion of the forested landscape than has historically occurred. Thus the current rules and practices likely result in an increased level of shade at a landscape scale. At a site-specific scale, however, some level of risk exists along some streams, as noted in the next section. The significance of this risk in terms of influencing stream temperatures at a watershed (or sub-basin) scale is uncertain.

More arguably, higher conifer stocking levels across the landscape in upland and riparian areas may result in an increased potential for large wood delivery. The likelihood of such additional stocking resulting in increased large wood production is dependent upon the harvest levels, retained trees, natural mortality and other disturbance events. Until the sizes of riparian trees increase through normal growth volume may be limited, even though the number of trees may be relatively high. Nonetheless, current practices are likely sufficient at a landscape scale.

Temperature

The following is an evaluation of the temperature standard by specific stream types and sizes:

Medium and small Type F streams: Current research and monitoring results show that current RMA prescriptions for western Oregon may result in short-term temperature increases on some Type F streams; however the significance of the potential temperature increases at a watershed (or sub-basin) scale is uncertain.

Small Type N streams: Current research and monitoring results show current practices may result in short-term (two to three years) temperature increases on some Type N streams. The significance of potential temperature increases on Type N streams to downstream fish-bearing streams and at a watershed (or sub-basin) scale is uncertain.

All other streams: Influences on stream temperatures from shade levels resulting from specific BMP prescriptions for the other stream category types have not been assessed due to a lack of relevant data. However, in light of the data and findings specific to medium and small Type F streams, and given the higher level of vegetation retention on large Type F streams, it is likely that the standard is being met on large Type F streams.

Sedimentation Standard

The intent of the sedimentation standard as it applies to the FPA is to minimize soil and debris entering waters of the state. (OAR 629-30-000(3)) With the exception of wet-weather road use, complying with the road construction and maintenance rules currently in place is likely to result in meeting water quality standards. The rule and guidance recommendations described in the next section of this report will work towards ensuring the goals of the FPA and water quality standards are being met.

Turbidity Standard

Given the lack of quantitative data to specifically address the turbidity numeric standard, the turbidity standard is evaluated qualitatively. The intent of the turbidity standard, as it applies to the FPA, is to minimize soil and debris entering waters of the state. (OAR 629-30-000(3)). Both the FPA and water quality standards are being met when unfiltered surface runoff from road construction is entering applicable waters of the state and there is a visible difference in the turbidity of the stream above and below the point of delivery of the runoff for less than a two- or four-hour duration (depending on the stream grade and with all practicable erosion controls in place). When unfiltered surface runoff from general road use is minimized, and/or if all applicable BMPs have been applied, both the FPA and water quality standards are being met as well.

With the exception of wet-weather road use, complying with the road construction and maintenance rules and guidance currently in place is likely to result in meeting water quality standards. The rule recommendations will help improve compliance and implementation of the FPA to ensure the goals of the FPA and thus water quality standards are being met. Specific to

wet-weather hauling, construction and maintenance standards should be developed for roads at risk for sediment delivery. Prohibiting hauling during periods of wet weather on road systems that have not been constructed with specific standards for surface materials, drainage systems, or other alternatives (paving, increased numbers of cross drains, sediment barriers, settling basins, etc.) will also minimize delivery of sediment streams.

Habitat Modification Standard

The FPA standard as it relates to habitat modification is "to grow and retain vegetation [along fish-bearing streams] so that, over time, average conditions across the landscape become similar to those of mature streamside stands;" and "to have sufficient streamside vegetation [along non fish-bearing streams] to support functions and processes that are important to downstream fish use waters and domestic water use."(OAR 629-640-0000)

The following is an evaluation of the habitat modification standard described above by specific stream types and sizes:

Medium and small Type F streams: Monitoring data indicates the assumptions used to determine basal area targets for small and medium streams in western Oregon may not be consistent with what the RMAs are capable of growing along these streams. The data also shows that 60 percent of harvest operations occurring along fish-bearing streams do not result in management within the RMAs. There is a reasonable possibility that, under the current rules, some of these streams are not likely to result in the "desired future condition" in a timely manner, as described in the goals of the FPA.

Small Type N streams: There is increasing scientific evidence that small non-fish-bearing streams prone to debris flows provide an important source of large wood for downstream fish habitat. While these streams are providing some level of functional large wood inputs and shade production under the current rules, the rules were not specifically designed to retain significant sources of large wood and shade in these areas. There is a reasonable possibility that, under the current rules, some of these streams are not likely to adequately support functions and processes important to downstream fish use waters, as described in the goals of the FPA.

All other streams: Influences on habitat modification resulting from specific best management practices for the other stream category types have not been assessed since they were considered a lower priority. However, given the higher level of vegetation retention on large Type F streams, and in light of the data and findings specific to medium and small Type F streams, it is likely the standard is being met on these streams.

Fish passage blockages: Since 1994, the FPA has required juvenile fish passage be provided on all fish-bearing streams. Current monitoring information does not indicate Forest Practices policies need to be significantly changed on how to install fish-passable stream crossings. With few exceptions, it appears when the guidelines are implemented correctly, the success rate is high for creating conditions believed to provide a high likelihood of fish passage.

Biocriteria Standard

This standard is consistent with multiple FPA purposes and goals that refer to the sound management of soil, air, water, fish and wildlife resources, while at the same time ensuring the continuous growing and harvesting of forest tree species. Given the general nature of this standard and the lack of specific criteria to use in evaluating this standard, biocriteria cannot be explicitly evaluated at this time. It is reasonable to assume that, given the inter-related nature of the temperature, sediment, turbidity and habitat modification parameters relative to biocriteria, to the extent these other parameters are being met, the biocriteria standard is likely to be met as well.

Recommendations

The FPA goals and objectives, as well as most of the state water quality standards and criteria being evaluated in this analysis (temperature and turbidity being the exceptions), are qualitative in nature. Thus, conclusions regarding the effectiveness of the rules in meeting the goals and objectives are qualitative as well. Available data relevant to those quantitative water quality standards (i.e. temperature and turbidity) is inadequate to draw specific and comprehensive conclusions about the adequacy of current practices; therefore, the evaluation of these criteria is also qualitative.

Data in many areas is lacking and, in many cases, not comprehensive. In light of this, any policy decisions made when this report is completed will depend upon professional judgement consistent with available scientific information. As the Board of Forestry considers these recommendations, social and economic factors, along with the scientific evidence on the adequacy of current practices presented here, will be considered as well.

The following recommendations are offered to highlight general areas where current practices could be improved upon to better meet the FPA goals and objectives and, in turn, provide greater likelihood of meeting water quality standards.

Recommendation #1: The RMA basal area retention standards should be revised, where appropriate, to be consistent with achieving characteristics of mature forest conditions in a timely manner; and to ensure that RMAs are providing desirable amounts of large wood and shade over space and time.

Recommendation #2: Revise current practices so desirable amounts of large wood are available along small stream channels that can deliver debris torrents to Type F streams. Ensure that adequate shade is maintained or rapidly recovered for riparian areas along small perennial Type N streams with the potential to impact downstream Type F waters.

Recommendation #3: Provide additional large wood to streams by actively placing the wood in areas where it will provide the greatest benefits to salmonids.

Recommendation #4: Reduce the delivery of fine sediment to streams by installing cross drains to keep drainage waters from eroding slopes. This will allow filtering of sediments and infiltration of drainage water into undisturbed forest soils. Cross drains should not be confused with stream crossing culverts. Cross drains take water from the road surface and ditch and route it under/across the road, discharging the water downslope from the road.

Recommendation #5: Develop specific standards for roads that will be actively used during the wet season. This would include a requirement for durable surfacing of roads in locations where fine sediment can enter streams. This would also include ceasing to haul if roads have not been constructed with effective surface materials, drainage systems, or other alternatives (paving, increased numbers of cross drains, sediment barriers, settling basins, etc.) that minimizes delivery of sediment into streams.

Recommendation #6: Develop specific guidance describing how roads in critical locations would be reviewed to reduce road length, and determining when, despite the relocation, the road location would pose unacceptable risk to resources and not be approved.

Recommendation #7: Construct stream crossings that adequately pass large wood and gravel downstream, and provide other means for passage of large wood and sediment at those crossings that restrict passage. The transport mechanisms for large wood and gravel should include both stream storm flows and channelized debris flows. This would reduce the risk of debris backing up behind the structure, potentially resulting in catastrophic sediment delivery caused by washouts.

Recommendation #8: Develop specific steep-slope, ground-based, yarding practices, or add a prior approval requirement for ground skidding in high-erosion hazard locations.

Recommendation #9: Manage locations most prone to landslides (high-risk sites) with techniques that minimize impacts to soil and water resources. To achieve this objective, best management practices to protect landslide-prone terrain currently in guidance should be incorporated into the forest practice rules, while developing a better case history for evaluating the effectiveness of those practices. These standard practices are designed to minimize ground alteration/disturbance on high-risk sites from logging practices.

Recommendation #10: Provide for riparian functions along stream reaches above impassable stream crossing structures that have a high probability of recolonization by salmonids once the structure is replaced/improved. If an upstream reach has the capacity to be a fish-bearing stream, but is currently a non-fish-bearing stream because a stream crossing structure cannot pass fish,

the forest practices rules should be amended so the upstream reach is classified as a fish-bearing stream.

Recommendation #11: Facilitate the identification, prioritization, and restoration of existing culverts that currently do not pass fish. Culvert replacement should be accelerated above what is currently being done, specifically for family forestland owners who often do not have adequate resources to address this issue in a timely manner.

Recommendation #12: Provide a more effective and efficient means of classifying streams for "fish use." Revise the forest practice rule definition of Type F and Type N streams using a physical habitat approach to classify fish-use and non-use streams.

Compliance and Effectiveness Monitoring

The goal of the ODF forest practices monitoring program is to evaluate the effectiveness of the forest practice rules. Monitoring results are used to guide future management practices through the rule revision process. The goal includes a commitment to address specific Oregon Plan issues. The forest practices monitoring strategy is currently being revised. The key areas identified for improvement include:

- Building understanding, acceptance and support for the monitoring strategy.
- Using random sample design to select all sites. This has been used for two current projects.
- Combining monitoring efforts at each site to increase efficiency (i.e. compliance monitoring and riparian function at the same site)
- Increasing coordination with other Oregon Plan monitoring efforts, most notably DEQ and ODF&W.
- Addressing issues at a watershed scale.
- Improving communication of project status and results, both internally and externally using newsletters and project publications.

The following are specific recommendations for future monitoring:

1. Maintain a riparian monitoring program that continues to monitor the effectiveness of riparian prescriptions and riparian functions to ensure water quality goals are achieved in the future.

2. Monitor improvement of forest roads at a landscape level, looking specifically at implementation of the road hazard and risk reduction project.

3. Evaluate the need for further road compliance and effectiveness monitoring following the completion of the BMP compliance monitoring project relating to road BMPs. Also evaluate the progress and effectiveness of current voluntary efforts under the Oregon Plan to upgrade existing culverts that do not pass fish.

4. Monitoring of watershed-scale effects relative to current practices along small Type N streams should be a priority to help narrow the current level of uncertainty.

The following are remaining issues identified in this report that may warrant future examination as additional information is available:

- Is the occurrence of blowdown having an effect on meeting the goal of achieving "over time, average conditions across the landscape become similar to those of mature forest conditions" in RMAs?

- Are current forest practices meeting the water quality standard with respect to cold-water refugia? (This analysis will not be possible until the DEQ develops the specific guidance necessary to identify cold-water refugia on the ground that can be evaluated against the standard.)

- What effect, if any, are current practices along small non-fish-bearing streams having on downstream sediment regimes?

The Board of Forestry is currently deliberating the recommendations introduced by the Forest Practices Advisory Committee (FPAC) in September 2000. The process of implementing changes to current BMPs will occur over the next few years and is likely to consist of both regulatory and non-regulatory measures. The ODF monitoring program is also beginning a new series of effectiveness monitoring projects to evaluate BMP sufficiency in protecting riparian functions and water quality. There may also be some issues with water quality parameters that are not specifically addressed in this report that could have an unknown potential for current practices to cause changes in water quality conditions. In these cases, the DEQ will coordinate with the ODF and its monitoring program to address these parameters as concerns are identified and documented. Specific details of future monitoring efforts will be determined once the FPAC recommendations are developed further and implemented. ODF's monitoring strategy will continue to be developed at that time.