Report of the Ad Hoc
Eastside
Riparian
Functions
Advisory
Committee
February 2003
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Report of the Ad Hoc Eastside Riparian Functions Advisory Committee
To
The Oregon Department of Forestry

February 2003
Howard Sohn, Chair  
Oregon Board of Forestry  
2600 State Street  
Salem, OR 97310

Dear Chairman Sohn and Members of the Oregon Board of Forestry:

I am pleased to transmit the final report of the ad hoc Eastside Riparian Functions Advisory Committee (ERFAC). The report represents the culmination of twenty months of work by the committee. ERFAC was convened by the Department of Forestry as recommended by the ad hoc Forest Practices Advisory Committee on Salmon and Watersheds, and as approved by the Board on July 20, 2001. ERFAC’s deliberations focused on forest practices and riparian functions in eastern Oregon. The report presents recommendations for regulatory and nonregulatory actions to meet water quality standards and to protect and restore salmonids in eastern Oregon.

The Department of Forestry selected representatives for the eleven-member committee with the intention of providing a cross-section of viewpoints, both from a geographical and an interest group perspective. The intended balance was impacted when the tribal representative and subsequently the designated alternate left their positions with the Confederated Tribes of Warm Springs before the committee’s final deliberations. ERFAC deliberations were lengthy and at times challenging as committee members with diverse backgrounds struggled to develop recommendations based on the limited scientific and technical information available for eastern Oregon. The report presents the committee’s support for specific recommendations related to riparian functions and an explanation of the basis for each recommendation. The report also presents dissenting viewpoints from members who indicated that they did not support a recommendation.

A central concept in committee deliberations was the potential need for active management within riparian areas because of the role of frequent fire in the natural history of the arid eastside ecosystems, and the increasing impacts of disease and insect outbreaks attributed to decades of fire suppression. Some committee members felt that the committee had effectively focused on protecting riparian functions, while others felt the focus was on active management and silviculture, with a lack of consideration for what was needed to meet water quality standards and improve fish habitat. These conflicting viewpoints are reflected in the tallies of support for each recommendation.
Howard Sohn, Chair
February 19, 2003
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I am hopeful that the recommendations contained in this report, along with those from the preceding efforts of Forest Practices Advisory Committee, the Independent Multidisciplinary Science Team, and Sufficiency Analysis reports, will be useful as the Board of Forestry considers potential changes to forest practices.

Sincerely,

John Howard
Chair, Eastside Riparian Functions Advisory Committee

JH:1Q:kg

c: Members of the Eastside Riparian Functions Advisory Committee
   Roy Woo, Acting State Forester
   Charlie Stone
   Jim Brown, GNRO
   Jim Myron, GNRO
LIST OF ACKNOWLEDGMENTS

Committee Members

John Howard, Chair, Union County Commissioner  
Stan Benson, Eastern Oregon Regional Forest Practices Committee  
Rex Storm, Associated Oregon Loggers  
Berta Youtie, The Nature Conservancy  
John Rounds, Oregon Small Woodlands Association  
Marilyn Livingston, Public-at-Large  
Jason Miner, Oregon Trout  
John Ward, Friends of the Greensprings  
Steve Courtney, Malheur Lumber, Eastern Oregon Regional Forest Practices Committee  
Bob Messinger, Oregon Forest Industries Council, Boise Cascade Corp.  
Brad Nye, Confederated Tribes of Warm Springs (Tribal representatives were not present in the later ERFAC meetings)

Committee Alternates

Dennis Reynolds (for John Howard)  
Chris Sokol (for Stan Benson)  
Jim Geisinger (for Rex Storm)  
Jeff Fields (for Berta Youtie)  
John Breese (for John Rounds)  
Irene Jerome (for Marilyn Livingston)  
Jim Myron (for Jason Miner)  
Anita Ward (for John Ward)  
John Morgan (for Steve Courtney)  
Chris Jarmer (for Bob Messinger)  
Bobby Brunoe (for Brad Nye)

Facilitators

Denise Reinhart, US Forest Service, and Dale Largent, Resolutions, Inc.

Oregon Department of Forestry Staff

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Technical Advisors

Jon Germond, Oregon Department of Fish and Wildlife; Tom Rosetta, Oregon Department of Environmental Quality; Fred Hall, Retired, US Forest Service, Region 6 (now with Plantecol NW); Steve Fitzgerald and Guillermo Giannico, Oregon State University
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Executive Summary
Report of the Eastside Riparian Functions Advisory Committee

Introduction

In 1999, then-Governor John Kitzhaber issued Executive Order No. EO 99-01 to outline the responsibilities of state agencies under the Oregon Plan for Salmon and Watersheds. The executive order directed the Board of Forestry to determine what, if any, changes were needed to forest practices to meet water quality standards and to protect and restore salmonids. In 1999, the Board convened the ad hoc Forest Practices Advisory Committee (FPAC), which provided its report to the Board in 2000. The FPAC report addressed a range of issues, including riparian functions. However, the committee recognized that its recommendations relating to riparian functions were developed primarily from a western Oregon perspective, and that additional review from an eastern Oregon perspective was needed. In response to this need, the Oregon Department of Forestry convened the Eastside Riparian Functions Advisory Committee (ERFAC) in 2001. ERFAC completed its deliberations late in 2002, providing the recommendations outlined in this executive summary.

ERFAC’s goal was to reach consensus on a set of recommendations related to forest practices and riparian functions. The language of the charter and decision protocol indicates that consensus agreement was the most desirable outcome, but that if consensus could not be reached, strong agreement or majority support would still be considered valuable. The committee held extensive discussions in its attempt to achieve consensus, visiting field sites, reviewing scientific and monitoring information, and looking at the wide range of viewpoints of committee members.

At its final meeting (on October 30, 2002) ERFAC members indicated their level of support for the package of thirteen recommendations outlined in this executive summary. Ten members were present at this meeting. Eight members supported the package; two members opposed it. According to the decision protocol, this would constitute strong agreement, but not consensus. Committee members also indicated their level of support for the individual recommendations that made up the package. Six of those recommendations received consensus support, and seven received strong agreement.

Individual Recommendations

Recommendation A: Desired Future Condition for Fish Use Streams

The following definition for the “desired future condition” should be used for eastern Oregon (OAR 629-640-000 (2)(a)):

“Eastern Oregon has a tremendous diversity of riparian forest conditions. The desired future riparian condition for fish use streams is to grow and retain vegetation so that over time and across the landscape riparian forests are vigorous and structurally diverse. Riparian forest structures vary across the eastern Oregon landscape and within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs. The functions and values of riparian forests include water quality, hydrologic function, the growing and harvesting of trees, and fish and wildlife resources. These riparian forests provide ample shade over the channel, a relative
abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.”

Strong agreement: Nine committee members supported Recommendation A; one member opposed it.

**Recommendation B: RMA Widths for Fish Use Streams**
Retain current RMA widths (50, 70, and 100 feet for small, medium, and large Type F streams, respectively).

Consensus support: Ten committee members supported Recommendation B.

**Recommendation C: Basal Area Retention Along Fish Use Streams**
Use two site classes for basal area retention in RMAs to reflect variability in site capability in eastern Oregon riparian management areas, as follows:

*For partial harvest or Type 1 (square feet of basal area/1000 ft)*

<table>
<thead>
<tr>
<th>Site 4/5* (moist)</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% GBA Large</td>
<td>170</td>
<td>120</td>
<td>85</td>
</tr>
<tr>
<td>Site 6/7 (dry)</td>
<td>110</td>
<td>80</td>
<td>55</td>
</tr>
</tbody>
</table>

*For final harvest (Type 2 & 3), and for ‘brush credit’ or ‘ungulate alternative’ (partial harvest or Type 1) (square feet of basal area/1000 ft)*

<table>
<thead>
<tr>
<th>Site 4/5* (moist)</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% GBA Large</td>
<td>130</td>
<td>90</td>
<td>65</td>
</tr>
<tr>
<td>Site 6/7 (dry)</td>
<td>90</td>
<td>65</td>
<td>45</td>
</tr>
</tbody>
</table>

*Much of the discussion was on whether the distinction between site 4 and 5 could be consistently made on the ground, but the understanding was that site 2 and site 3 ground would be included in the site 4/5 category.*

The following conditions must be present in order for the ‘brush credit’ or ‘ungulate alternative’ basal area targets to be applicable: existing understory vegetation (grasses, shrubs, and non-merchantable trees) retained along the stream has a high likelihood to persist over time.

Strong agreement: Eight committee members supported Recommendation C; two members opposed it.

**Recommendation D: Near Stream Protection for Fish Use Streams**
Near-stream protection under an active management approach within the RMA will be provided by the protections described below. If this approach is not utilized in the RMA, then the default is the 20-foot no-harvest zone:
1. Retain all trees leaning over the channel, as required by current rule.
2. Retain all channel-stabilizing trees that have exposed roots within the active channel.
3. For large and medium Type F streams, retain the five largest trees within the first half of the RMA, per 1000 feet of stream length.
   • Create an active placement incentive as an alternative for meeting this requirement.
   • Encourage site specific plans to alter the requirements if necessary to address forest health issues.
4. For small Type F streams, retain five trees 20 inches DBH or larger within the first half of the RMA, per 1000 feet of stream length. If no trees at least 20 inches DBH are present, retain the five largest trees.
   • Create an active placement incentive as an alternative for meeting this requirement.
   • Encourage site specific plans to alter the requirements if necessary to address forest health issues.
5. Within the first 20 feet adjacent to Type F streams, retain all understory vegetation and all trees up to 6 inches in DBH, unless management is necessary for regeneration or pre-commercial thinning to achieve the desired future condition.
6. A thirty-five-foot equipment exclusion zone on all fish use streams would be the standard prescription. Prior approval for entering the 35-foot zone would be allowed under certain circumstances and would be addressed in a written plan.

Note: The retention requirements in items D1 through D5 would not necessarily be mutually exclusive. For example, a tree required to be retained for bank stabilization could be one of the five largest trees if it met the size requirement, and might also fulfill other near stream protection requirements.

Level of Support for Recommendation D with item D3: Strong agreement. Eight committee members indicated support; two members indicated opposition.

Level of Support for Recommendation D with Item D4: Strong agreement. Seven committee members indicated support; three members indicated opposition.

Recommendation E: Stratification
ERFAC agrees with the concept of stratification and recommends that the department develop rule language and guidance specific to eastern Oregon. All trees should be retained in segments of the RMA that are below the standard basal area target, and trees retained within the ‘overstocked’ area can be at or above the standard target.

Strong agreement: Nine committee members supported Recommendation E; one member opposed it.

Recommendation F: Channel Migration Zones (CMZs)
ERFAC recommends that the department develop guidance on eastern Oregon CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

Consensus support: Ten committee members supported Recommendation F.
**Recommendation G: Protection of Type N Streams**
The following additional protections are to apply to Type N streams:
1. Extend the current vegetation retention requirements along small perennial Type N streams out to 20 feet during harvest operations.
2. The forest practice rules should be modified to more specifically address the risk of sediment delivery from skid trails\(^1\) located near small Type N streams.
3. For medium and large Type N streams, apply the protection standards ERFAC recommends for small Type F streams.
4. The effectiveness of the small Type N stream prescriptions should be a monitoring priority.

Strong agreement: Seven committee members supported Recommendation G; three opposed it.

**Recommendation H: Monitoring Strategies for Wetlands**
The department should develop monitoring strategies that will include evaluating the effectiveness of the forest practice rules for significant and other wetlands.

Strong agreement: Nine committee members supported Recommendation H; one member declined to indicate support or opposition.

**Recommendation I: Incentives**
The department should recommend to the Board of Forestry that the forest practice rules be modified, as necessary, to provide a broad range of incentives to improve fish habitat. It should be recognized that multiple methods are available to address protection issues related to ungulates (e.g. see Recommendation C above and OAR 629-640-0110).

Consensus support: Ten committee members supported Recommendation I.

**Recommendation J: Statewide Riparian Policy; Wild and Domestic Ungulates**
Urge the Board of Forestry to provide a recommendation to the Statewide Riparian Management Policy Group concerning the impacts of both wild and domestic ungulates on forested eastside RMAs. The recommendation should discuss the roles of other regulatory and land-use agencies concerning the maintenance and enhancement of high-quality riparian areas.

Consensus support: Ten committee members supported Recommendation J.

Note: The committee asked the Oregon Department of Forestry to prepare a clarifying redraft, if it could be done without changing the meaning of the statement. However, the committee did not reach agreement on the proposed redraft. For more information on this process, see Recommendation J in the full ERFAC report.

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\(^1\) As determined by the Department, skid trails include, but are not limited to, any area where equipment constructs a trail by excavating, filling, and/or compacting. Ground used for a single pass by mechanical shears or feller-bunchers is not considered a skid trail unless ruts develop or the surface organic material is removed.
**Recommendation K:** Riparian Specialists
The department should designate at least one riparian specialist for each district in eastern Oregon to inventory and prepare riparian prescriptions for operators and landowners.

Consensus support: Ten committee members supported Recommendation K.

**Recommendation L:** Training for Landowners, Operators, and the Public
The department is encouraged to emphasize Forest Practices Act training and education opportunities for landowners, operators, and the public.

Consensus support: Ten committee members supported Recommendation L.

**Recommendation M:** Training for Forest Practices Foresters (FPFs)
The department is encouraged to emphasize FPF training to ensure compliance and consistency with the Forest Practices Act.

Consensus support: Ten committee members supported Recommendation M.
Introduction/Overview

Oregon Department of Forestry Charge to the Eastside Riparian Functions Advisory Committee

Consistent with Executive Order 99-01, the mission and objectives of the Oregon Plan for Salmon and Watersheds, and in consideration of eastside riparian conditions, determine what, if any, modifications to forest practices that are associated with riparian functions are necessary to meet water quality standards and to protect and restore salmonid habitat in eastern Oregon.

Background

This report describes the deliberations and recommendations of the Eastside Riparian Functions Advisory Committee. The Oregon Department of Forestry convened the committee to develop recommendations related to forest practices and eastside riparian functions. The recommendations will be presented by the department to the Oregon Board of Forestry. The department expects to use the recommendations in conjunction with recommendations from the Forest Practices Advisory Committee (FPAC, 2000), the Independent Multidisciplinary Science Team (IMST, 1999), and the Sufficiency Analysis (ODF and DEQ, 2002) to develop rule concepts and eventually draft rules for Board consideration. As required by ORS 527.714, the Board will review costs and benefits of proposals for any rules that would establish new or increased standards for forest practices. The Board is also expected to consider incentive-based approaches and other voluntary measures.

The Oregon Plan for Salmon and Watersheds

The goal of the Oregon Plan for Salmon and Watersheds is to restore Oregon’s native fish populations and their aquatic systems to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits. The Oregon Plan spans the range of land uses and activities impacting salmon and water quality, including forest management, agriculture, fisheries, water management, hatchery management, industry and urban development. Governor Kitzhaber recognized each of these interests and the roles of state agencies in his Executive Order No. EO 99-01 (See Appendix A). Many efforts have been launched to contribute to the Oregon Plan, including watershed council plans and projects, Oregon's Senate Bill 1010 process dealing with the effects of agricultural practices on water quality, and forest landowner voluntary contributions.

The Forest Practices Advisory Committee (FPAC)

As part of a program for all agencies to examine their contribution to the Oregon Plan, Executive Order No. EO 99-01 directed the Board of Forestry to form an advisory committee, and with the committee’s assistance to determine what, if any, changes to forest practices are necessary to meet water quality standards and to protect and restore salmonids. The Forest Practices Advisory Committee was formed in 1999 to assist the Board in meeting that charge. The committee reviewed contemporary forest practices and provided the Board with recommendations (FPAC, 2000). FPAC made extensive recommendations on the issue of how forest practices affect riparian functions; however, most of this work was done from a western Oregon perspective. Recognizing that riparian conditions and silvicultural requirements in eastern Oregon are significantly different than in western Oregon, FPAC recommended that the Department of Forestry work with interests in eastern Oregon to develop riparian measures for eastside forests.
Forests in eastern Oregon exhibit a wide diversity in species composition and productivity. This diversity is largely a result of the wide range in available moisture, temperature, elevation, and soil productivity. To varying degrees over the landscape, periodic fire has affected the development of eastern Oregon forests. Over the last century, the effect of this forest regulating agent has been significantly altered by fire suppression. These influences, combined with periodic epidemic insect infestations and tree diseases, have a strong effect on the development of eastside riparian forests and are significantly different than the influences affecting western Oregon riparian forests. It was primarily these circumstances that were recognized by the members of FPAC and that resulted in the formation of ERFAC.

The Board directed the department to form an eastside advisory committee and in June 2001, the department convened the first meeting of the Eastside Riparian Functions Advisory Committee. Initially, the committee had eleven members, as shown in the following list. Brad Nye, the tribal representative attended several early meetings, and then left the committee because of a change in employment. Two other tribal representatives replaced Brad Nye for short periods, but were not able to continue attending ERFAC meetings. The department determined that the tribal representative position on the committee would remain open and continued to encourage the eastside tribes to provide representatives. However, representatives of the eastside tribes were not present at the later ERFAC meetings where committee members formulated potential recommendations and determined which, if any, they would support.

In selecting members, the department’s goal was to have broad representation based on interests and eastside geographic regions. The committee’s charter (see Appendix B) sets forth its background and purpose, parameters and assumptions, charge from the department, and roles and responsibilities. Committee members and affiliations are listed here:

**Stan Benson**, Consulting Forester, Eastern Oregon Regional Forest Practices Committee Representative, Hood River/Wasco County (Proxy: Chris Sokol, U.S. Timberlands, Klamath County)

**Steve Courtney**, Malheur Lumber, Eastern Oregon Regional Forest Practices Committee Representative, Grant County (Proxy: John Morgan, Ochoco Lumber, Prineville)

**John Howard**, Committee Chair, Union County Commissioner, Elected Official Representative (Proxy: Dennis Reynolds, Grant County Judge)

**Marilyn Livingston**, Woodland Owner, Public at Large Representative, Klamath County (Proxy: Irene Jerome, Consulting Forester, Central Oregon)


**Jason Miner**, Oregon Trout, Environmental Representative, Statewide (Jim Myron, Oregon Trout, Statewide)

**Brad Nye**, Confederated Tribes of Warm Springs, Tribal Representative (Proxy: Bobby Brunoe, Confederated Tribes of the Warm Springs)

**John Rounds**, Woodland Owner, Oregon Small Woodlands Association Representative, Crook County (Alternate: John Breese, Woodland Owner, Crook County)
ERFAC Deliberations
The committee held twelve meetings, with the first taking place on June 25, 2001 and the concluding meeting being held on October 30, 2002. Five of the meetings included field tours, with visits to sites near John Day, Prineville, La Grande, Klamath Falls, and Sisters. At these sites, committee members observed streams, riparian conditions, forest sites, and forest operations near streams. The committee also reviewed eastside silviculture and riparian conditions, looked at technical and monitoring information, and considered the points of view of committee members. Information sources for the committee included technical specialists, committee members themselves, technical publications, members of the public, and Oregon Department of Forestry personnel.

To begin discussions on potential recommendations, the committee formulated issue questions. The list of questions was initially based on riparian function issues identified in the Forest Practices Advisory Committee report, and was then modified by ERFAC to more closely reflect eastside conditions (see Appendix C). For each issue, the committee reviewed scientific and monitoring information, current forest practices requirements, and current voluntary measures, and then worked to develop recommendations.

ERFAC’s goal was to reach consensus on a set of recommendations related to forest practices and riparian functions. The committee charter gives the following direction (see Appendix B):

The Committee will seek consensus about recommendations when possible and clearly articulate the range of views when consensus is not possible. Significant differences of opinion, if any, will be highlighted in the Committee’s report to the Board.

At the October 16, 2002 meeting, the committee agreed on a decision protocol that included the following (see Appendix B):

Support: “Consensus” support means all committee members, present or represented by their proxy at the meeting where the recommendation was discussed, expressed support. “Strong Agreement” means no more than three of the eleven committee members expressed nonsupport. “Majority ” support referenced in the body of the report means at least six committee members expressed support, but two to five committee members expressed nonsupport.
The language of the charter and decision protocol indicates that consensus agreement was the most desirable outcome, but that if consensus could not be reached, strong agreement or majority support would still be considered valuable. The committee held extensive discussions in its attempt to achieve consensus. At its final meeting (on October 30, 2002), ERFAC members indicated their level of support for the package of thirteen recommendations described in the following section of this report. Ten members were present at this meeting. Eight members supported the package; two members opposed it. According to the decision protocol, this would constitute strong agreement, but not consensus. Committee members also indicated their level of support for the individual recommendations that made up the package. Six of those recommendations received consensus support, and seven received strong agreement. See the sections of this report on each of Recommendations A through M for more information, including dissenting viewpoints, on the individual recommendations.
ERFAC Combined Recommendation

Committee Deliberations
At the October 30, 2002 ERFAC meeting, committee members concluded their deliberations by indicating their level of support for a combined package of thirteen recommendations. The members also indicated their level of support for each individual recommendation. Ten committee members were present at the meeting. As directed in the ERFAC charter, the committee’s goal was to reach consensus on a set of recommendations related to forest practices and riparian functions.

The language of the charter and decision protocol (see Appendix B) indicates that consensus agreement was the most desirable outcome, but that if consensus could not be reached, strong agreement or majority support would still be considered valuable. The committee held extensive discussions in its attempt to achieve consensus. With its diversity of viewpoints, the committee was not able to reach consensus, but did achieve strong agreement on this package consisting of thirteen recommendations. Eight members supported the package (SB, JB (for JR), SC, JH, ML, BM, RS, BY) and two members opposed it (JM, JW).

Note: JR participated in committee deliberations on October 30, 2002, for portion of the meeting; for the rest of the meeting, JB served as proxy for JR.

Dissenting Viewpoints

JM said the committee had not met the charge to first protect water quality and fish habitat. See the letter in Appendix D for more information.

JW stated several objections. First, he also said that the committee had not followed its charge to first protect water quality and fish habitat. Next, he said that he had commented at previous meetings that the committee needed better information on eastside stream and riparian conditions. He stated that there was a large store of that sort of information available from the Oregon Watershed Enhancement Board and other sources, but it had not been made available to the committee. Without more information, he doubted that the committee could meet its charge. Third, he said that none of the field sites visited by the committee showed examples of riparian management areas that had been harvested to the minimum standards allowed by the Forest Practices Act. The field visits provided no information base or support for relaxing forest practices requirements. Finally, he noted that the science and monitoring information provided to the committee omitted the Klamath area, the dominant timber-producing area in eastern Oregon. He said that Klamath County has significant water quality and riparian issues and that data for the Blue Mountains and Deschutes is not appropriate for Klamath area recommendations.

ERFAC Combined Recommendation
Following is a listing of the combined recommendation consisting of individual recommendations A through M.
**Recommendation A: Desired Future Condition for Fish Use Streams**

The following definition for the “desired future condition” should be used for eastern Oregon (OAR 629-640-000 (2)(a)):

“Eastern Oregon has a tremendous diversity of riparian forest conditions. The desired future riparian condition for fish use streams is to grow and retain vegetation so that over time and across the landscape riparian forests are vigorous and structurally diverse. Riparian forest structures vary across the eastern Oregon landscape and within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs. The functions and values of riparian forests include water quality, hydrologic function, the growing and harvesting of trees, and fish and wildlife resources. These riparian forests provide ample shade over the channel, a relative abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.”

Strong agreement: Nine committee members supported Recommendation A: one member opposed it.

**Recommendation B: RMA Widths for Fish Use Streams**

Retain current RMA widths (50, 70, and 100 feet for small, medium, and large type F streams, respectively).

Consensus support: Ten committee members supported Recommendation B.

**Recommendation C: Basal Area Retention along Fish Use Streams**

Use two site classes for basal area retention in RMAs to reflect variability in site capability in eastern Oregon riparian forests, as follows:

*For partial harvest or Type 1 (square feet of basal area/1000 ft)*

| Site 4/5* (moist) | 170 | 120 | 85 |
| Site 6/7 (dry)    | 110 | 80  | 55 |

*For final harvest (Type 2 & 3), and For ‘brush credit’ or ‘ungulate alternative’ (partial harvest or Type 1) (square feet of basal area/1000 ft)*

| Site 4/5* (moist) | 130 | 90  | 65 |
| Site 6/7 (dry)    | 90  | 65  | 45 |

*Much of the discussion was on whether the distinction between site 4 and 5 could be consistently made on the ground, but the understanding was that site 2 and site 3 ground would be included in the site 4/5 category.*

The following conditions must be present in order for the ‘brush credit’ or ‘ungulate alternative’ basal area targets to be applicable: existing understory vegetation (grasses, shrubs, and non-merchantable trees) retained along the stream has a high likelihood to persist over time.
Strong agreement: Eight committee members supported Recommendation C; two members opposed it.

**Recommendation D: Near Stream Protection for Fish Use Streams**
Near-stream protection under an active management approach within the RMA will be provided by the protections described below. If this approach is not utilized in the RMA, then the default is the 20-foot no-harvest zone:
1. Retain all trees leaning over the channel, as required by current rule.
2. Retain all channel-stabilizing trees that have exposed roots within the active channel.
3. For large and medium Type F streams, retain the five largest trees within the first half of the RMA, per 1000 feet of stream length.
   - Create an active placement incentive as an alternative for meeting this requirement.
   - Allow site specific plans to alter the requirements if necessary to address forest health.
4. For small Type F streams, retain five trees 20 inches DBH or larger within the first half of the RMA, per 1000 feet of stream length. If no trees at least 20 inches DBH are present, retain the five largest trees.
   - Create an active placement incentive as an alternative for meeting this requirement.
   - Allow site specific plans to alter the requirements if necessary to address forest health.
5. Within the first 20 feet adjacent to Type F streams, retain all understory vegetation and all trees up to 6 inches in DBH, unless management is necessary for regeneration or pre-commercial thinning to achieve the desired future condition.
6. A thirty-five-foot equipment exclusion zone on all fish use streams would be the standard prescription. Prior approval for entering the 35-foot zone would be allowed under certain circumstances and would be addressed in the written plan.

Note: The retention requirements in D1 through D5 would not necessarily be mutually exclusive. For example, a tree required to be retained for bank stabilization could be one of the five largest trees if it met the size requirement, and might also fulfill other near stream protection requirements.

Strong agreement for Recommendation D with item D3: Eight committee members indicated support; two members indicate opposition.

Strong agreement for Recommendation D with Item D4: Seven committee members indicated support; three members indicated opposition.

**Recommendation E: Stratification**
ERFAC agrees with the concept of stratification and recommends that the department develop rule language and guidance specific to eastern Oregon. All trees should be retained in segments of the RMA that are below the standard basal area target, and trees retained within the ‘overstocked’ area can be at or above the standard target.

Strong agreement: Nine committee members supported Recommendation E; one member opposed it.
**Recommendation F: Channel Migration Zones (CMZs)**
ERFAC recommends that the department develop guidance on eastern Oregon CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

Consensus support: Ten committee members supported Recommendation F.

**Recommendation G: Protection of Type N Streams**
The following additional protections are to apply to Type N streams:
1. Extend the current vegetation retention requirements along small perennial Type N streams out to 20 feet during harvest operations.
2. The forest practice rules should be modified to more specifically address the risk of sediment delivery from skid trails\(^2\) located near small Type N streams.
3. For medium and large Type N streams, apply the protection standards ERFAC recommends for small Type F streams.
4. The effectiveness of the small Type N stream prescriptions should be a monitoring priority.

Strong agreement: Seven committee members supported Recommendation G; three opposed it.

**Recommendation H: Monitoring Strategies for Wetlands**
The department should develop monitoring strategies that will include evaluating the effectiveness of the forest practice rules for significant and other wetlands.

Strong agreement: Nine committee members supported Recommendation H; one member declined to indicate support or opposition.

**Recommendation I: Incentives**
The department should recommend to the Board of Forestry that the forest practice rules be modified, as necessary, to provide a broad range of incentives to improve fish habitat. It should be recognized that multiple methods are available to address protection issues related to ungulates (e.g. see Recommendation C above and OAR 629-640-0110)

Consensus support: Ten committee members supported Recommendation I.

**Recommendation J: Statewide Riparian Policy; Wild and Domestic Ungulates**
Urge the Board of Forestry to provide a recommendation to the Statewide Riparian Management Policy Group concerning the impacts of both wild and domestic ungulates to forested eastside RMAs. The recommendation should discuss the roles of other regulatory and land-use agencies concerning the maintenance and enhancement of high-quality riparian areas.

Consensus support: Ten committee members supported Recommendation J.

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\(^2\) As determined by the Department, skid trails include but are not limited to any area where equipment constructs a trail by excavating, filling, and/or compacting. Ground used for a single pass by mechanical shears or feller-bunchers is not considered a skid trail unless ruts develop or the surface organic material is removed.
Note: The committee asked the Oregon Department of Forestry to prepare a clarifying redraft, if it could be done without changing the meaning of the statement. However, the committee did not reach agreement on the proposed redraft. For more information on this process, see the detailed discussion for Recommendation J in this report.

Recommendation K: Riparian Specialists
The department should designate at least one riparian specialist for each district in eastern Oregon to inventory and prepare riparian prescriptions for operators and landowners.

Consensus support: Ten committee members supported Recommendation K.

Recommendation L: Training for Landowners, Operators, and the Public
The department is encouraged to emphasize Forest Practices Act training and education opportunities for landowners, operators, and the public.

Consensus support: Ten committee members supported Recommendation L.

Recommendation M: Training for Forest Practices Foresters (FPFs)
The department is encouraged to emphasize FPF training to ensure compliance and consistency with the Forest Practices Act.

Consensus support: Ten committee members supported Recommendation M.
Recommendation A: Desired Future Condition

Committee Support: Strong Agreement

Nine members supported Recommendation A (SB, JB (for JR), SC, JH, ML, BM, RS, JW, BY) and one member opposed the recommendation (JM).

Dissenting Comments:
JM stated that the committee did not meet its charge to first protect water quality and fish and wildlife habitat.

Issue Question:
What is the structural and functional definition of the desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?

Recommendation:
The committee recommends the following change to OAR 629-640-0000 (2) that includes a new section (2)(a) which describes the desired future condition for eastern Oregon riparian forests.

2) In Western Oregon, the desired future condition for streamside areas along fish use streams is to grow and retain vegetation so that, over time, average conditions across the landscape become similar to those of mature streamside stands. Oregon has a tremendous diversity of forest tree species growing along waters of the state and the age of mature streamside stands varies by species. Mature streamside stands are often dominated by conifer trees. For many conifer stands, mature stands occur between 80 and 200 years of stand age. Hardwood stands and some conifer stands may become mature at an earlier age. Mature stands provide ample shade over the channel, an abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.

2a) Eastern Oregon has a tremendous diversity of riparian forest conditions. The desired future riparian condition for fish use streams is to grow and retain vegetation so that over time and across the landscape riparian forests are vigorous and structurally diverse. Riparian forest structures vary across the eastern Oregon landscape and within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs. The functions and values of riparian forests include water quality, hydrologic function, the growing and harvesting of trees, and fish and wildlife resources. These riparian forests provide ample shade over the channel, a relative abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.

Additional information on this issue:
The 1994 water protection rules were focused on reaching a desired state or mature condition at a discrete point in time; but in eastern Oregon, the committee’s vision was to achieve riparian
stands that are vigorous and have structural diversity over time. Eastside stands are often uneven aged due to the greater influence that wildfire has had historically on forest ecosystem dynamics, as compared to westside forests. Most of the lower elevation forestlands in eastern Oregon historically experienced low-intensity wildfire every 10 to 30 years, making a mature condition somewhat difficult to describe in terms of average age or average size. Fire return intervals were usually longer on the moister, higher elevation sites. The definition recommended by ERFAC requires maintaining the desired condition over time, as opposed to setting a stand on a trajectory so that it achieves the condition at some point in the future. The current rules refer to an average condition, but that relates to an average condition in each individual riparian management area, not a single condition to be reached at the same time on every riparian site across the landscape. Under the current rules, a specific riparian management area is assumed to be below the basal area levels of the desired condition following a harvest, meet the condition at the midpoint of the rotation, and exceed the condition for the second half of the rotation.

Trees compete with each other and with other plants for limited site resources. Where moisture is abundant, this competition is less evident; the trees can usually grow vigorously even if crowded, although diameter growth is reduced. In much of eastern Oregon, annual precipitation amounts are low, so soil moisture available to plants is very limited. In this context, competition among plants is much more evident. Trees in dense stands tend to grow slowly and tend to have poor vigor, making them more vulnerable to catastrophic fire and insect attacks. As a result, eastern Oregon forests where fire has been suppressed and trees have not been thinned are more likely to be burned by stand-replacement fires or killed by severe insect outbreaks, as compared to historical conditions. Historically, overcrowded forest conditions were the exception in eastern Oregon; today, after nearly a century of fire suppression, this condition tends to be a much more common occurrence. A central concept in this recommendation is that to provide long term riparian functions, riparian forests should be growing vigorously in order to be resilient to natural disturbances and avoid a significant loss of function in the future.

Given this shift in thinking, ERFAC replaced the word ‘mature’ with ‘structurally diverse.’ The committee defined structural diversity to include structure and composition as well as function. Further, the term is intended to convey that within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs.

A range of functions and values exist for riparian areas which includes water quality, hydrologic function, and fish and wildlife resources, as well as the growing and harvesting of trees. An important theme in ERFAC discussions was that the revised definition should remain consistent with the department and Board’s 1994 view of riparian areas as places where the emphasis is on providing for water quality and fish and wildlife habitat first and where, to the extent that the goals for these values are met, timber management is encouraged (Lorensen et al., 1994).

The definition of 'desired future condition' formed the basis for the remainder of the committee’s work, as each issue was evaluated to contribute towards the achievement of the desired future condition. The tension to focus committee discussion solely on water quality and fish habitat continued throughout ERFAC’s discussion of the desired future condition and subsequent issue deliberations. Philosophical differences occurred between committee members on the most positive and productive means by which to meet water quality standards and improve fish
habitat. Some considered managing riparian areas to increase tree vigor and growth and to reduce the risk of losing riparian functions to catastrophic natural disturbance (e.g. fire, insects, and disease) as the proper course of action. Some of the members conveyed the opinion that by creating healthy, diverse forest conditions, healthy riparian areas and a healthy aquatic environment will result. Other members’ view was that the focus should remain solely on water quality and fish habitat, and that maintaining vigorous riparian areas was not necessarily essential to achieving the desired riparian functions.
**Recommendation B: RMA Widths**

Committee Support: Consensus

Ten members supported Recommendation B (SB, JB (for JR), SC, JH, ML, BM, JM, RS, JW, BY)

Issue Question:

Are current forest practice rules and voluntary measures for riparian management area widths resulting in or likely to result in ‘desired future conditions’ within riparian management areas and conditions necessary to meet water quality standards and protect and restore salmonids?

Recommendation:

ERFAC reached consensus that the current RMA widths (50, 70 and 100 feet for small, medium, and large Type F streams, respectively) be retained.

Additional information on this issue:

Riparian management area widths are designated to provide adequate areas along streams, lakes, and wetlands to retain the physical components and maintain the functions necessary to accomplish the purposes and to meet the protection objectives and goals for water quality, fish, and wildlife set forth in OAR 629-635-0100. A 50- to 100-foot buffer can achieve 65 to 95 percent of potential near stream and upstream riparian large wood. In terms of shade, canopy density, canopy height, stream width, and stream discharge, all are interrelated and determine the effectiveness of the riparian buffer width. Because of the complex interactions between all of these factors, buffer width alone is not always a reliable determinant of effective shade. A combination of basal area targets, minimum tree retention, buffer widths, and future regenerated stands are used to achieve the desired large wood inputs and shade conditions for a given stream. Background information on the scientific assumptions underlying the rules for RMA widths, monitoring, and Oregon Plan voluntary measures can be found in the Appendices to this report.

The committee concurred with the Forest Practices Advisory Committee recommendation to continue using the current RMA widths. ERFAC members discussed the idea that RMAs along small and medium Type F streams may or may not have adequate standing large wood, and that additional monitoring would be needed to determine if RMA widths need to be changed. The committee also emphasized that the individual riparian recommendations are interdependent and must be considered holistically.

ERFAC also considered using site potential tree height as an alternative to the widths in the current rule. Site potential tree height provides a means to fit RMA widths to site productivity in order to obtain the desired future condition and range of values. While a site potential method offers greater site specificity, how the widths would be determined for various site potentials was not clear. Ultimately, ERFAC settled on retaining the current RMA widths and focused their attention instead on the activities that would occur within the existing standard widths.
ERFAC considered reducing the RMA of large fish-bearing streams to 70 feet while retaining the current widths for small and medium streams or using a different category for seasonally dry streams. However, the last two options were dropped early in the process.
Recommendation C: Basal Area Retention along Fish Use Streams

Committee Support: Strong Agreement

Eight members supported Recommendation C (SB, SC, JH, ML, BM, JR, RS, BY) and two members opposed the recommendation (JM, JW).

Dissenting Comments:
JM stated that the committee did not meet the charge to first protect water quality and fish habitat. He also said that the ungulate alternative, as written, provides an incentive for grazing.

JW stated that the committee did not meet its charge to first protect water quality and fish habitat. He said that the committee had not considered a considerable body of information on eastside riparian conditions that was available from the Oregon Watershed Enhancement Board and other sources. He also said he thought there were other alternatives that were not considered by the committee. He said that for these reasons, he could not support the recommendation.

Issue Question:
Are current forest practices rules and voluntary measures on fish use streams resulting in or likely to result in the desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?

Recommendation:
For RMAs in eastern Oregon, use the basal area retention figures described in tables C1 through C3 to move RMAs toward the desired future condition (see Recommendation A).

Table C1. Basal Area Retention in RMAs along Fish Use Streams:

<table>
<thead>
<tr>
<th>Productivity Class</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 4/5* (moist) (50-119 cubic ft/acre/yr)</td>
<td>170</td>
<td>120</td>
<td>85</td>
</tr>
<tr>
<td>Site 6/7 (dry) (49 cu. ft/acre/yr or less)</td>
<td>110</td>
<td>80</td>
<td>55</td>
</tr>
</tbody>
</table>

• Figures are in square feet of basal area per 1000 feet of stream, each side.
• Figures represent 40% of Growth Basal Area (see the discussion following Table C3).

*Also includes sites 2 and 3. See the discussion following Table C4.
Table C2. Basal Area Retention in RMAs along Fish Use Streams:

Partial or Type 1 Harvest with “Brush Credit” or “Ungulate Alternative” (see the discussion following Table C3).

<table>
<thead>
<tr>
<th>Productivity Class</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 4/5* (moist) (50-119 cubic ft/acre/yr)</td>
<td>130</td>
<td>90</td>
<td>65</td>
</tr>
<tr>
<td>Site 6/7 (dry) (49 cu. ft/acre/yr or less)</td>
<td>90</td>
<td>65</td>
<td>45</td>
</tr>
</tbody>
</table>

- Figures are in square feet of basal area per 1000 feet of stream, each side.
- Figures represent 30% of Growth Basal Area (see the discussion following Table C3).
- The brush or ungulate credit targets apply only when understory vegetation (grasses, herbs, shrubs, and non-merchantable trees) is present along streams and when it has a high likelihood of persisting over time.

*Also includes sites 2 and 3. See the discussion following Table C4.

Table C3. Basal Area Retention in RMAs along Fish Use Streams:

Final Harvest (Harvest Type 2 or 3)

<table>
<thead>
<tr>
<th>Productivity Class</th>
<th>Large</th>
<th>Medium</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 4/5* (moist) (50-119 cubic ft/acre/yr)</td>
<td>130</td>
<td>90</td>
<td>65</td>
</tr>
<tr>
<td>Site 6/7 (dry) (49 cubic ft/acre/yr or less)</td>
<td>90</td>
<td>65</td>
<td>45</td>
</tr>
</tbody>
</table>

- Figures are in square feet of basal area per 1000 feet of stream, each side.
- Figures represent 30% of Growth Basal Area (see the discussion following Table C3).

*Also includes sites 2 and 3. See the discussion following Table C4.

Additional information on this issue:

**Background and Rationale for Recommendation C.** Much of the committee discussion focused on the current conditions in eastern Oregon forests and the implications for riparian functions. In Oester et al., 1992, the authors describe the progression over the last century from historical to contemporary conditions:

> Historically, fire came through many eastern Oregon forests about every 8 to 20 years in lower elevation ponderosa pine and every 20 to 40 years in mixed-conifer forests. These ground fires removed accumulated debris and thinned out seedlings and saplings. In mixed-conifer forests, periodic fires left the fire-tolerant pine and western larch but eliminated most of the fire-sensitive fir species. Beginning in the early 1900s, humans, seeing only the destructive side of fires, aggressively suppressed them. Inadvertently, this absence of fire over an 80- to 100-year period allowed Douglas-fir and grand or white fir to take over the forest, slowly replacing the pine and larch.

> Another factor encouraging the buildup of fir species was selective logging of the economically more preferable pine and larch. The firs that dominate today’s forests are
less drought tolerant and more susceptible to defoliating insects, root diseases, and stem decays.

Without fire to thin out the small trees, tree density increases so much that individual trees must compete intensely for water and nutrients. Under this stress, all trees become more vulnerable to insect attack. In recent years, [as of 1992] drought, which is particularly stressful to the more moisture-dependent firs, has aggravated this already critical situation.

Although forest conditions vary widely over eastern Oregon, the trend described by Oester et al. has resulted in forests that, in general, are very dense, with high fuel loadings and often with multiple canopy levels. High fuel loadings make the fires more intense; continuous, multiple canopy levels allow fires to move from the ground into tree crowns and from tree to tree. Fires that in the past would have stayed near the ground as they moved through the forest now tend to move quickly into the upper canopy and to be much more intense. Fires of this character can kill a high percentage of the larger as well as the smaller trees. Large wood in or near streams can be consumed, and erosion can be increased manyfold. Water quality and salmonid habitat can be negatively affected over long time periods. The rationale for Recommendation C is that some form of intervention is needed in eastside riparian forests to allow the trees to grow vigorously and therefore to avoid catastrophic events that can damage riparian functions in this manner.

Recognizing that a return to historical fire conditions on private forestland is neither practical nor likely, the committee focused on density control (thinning) and other active management as the primary mechanisms to restore and maintain vigorous tree growth in riparian forests. ERFAC also determined that to address the diversity in site productivity in eastern Oregon, basal area retention targets should be matched to local site productivity levels. ERFAC’s recommendations for basal area retention are shown in tables C1 through C3. Landowners would be allowed to harvest in riparian forests down to the targets shown in the tables. The targets shown in the tables represent a level expected to allow vigorous growth of residual trees, while still providing adequate riparian protection. The expected results would be that landowners could derive income from harvesting, forests would be resistant to insect attacks and fires, and large wood would develop relatively quickly. In addition to and in concert with the near stream protection measures described in Recommendation D, shade and other riparian functions would also be provided.

The Role of Understory Vegetation. In developing the recommended basal area targets, ERFAC also considered the importance of understory vegetation, i.e., grass, shrubs, nonmerchantable trees, and other low vegetation. Understory vegetation growing near a stream can provide significant shade, bank stabilization, litter fall, insect fall, and other riparian functions.

Why Use Basal Area Targets? Basal area targets serve as a practical measure of forest stocking levels. The current water protection rules of the Forest Practices Act describe basal area targets that, if retained along streams, are expected to lead to a desired future condition. This ERFAC recommendation follows the same basic approach, albeit with a revised desired future condition (see Recommendation A).
**Growth Basal Area.** Fred Hall, Senior Plant Ecologist (retired), U.S. Forest Service, Region 6, has developed the concept of “growth basal area” into a tool that can be used to determine how eastern Oregon forest stands will respond to a range of stocking levels. Growth basal area means the basal area per acre at which the dominant trees grow at the rate of one inch in diameter per decade. Growth basal area varies with site productivity. More trees can grow at a given rate on more productive sites, so growth basal area is higher on these sites. Conversely, growth basal area will be lower on less productive sites. Growth basal area also varies among tree species another. One key use of the growth basal area tool is to determine whether forests will be resistant to bark beetle attacks. The growth threshold is about 1.4 inches in diameter per decade, i.e., trees growing at least that fast tend to resist bark beetle attacks, while trees growing more slowly are likely to be killed by the attacks. This growth rate translates to about 80% of growth basal area. Managers can use this information as a tool to manage density to keep stands in a vigorous condition.

**Site Productivity.** The current water protection rules specify a single per-acre basal area target for the entire eastern Oregon region. ERFAC determined that this approach did not adequately reflect the diversity in site productivity that is found across the region. To more accurately match basal area targets to site productivity levels, the committee considered using as many as five separate site productivity classifications. However, most discussion centered on whether to use two or three site classes. The objective was to develop a system that would accurately reflect the site productivity range on forestland in eastern Oregon while being practical to apply on the ground. Table C4 provides summary descriptions of the site classes that exist in eastern Oregon.

<table>
<thead>
<tr>
<th>Site Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (165-224 cubic ft/acre/yr)</td>
<td>Higher elevation mixed conifers</td>
</tr>
<tr>
<td>3 (120-164 cubic ft/acre/yr)</td>
<td>Higher elevation mixed conifers</td>
</tr>
<tr>
<td>4 (85-119 cubic ft/acre/yr)</td>
<td>Grand fir, white fir, or Douglas-fir dominate, few ponderosa pine</td>
</tr>
<tr>
<td>5 (50-84 cubic ft/acre/yr)</td>
<td>Same as site 4 except higher stocking, some ponderosa pine; OR Dominated by lodgepole pine, quaking aspen, or cottonwood</td>
</tr>
<tr>
<td>6 (20-49 cubic ft/acre/yr)</td>
<td>Dominated by ponderosa pine</td>
</tr>
<tr>
<td>7 (19 cubic ft/acre/yr or less)</td>
<td>Although site class 7 land is often not considered productive forestland, some harvesting does take place. ERFAC therefore included site class 7 lands in Recommendation C.</td>
</tr>
</tbody>
</table>

Considering upland and riparian locations together, site classes 2 and 3 are relatively rare on the eastside, making up a total of about 1 percent of non-U.S. Forest Service forestland in eastern Oregon (FPAC, 2000, p. D-70). ERFAC discussions focused on the more abundant sites 4 through 7. The committee generally agreed that separate basal area targets for each of site classes 4, 5, 6, and 7 would accurately match riparian forest density levels to site productivity levels across eastern Oregon. However, without technical evaluation, it can often be difficult to make the on-the-ground distinction between sites 4 and 5 with mixed conifer stands. Because of this difficulty, and because site 4 lands make up a relatively low percentage of private forestland on the eastside, ERFAC recommended a single basal area target for sites 4 and 5 together as a
single productivity class. This class was termed “moist,” since it is usually found on higher elevation sites or other sites that typically get more precipitation. Areas of site classes 2 or 3 (expected to be encountered only rarely, as noted above) would be included along with site classes 4 and 5.

Site class 7 lands were grouped with site class 6 lands because there is some harvesting on the former, even though the land is often not considered productive for forestry purposes. The site 6/7 productivity class was called “dry,” because it occurs usually on lower elevation lands with less precipitation. For ERFAC’s purposes, Fred Hall and Steve Fitzgerald blended growth basal area information for species and site classes to develop the 40% and 30% growth basal area figures requested by the committee for Tables C1 through C3. In keeping with the growth basal area concept, the committee supported setting higher basal area targets for the productivity class made up of sites 4/5 than for the class made up of sites 6/7.

**Basal Area Retention Targets.** Tables C1, C2, and C3 describe the basal area targets the committee recommended. Table C1 specifies basal area retention when the harvest next to the stream will be a Type 1 harvest or other partial harvest. Data presented by the Oregon Department of Forestry showed that through the last five years, most harvesting in eastern Oregon (about 88% by acreage) was planned to fit into this category. In this recommendation, the committee settled on a figure of 40% of growth basal area as a balance between maintaining vital riparian functions and promoting vigorous tree growth. When landowners harvest to 40% of growth basal area, the remaining trees would be expected to grow at three inches in diameter per decade. This growth rate promotes relatively rapid development of large wood and allows trees to grow in a healthy and vigorous condition until the next harvest entry. The resulting relatively open stand conditions should allow the development of streamside understory vegetation as well.

Table C2 describes the brush credit or ungulate alternative. This option allows landowners conducting Type 1 harvests or other partial harvests to reduce basal area levels 30% of growth basal area in exchange for maintaining understory vegetation (grass, shrubs, and non-merchantable trees) along streams. Understory vegetation growing along streams can provide shade and other valuable riparian functions. The intent in this recommendation was to recognize landowners that have managed their lands to maintain understory vegetation, and to provide an incentive for other landowners to begin that kind of management, which could involve controlling ungulate activity. The recognition and incentive would come from the allowance to remove basal area down to 30% of growth basal area, rather than the 40% figure used in Table C1. The expectation of the members supporting this recommendation was that trees retained to meet the 30% figure would in combination with the understory vegetation (and the near stream protection elements in Recommendation D) provide adequate riparian protection.

Table C3 specifies basal area retention when the harvest next to the stream will be a Type 2 or Type 3 harvest, sometimes called a “final” harvest. While partial harvesting is the general rule in eastern Oregon, trees eventually die from old age, insects, diseases or other causes, and regeneration is eventually needed to maintain or reestablish the forest. Information presented by Fred Hall indicated that regeneration in eastside forests is often plentiful at most stand densities, but growth is slow when the overstory is denser than about 30% of growth basal area. The ERFAC recommendation here was that landowners should be allowed to harvest down to 30% of
growth basal area when reforestation is needed. The expectation of the members supporting this recommendation was that this level of basal area retention would allow reasonable growth of regeneration, while still providing protection that is adequate in the short term until the regeneration begins contributing to riparian functions.

The basal area targets in Tables C1 through C3 are considered starting points at a harvest entry. The concept is that landowners may harvest trees, moving the forest density down to no lower than the appropriate basal area target. The goal is to allow the landowner some income and to provide adequate riparian protection. At some point as the trees grow and basal area increases, the landowner can harvest again, always keeping the forest density to levels high enough to protect riparian functions, but low enough to allow vigorous tree growth (usually below 80% of growth basal area).
Recommendation D: Near Stream Protection for Fish Use Streams

Committee Support: Strong Agreement

Note: The committee voted separately on items D3 and D4 (see the following discussion of the recommendation).

Eight members supported Recommendation D with item D3 (SB, JB (for JR), SC, JH, ML, BM, RS, BY) and two members opposed the recommendation (JM, JW)

Seven members supported Recommendation D with item D4 (SB, JB (for JR) SC, JH, ML, BM, RS) and three members opposed the recommendation (JM, JW, BY).

Dissenting Comments:

JM noted that trees in the current 20-foot no-harvest zone provided valuable riparian functions; while there may be options that accomplish the committee goals better than a blanket 20-foot no-harvest buffer, none have been presented.

JW stated that the committee had not considered at least one other important alternative developed by Kim Jones and Jeff Dambacher. The proposal was designed to retain the largest and smallest near-stream trees while providing opportunities to harvest medium sized trees above a minimum basal area.

BY stated that in opposing item D4, the requirement to retain the five largest trees within the first half of the RMA should apply to small streams as well as to large and medium streams.

Issue Question:

Are current forest practices rules and voluntary measures on fish use streams resulting in, or likely to result in, the desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?

Recommendation:

Near stream protection under an active management approach within the RMA will be provided by the measures described below. If this approach is not utilized in the RMA, then the default is the 20-foot no-harvest zone:

1. Retain all trees leaning over the channel, as required by current rule.
2. Retain all channel stabilizing trees that have exposed roots within the active channel.
3. For large and medium Type F streams, retain the five largest trees within the first half of the RMA, per 1000 feet of stream length.
   - Create an active placement incentive as an alternative for meeting this requirement.
   - Allow site specific plans to alter the requirements if necessary to address forest health.
4. For small Type F streams, retain 5 trees 20 inches DBH or larger within the first half of the RMA, per 1000 feet of stream length. If no trees at least 20 inches DBH are present, retain the 5 largest trees.
   • Create an active placement incentive as an alternative for meeting this requirement.
   • Allow site specific plans to alter the requirements if necessary to address forest health.
5. Within the first 20 feet adjacent to Type F streams, retain all understory vegetation and all trees up to 6 inches DBH, unless management is necessary for regeneration or pre-commercial thinning to achieve the desired future condition.
6. A thirty-five-foot equipment exclusion zone on all fish use streams would be the standard prescription. Prior approval for entering the 35-foot zone would be allowed under certain circumstances and would be addressed in the written plan.

Note: The retention requirements in items D1 through D5 in this list would not necessarily be mutually exclusive. For example, a tree required to be retained for bank stabilization could be one of the five largest trees if it met the size requirement, and might also fulfill other near stream protection requirements.

Additional Information

The Need for Near-Stream Protection. An important concept in committee discussions was that protection measures in addition to basal area retention (see Recommendation C) might be necessary to ensure that trees within riparian management areas provide adequate shade, large wood inputs, channel stability, snags, and litter fall. For example, without the additional near-stream protection measures, landowners could periodically remove the largest trees and still meet basal area retention targets. The long-term result could be that RMA trees would not be allowed to reach larger sizes, and some level of benefit from large wood would be lost. Protection of understory vegetation was also seen as important, since that vegetation can provide significant shade, channel stability, litter fall, and insect fall.

Management in RMAs. ERFAC also discussed what many (but not all) members saw as a need for management within RMAs. Committee discussions centered on the idea that without management, eastside forests now tend toward an overstocked and weakened condition and consequently are subject to large scale insect attacks and fires. The negative impacts on riparian functions can be significant and long lasting.

The current prohibition on harvesting within 20 feet of fish use streams often does not allow density management in that area. In addition, the 20-foot no-harvest requirement can also lead to only a narrow strip of trees being left along a stream where the basal area retention target can be met in that zone, which could again result in an undesirable loss of riparian functions. The site specific plan option described in OAR 629-640-0400 can allow landowners to operate within the 20-foot zone, but landowners have tended to avoid that avenue. Potential reasons for this behavior include a lack of time or expertise, the low value of the trees that could be harvested, perceptions that an “alternate” process should be used only occasionally, and a lack of consistent direction from the Oregon Department of Forestry to its field personnel.

Rationale for Individual Protection Measures. Item D1 would continue the current mandate to retain all trees within the RMA that lean over the channel. The rationale is that these trees are
very likely to fall in or over the channel, providing large wood to the stream. The committee’s intent with item D2 is to require retention of trees that have direct effects on channel stability; the committee envisioned that these trees would be immediately adjacent to the stream with root masses exposed by stream erosion.

Much of the committee’s discussion focused on items D3 and D4 relating to retention of large trees. There was general agreement that the recommendation should include retention of large trees so that a supply of large wood would be available over time, and so that other benefits of large trees would be realized. However, there was some disagreement on how to ensure that large trees would be retained while still allowing landowners financial gains from harvesting. For large and medium fish use streams, the resolution in item D3 was that the five largest trees per 1000 feet within the first half of the RMA should be retained, as long as there were incentives for active placement of wood in streams and allowances for harvesting to address forest health concerns. For small fish use streams, the idea in item D4 was that smaller wood could provide equivalent function; the recommendation for small streams was therefore to retain five trees at least 20 inches DBH instead of the five largest trees.

The intent in D5 was to capture the benefits that can come from retaining smaller trees and other vegetation very near streams. The committee discussed the idea that thinning of small trees near streams should be allowed to meet the desired future condition described in Recommendation A. In item D6, the committee determined that an equipment exclusion zone out to 35 feet from the stream was necessary to help minimize erosion of sediment from skid trails or other harvesting disturbances into fish use streams. Discussions indicated that in this recommendation, “equipment” meant the tracks or wheels of ground-based equipment; cables or the booms of harvesting or yarding equipment would not be included in this definition of “equipment,” and so could be used in the 35-foot zone. Because it is difficult to write rules that cover all situations, item D6 would allow the operation of ground-based equipment in the 35-foot zone after approval of a site specific plan showing that that practice would result in better resource protection.

Some committee members noted that landowners might find the list of near-stream protection measures too complex. Therefore, the recommendation was structured so that the near-stream protection elements would be the desired method, but landowners could choose the simpler 20-foot no-harvest zone. In addition, the committee wanted to clarify that the individual tree retention requirements in this recommendation were not necessarily mutually exclusive, i.e., a tree could be counted to meet more than one requirement.
Recommendation E: Stratification

Committee Support: Strong Agreement

Nine members supported Recommendation E (SB, JB (for JR), SC, JH, ML, BM, RS, JW, BY) and one member opposed the recommendation (JM).

Dissenting Comments:
At the June 25-26, 2002, ERFAC meeting, JM stated that where a portion of an RMA was overstocked, and a portion was understocked, basal area to be left should favor fish and water quality values rather than tree vigor.

Issue Question:
Are current forest practices rules and voluntary measures on fish use streams resulting in or likely to result in the desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?

Recommendation:
ERFAC agrees with the concept of stratification and recommends that the department develop rule language and guidance specific to eastern Oregon. All trees should be retained in segments of the RMA that are below the standard basal area target, and trees retained within the ‘overstocked’ area can be at or above the standard target.

Additional Information:

Definition. In this context, “stratification” means segregating portions of riparian management areas with different stand densities. Thinning would be allowed in RMA segments that have basal area levels above the standard targets described in Recommendation C: Basal Area Retention along Fish Use Streams, and Recommendation G: Protection of Type N Streams (medium and large type N streams).

Management in RMAs. ERFAC discussed what many (but not all) members saw as a need for management within RMAs. Committee discussions centered on the idea that without management, eastside forests now tend toward an overstocked and weakened condition and consequently are subject to large scale insect attacks and fires. The negative impacts on riparian functions can be significant and long lasting.

Under the current water protection rules, the first step in determining which prescriptions will apply is measuring the basal area in the RMA. In this step, basal area must be calculated over the entire RMA length within the planned harvest unit. If basal area levels are above the specified target, then the landowner must retain enough trees to meet that target on average over the entire RMA length within the harvest unit. For RMAs with relatively uniform stocking, this method seems appropriate. However, in an RMA that has both very dense and very sparse patches, but that still on average meets the basal area target, the landowner would be prohibited
from thinning in the dense patches if that work would reduce basal area below the target for the entire RMA length. In many cases, the result would be overly dense stands and the attendant problems described in the preceding paragraph. Landowners currently can propose to thin those stands under the site specific plan process, but they have tended to avoid that option. Potential reasons for this behavior include a lack of time or expertise, the typically low value of the trees that could be harvested, perceptions that an “alternate” process should be used only occasionally, and a lack of consistent direction from the Oregon Department of Forestry to its field personnel.

In summary, ERFAC recommended that the concept of stratification be made part of the standard riparian management prescriptions to (1) allow needed management of densely stocked portions of RMAs, and (2) to remove the roadblocks that the site specific plan process seems to pose for many landowners. To help ensure that streams would be adequately protected, this recommendation stipulates that all trees must be retained in RMA segments where basal area levels are below the standard targets described in Issue C: Basal Area Retention along Fish Use Streams, and Issue G: Protection of Type N Streams (medium and large Type N streams).
Recommendation F: Channel Migration Zones

Committee Support: Consensus

Ten members supported recommendation F (SB, JB (for JR), SC, JH, ML, BM, JM, RS, JW, BY).

Issue Question:

Are current forest practice rules and voluntary measures resulting in or likely to result in desired future conditions within channel migration zones?

Recommendation:

ERFAC recommends that the department develop guidance on eastern Oregon CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

Additional information on this issue:

Where channel migration zones (CMZs) extend beyond areas where vegetation has been retained in order to provide desirable levels of riparian functions, it is possible that the channel could migrate to a location where less than desirable levels of riparian functions are provided. Ensuring that riparian vegetation is retained within CMZs can increase the likelihood that desirable levels of riparian functions will be provided over time.

Adequate data is currently not available to make quantifiable statements about the extent to which riparian functions are currently being provided along stream channels that have CMZs. It is possible, however, that current protection is already at a desirable level under the various protections currently provided for waters of the state under the FPA (RMAs along streams and stream-associated wetlands). The ERFAC unanimously recommends that the department develop guidance on eastern Oregon CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

Information on the frequency of CMZs found in eastern Oregon is limited. While the ODF monitoring program has not collected data on CMZs, data were collected on the flood-prone width. Flood-prone width is a measure of the channel width when the stream is estimated at a frequent flood event. In this case, the flood-prone width was estimated for a 50-year peak flow event. While the floodplain does not directly correspond to the CMZ, it gives some idea of the possible extent of a CMZ of the same return interval. Data from 31 sites in the Blue Mountain Georegion indicate that flood-prone width varied greatly on small streams (11-104 feet). The ranges in flood-prone widths for medium and large streams were similar (30-87 feet and 45-88 feet respectively). On average the flood-prone widths for small, medium and large streams were 37, 52, and 70 feet respectively.
Recommendation G: Protection of Type N Streams

Committee Support: Strong Agreement

Seven members supported Recommendation G (SB, SC, JH, ML, BM, RS, BY) and three members opposed the recommendation (JB (for JR), JM, JW).

Dissenting Comments:
JB stated that the committee had not received information showing the adequacy of current 10-foot unmerchantable buffer on perennial small Type N streams in eastern Oregon, or the need for increasing the buffer to 20 feet. JB also felt that the recommendation would be too much of an economic burden for landowners.

JM stated that there is uncertainty on the right way to deal with Type Ns.

JW said that the recommendation did not provide adequate protection, especially for Type N streams associated with springs that may contribute cold water to downstream fish-bearing reaches.

Issue Question:
Considering vegetation, harvesting, and road construction and maintenance practices,
1. Do current forest practice rules and voluntary measures for small Type N streams minimize sediment delivery to waters of the state?
2. Should the effectiveness of practices along small Type N streams (minimizing sedimentation, large wood, and temperature functions) be a monitoring priority?

Recommendation:

The following additional protections are to apply to small Type N streams:
1. Extend the current vegetation retention requirements along small perennial Type N streams from 10 to 20 feet during harvest operations.
2. The forest practice rules should be modified to more specifically address the risk of sediment delivery from skid trails constructed near small Type N streams.
3. For medium and large Type N streams, apply the protection standards ERFAC recommends for small Type F streams.
4. Monitoring to determine the effectiveness of small type N stream prescriptions to meet water quality standards should be a priority.

Additional information on this issue:
The inter-relationships and processes between small non-fish bearing streams and downstream reaches are not currently well understood. Research is just beginning to probe the complexities of these systems. These small streams may be one important source of large wood that will migrate downstream and provide for downstream fish habitat. It is also documented that in some circumstances the removal of shade-producing vegetation along small perennial non-fish-bearing streams temporarily may result in an increase of temperature along portions of the stream.
reaches, until shade-producing vegetation becomes reestablished. While these streams contribute to some level of functional large wood inputs and shade production under the current rules, the current water protection rules were not specifically designed to retain significant sources of large wood and shade along small Type N streams. A limited amount of current research and monitoring results suggests that the current practices may result in short-term temperature increases in some Type N streams that feed into fish-bearing streams, however, the significance of the potential temperature increases at a watershed (or sub-basin) scale is uncertain (ODF and DEQ 2002, p. 58).

1. Extend the current vegetation retention requirements along small, perennial Type N streams from 10 feet to 20 feet during harvest operations.

OAR 629-640-0200 specifies:

*Operators shall retain all understory vegetation and non-merchantable conifer trees (conifer trees less than six inches DBH) within 10 feet of the high water level on each side of small perennial Type N streams indicated in Table 5.*

ERFAC discussions included the concept that extensive research and monitoring is necessary to improve the understanding of the cause and effect relationships between forest practices along small perennial non-fish bearing streams. ERFAC, as an interim step, recommended increasing the vegetation retention requirements along small, perennial Type N streams from 10 feet to 20 feet during harvest operations. The intent in this recommendation is that the increased protection may provide additional certainty for meeting water quality standards of downstream fish-bearing reaches. A central concept in this recommendation is that brush treatment for reforestation purposes is an acceptable practice and should not be confused with situations where brush growth is encouraged to provide riparian function during harvest operations.

2. The forest practices rules should be modified to more specifically address the risk of sediment delivery from skid trails located near small Type N streams.

Skid trails located in riparian areas can result in unfiltered surface runoff entering streams, and in some cases, lead to channel avulsion during high flow events. This may have an adverse effect on water quality and the maintenance and recovery of salmonids. Currently, in eastern Oregon the relationship between skid trail location and impacts on water quality due to sedimentation is not well documented. The current requirement is for a 35-foot buffer between skid trails and Type F and Type D streams, except at stream crossings (ORS 629-630-800). An exclusion for small Type N streams is not addressed, although general provisions to protect water quality when constructing and using skid trails are provided by Division 630, Harvesting Rules.

ERFAC recommended the department modify the rules to more specifically address skid trails constructed and used near small Type N streams with intent that the following concepts would be considered:

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3 As determined by the Department, skid trails include, but are not limited to, any area where equipment constructs a trail by excavating, filling, and/or compacting. Ground used for a single pass by mechanical shears or feller-bunchers is not considered a skid trail unless ruts develop or the surface organic material is removed.
a. The rule should be flexible, so that on a site-specific and seasonal basis, adjustments could be made to arrive at the best solution for preventing sediment discharges into small Type N streams.

b. Clearly defined parameters are needed so that small Type N streams can be better identified and protected, while not unduly extending the requirements to features that are not truly a ‘stream.’

c. Keep the rule simple by limiting skid trails from 20 feet consistent with item a above (rather than 35 feet as currently required for Type F and D streams). There is currently no scientific basis for requiring 35-feet as opposed to 20 feet along small non-fish bearing streams.

d. The rule should apply to new and existing skid trails that pose a significant risk of sediment delivery to streams. (Significant should be defined as a high probability that the planned operational activity will result in sedimentation delivery to the stream)

3. For medium and large Type N streams, apply the protection standards ERFAC recommends for small Type F streams.

“Influences on water quality resulting from specific best management practices for medium and large Type N streams have not been assessed since they were considered a lower priority than fish-bearing streams. 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 standards are being met on these streams” (ODF and DEQ, 2002, pp. 5-7).

The current rule, OAR 629-640-0200, specifies:

(c) Operators are encouraged whenever possible to retain understory vegetation, non-merchantable trees, and leave trees required within harvest type 2 or harvest type 3 units (pursuant to Section 9, Chapter 9, Oregon Laws 1996 Special Session) [now ORS 527.676] along all other small Type N streams within harvest units.

ERFAC recommends, until more is learned about the relationship of various practices along medium and large Type N streams, these streams be treated the same as small fish-bearing streams. The requirement for medium and large Type N streams would be to retain five trees 20 inches DBH or larger within the first half of the RMA, per 1000 feet of stream length. If no trees are present that are at least 20 inches DBH, retain the five largest trees.

The intent in this recommendation is that treating medium and large Type N streams the same as small fish-bearing streams may provide more certainty in meeting water quality standards to downstream reaches that includes greater sediment filtering and large wood inputs.

4. Monitoring to determine the effectiveness of the small Type N stream prescriptions in meeting water quality standards should be a priority.
“The ecology of small non-fish bearing streams and their importance to downstream habitats and functions is not well understood. This is in part because headwater streams have not received as much attention as other portions of the watershed. Research and management policies have mainly focused on either larger fish-bearing streams or the headwalls above the small streams” (ODF 2001). Since there is limited research on small non-fish bearing streams, it was difficult for ERFAC to arrive at a science-based recommendation for small non-fish bearing streams. ERFAC recommended increased protections until more can be learned about the relationship between forest practices on Type N streams and downstream fish-bearing reaches with the caveat that a priority be placed on monitoring to determine the effectiveness of the small Type N stream prescriptions.
Recommendation H: Monitoring Strategies for Wetlands

Committee Support: Strong Agreement

Nine members supported Recommendation H (SB, JB (for JR), SC, JH, ML, BM, RS, JW, BY) and one member abstained from voting (JM).

Comments:
JM stated that monitoring should focus on riparian areas.

Issue Question:
Are protection measures for significant wetlands the appropriate practices for maintaining the functions and values of significant wetlands on eastern Oregon forestlands over time?

Recommendation:
The department should develop monitoring strategies that will include evaluating the effectiveness of the forest practice rules for significant and other wetlands.

Additional information on this issue:
The purpose of the rules for significant and other wetlands is to protect the functions and values of these wetlands. Significant wetlands on forestlands provide a wide range of functions and values, including those related to water quality, hydrologic function, fish and other aquatic organisms, and wildlife. In eastern Oregon, significant wetlands are those wetlands larger than eight acres and important springs identified by the State Forester. The forest practices rules require operators to provide the following for all significant wetlands: 1) soil and hydrologic function protection, 2) understory vegetation retention, 3) snag and down wood retention, and 4) live tree retention. Specifically, in significant wetlands and their riparian management areas, operators shall retain approximately 50 percent of the original live trees, by species, in four diameter classes.

The primary concern discussed by ERFAC was the wide variability of eastern Oregon wetlands meeting the current definition of a significant wetland. Seasonally flooded flats and basins, deep and shallow marshes, open water, and riverine systems are wetlands habitats represented in eastern Oregon. In some cases, wetlands are ephemeral, and may be subjected to typical upland use, such as grazing, for a significant portion of the year. In some geological areas, these wetlands are catchment basins that collect and store run-off and precipitation from a small surrounding area, but do not connect to other surface waters. The question ERFAC deliberated was whether the same riparian management area protections are needed to protect these wetlands as is required for all significant wetlands.

Wetland functions and values are complex. The department does not currently have research and/or monitoring information to reliably assess the effectiveness of significant wetland protections under the Forest Practices Act. Therefore, ERFAC recommended the department develop monitoring strategies that will include evaluating the effectiveness of the forest practice rules for significant and other wetlands. ERFAC further clarified that they did not intend that wetlands monitoring should have a priority over other monitoring.
Recommendation I: Incentives

Committee Support: Consensus

Ten members supported the recommendation (SB, JB (for JR), SC, JH, ML, BM, RS, JW, BY, JM)

Comments:
JM stated that his vote supporting this recommendation should not be construed as indicating his approval of Issue C: Basal Area Retention along Fish Use Streams.

Issue Question:
Are current forest practice incentive efforts achieving the desired result?

Recommendation:
The department should recommend to the Board of Forestry that the forest practice rules be modified, as necessary, to provide a broad range of incentives to improve fish habitat. It should be recognized that multiple methods are available to address protection issues related to ungulates (e.g. see Recommendation C and OAR 629-640-0110).

Additional information on this issue:
Stream habitat surveys conducted from 1991 to 2002 by the Oregon Department of Fish and Wildlife (ODFW) show that riparian forests under forestry, agricultural, or other management have lower numbers of instream wood pieces and lower volumes of instream wood than do reference stream reaches with mature riparian forests. The information for eastern Oregon represents both private and public lands. Where specific stream reaches are identified as lacking in large diameter trees, the active placement of key pieces of large wood can be an important tool for the creation and/or enhancement of fish habitat in the short-term. There may be opportunities to provide greater incentives for landowners to place large wood from riparian areas in streams where large wood is lacking (ODF and DEQ 2002, p. 58).

Fish bearing streams lacking structure would benefit from additional large wood in channels to improve habitat features. The live tree retention credit for improvement of fish-bearing streams (ORS 629-640-0110), commonly referred to as the ‘basal area credit incentive,’ allows operators incentives to place conifer logs in channels or to take other enhancement actions to create immediate improvements in fish habitat.

In June 2000, the U. S. Army Corps of Engineers (ACOE) determined that under the Clean Water Act, a permit is required for the placement of large wood and boulders for stream enhancement purposes. A Regional General Permit for Stream Restoration (RGP) was developed to streamline the process for projects within certain thresholds. The ACOE RGP does not allow the use of the ‘basal area credit incentive’ afforded by the Forest Practices Act. In lieu of the RGP, applicants wanting to use the basal area credit incentive would be required to submit
an individual permit, which can be a lengthy process that is not feasible as operators generally look for opportunities to place wood when an adjacent harvest operation is occurring. Since the federal interpretation that a permit is required under the Clean Water Act for the placement of wood, the numbers of projects have steadily decreased.

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Streamside shade in eastern Oregon can be provided through the establishment and maintenance of brush and non-merchantable trees. Active placement of large wood provides for immediate improvement of fish habitat. Thinning of densely stocked riparian conifer stands can accelerate the growth of trees for long-term large wood inputs. The intent of this recommendation is to provide incentives that will encourage actions that will accelerate reaching the desired future condition. ERFAC further specified that the department should develop a range of options while ensuring that both the short- and long-term overall riparian function is maximized.
Recommendation J: Statewide Riparian Policy; Wild and Domestic Ungulates

Committee Support: Consensus

Ten members supported the October 30, 2002 recommendation (SB, JB (for JR), SC, JH, ML, BM, RS, JW, BY, JM). ERFAC then requested that ODF redraft the recommendation for increased clarity. See the following discussion for more information.

Issue Question:

Is the presence or absence of ungulate activity (domestic and wild) in riparian management areas having an influence on whether or not current forest practice rules and voluntary measures are resulting in, or are likely to result in, the attainment of a desired future condition?

Recommendation approved by ERFAC on October 30, 2002 ERFAC:

Urge the Board of Forestry to provide a recommendation to the Statewide Riparian Policy Group concerning the impacts of both wild and domestic ungulates to forested eastside RMAs. The recommendation should discuss the roles of other regulatory and land-use agencies concerning the maintenance and enhancement of high-quality riparian areas.

Additional information on this issue:

Ungulate activity within the riparian area has the potential to degrade vegetation (e.g. trees, shrubs and herbs) that contributes to riparian functions. Some members of the ERFAC expressed the opinion that achieving the desired future condition may not be possible where ungulate activity is extremely concentrated or inappropriately managed. Forest management and the grazing of ungulates commonly occurs concurrently on eastern Oregon forestlands. Findings from ODF monitoring data included the observation that because of this, it can be difficult to evaluate the effectiveness of the Forest Practices Act in meeting stated protection goals since grazing activities may be impacting riparian conditions as well.

The live tree retention credit for improvement of Type F streams4, OAR 629-640-0110, provides an incentive for operators who implement stream enhancement projects, including the management of ungulates by fencing-off riparian areas or the establishment of off-channel watering sites. Some members of the ERFAC were in favor of rewarding landowners that manage their lands to minimize adverse consequences caused by both domestic and wild ungulates. An option that was discussed during the ERFAC process as an incentive to manage ungulate activity appropriately included alternative basal area targets for eastern Oregon riparian areas in the range of 30-35% of growth basal area (see Recommendations C, D, and I above). Built into this option was an understanding that the following conditions would need to be

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4 These projects are approved by the department through consultation with the Department of Fish and Wildlife. Basal area credit is given toward meeting the live tree requirements within the riparian management areas. The basal area credit is negotiated among the department, operator, and Department of Fish and Wildlife. In granting a basal area credit, the standing tree basal area retained within riparian management areas of Type F streams shall not be reduced to less than the active management targets shown in Table 2 or 3 in the current rules, as applicable. For small Type F streams in the Eastern Cascade and Blue Mountain geographic regions, the live conifer tree basal area may be reduced to 30 square feet for the active management target. The remaining portion of the basal area requirement must come from snags, dying or recently dead or dying trees, or hardwood trees, if available in the riparian management area.
present in order for alternative targets to be applicable and that any management plan for ungulates would need to be tailored to the local conditions:

Existing understory vegetation (grasses, shrubs, non-merchantable trees) retained along the stream must have a high likelihood to persist over time, and is expected to provide desirable levels of all riparian functions other than large wood. Some active wood placement may be needed to meet all the riparian needs for the short-term.

ERFAC discussed the idea that a variety of management strategies could be used to achieve the desired future condition, and that fencing alone may not always be the most successful means of protecting streamside vegetation from ungulate activity. ERFAC discussions also brought out the idea that since the Forest Practices Act is focused primarily on forestry activities, it has a limited and mostly indirect role in ungulate management. Other regulatory and land-use agencies have more direct roles in managing domestic and wild ungulate activities affecting riparian areas, and a coordinated riparian management policy is likely needed if the goal is to address the management of domestic and wild ungulates in eastern Oregon forests.

Oregon’s Statewide Riparian Management Policy directs agencies to:

- Coordinate the implementation of agency programs that affect riparian areas, and establish regional riparian management priorities.
- Develop a landscape approach to managing streams and their associated riparian features.
- Foster understanding of the public value of riparian areas and how protecting riparian functions can benefit landowners and improve the value of private property.

Some members of the ERFAC stressed that both domestic and wild ungulates be taken into account, and that a range of management strategies be considered. ERFAC reached consensus at the October 30, 2002, meeting on the recommendation described earlier in this section. At that point, the committee requested that ODF redraft the recommendation so that the intent would be clearer to the Board of Forestry. Also, ODF subsequently noted that the ad hoc Statewide Riparian Policy Management Group had reached its conclusion and was no longer meeting. ODF discussed the issue with ERFAC members in the following months. The members appeared to agree on the general concept that the impact of domestic and wild ungulates is an important factor to be considered for eastside forests. However, in the time available, ODF was not able to find common ground for specific language in a redrafted recommendation. Focusing on the areas of agreement and on the absence of the Statewide Riparian Management Policy Group, ODF supports the following redraft of this recommendation:

**Recommendation (as modified by ODF at the request of ERFAC on October 30, 2002):**

The impact of domestic and wild ungulates is an important factor to be considered in managing eastside riparian forests. The Oregon Forest Practices Act and the Oregon Department of Forestry focus on forestry activities, with only a limited, indirect influence on ungulate management, while other agencies have direct roles in affecting ungulate management. Ungulate management strategies should consider both wild and domestic ungulates and should be coordinated across agency jurisdictions, consistent with the Statewide Riparian Management Policy.
Recommendation K: Riparian Specialists

Committee Support: Consensus

Ten committee members supported Recommendation K (SB, JB (for JR), SC, JH, ML, BM, JM, RS, JW, BY).

Issue Question:

Are current forest practice rules flexible enough to ensure that forest operations near streams result in desirable outcomes while preventing and minimizing unintended negative consequences?

- Is the use of site specific plans encouraged, is there adequate support for them, and are they consistent with the rules?
- Are there adequate incentives for enhancing RMAs (e.g., “promise” of future harvest opportunity; basal area credits)?
- Is there adequate guidance?

Recommendation:

The department should designate at least one riparian specialist for each district in eastern Oregon to inventory and prepare riparian prescriptions for operators and landowners.

Additional Information:

Information provided by the Oregon Department of Forestry and ERFAC members indicated that many eastside landowners are reluctant to manage within RMAs; they harvest up to the RMA boundary, but often are not willing to get closer to the stream. The committee proposed that one reason for this was that these landowners see riparian prescriptions as complex, requiring time and resources that they do not have. To address this situation, the committee recommended that the department designate three riparian specialists in eastern Oregon, one for each department district that administers the Forest Practices Act.

The role of the riparian specialists would be to provide information landowners could use to make riparian management decisions within the framework of the Forest Practices Act and to help the landowner implement the decisions. The specific duties of the riparian specialists would be to help landowners determine current RMA conditions (basal area levels, for example), to determine what management options are available, and to help lay out the prescription on the ground (marking trees to be harvested, for example).
Recommendation L: Training for Landowners, Operators, and the Public

Committee Support: Consensus

Ten committee members supported Recommendation L (SB, JB (for JR), SC, JH, ML, BM, JM, RS, JW, BY).

Issue Question:

Are mechanisms/opportunities for landowner training adequate to achieve high levels of compliance?

Recommendation:

The department is encouraged to emphasize Forest Practices Act training and education opportunities for landowners, operators, and the public.

Additional Information:

The effectiveness of the Oregon Forest Practices Act depends upon thoughtful rule development and administration. However, this is only the part of the process. The next step involves landowners and operators who make the management decisions and do the on-the-ground work. To do their part, landowners and operators must be familiar with the Forest Practices Act requirements. With this in mind, ERFAC recommended that the department emphasize training on Forest Practices Act requirements for landowners and operators. In addition, ERFAC determined that the it is important for the public to be informed on this subject as well, and recommended that the department help make that happen.
Recommendation M: Training for Forest Practices Foresters

Committee Support: Consensus

Ten committee members supported Recommendation M (SB, JB (for JR), SC, JH, ML, BM, JM, RS, JW, BY).

Issue Question:

Are mechanisms/opportunities for landowner training adequate to achieve high levels of compliance?

Recommendation:

The department is encouraged to emphasize forest practices forester training to ensure compliance and consistency with the Forest Practices Act.

Additional Information:

Forest practices foresters (FPFs) with the Oregon Department of Forestry are a key link in communicating elements of the Forest Practices Act to landowners and operators. ERFAC members expressed concern that in some circumstances, administration of Forest Practices Act requirements seemed to vary among FPFs. For example, information from the Oregon Department of Forestry and from some committee members indicated that some eastside FPFs actively promote site specific plans for management in RMAs, while others see the plans as tools to be used only in rare or unexpected circumstances. One reason for this could be a lack of clear direction from the department on the expected role of site specific plans. With all of this in mind, ERFAC recommended that the department emphasize training of FPFs to help ensure correct and consistent administration of Forest Practices Act requirements.
APPENDIX A

EXECUTIVE ORDER No. EO 99-01
EXECUTIVE ORDER NO. EO 99-01

THE OREGON PLAN FOR SALMON AND WATERSHEDS

The purpose of the Oregon Plan for Salmon and Watersheds (the "Oregon Plan") as stated in the Plan and reaffirmed in this Executive Order is to restore Oregon's wild salmon and trout populations and fisheries to sustainable and productive levels that will provide substantial environmental, cultural, and economic benefits and to improve water quality. The Oregon Plan is a long-term, ongoing effort that began as a focused set of actions by state, local, tribal and private organizations and individuals in October of 1995. The Oregon Plan first addressed coho salmon on the Oregon Coast, was then broadened to include steelhead trout on the coast and in the Lower Columbia River, and is now expanding to all at-risk wild salmonids throughout the state. The Oregon Plan addresses all factors for decline of these species, including watershed conditions and fisheries, to the extent those factors can be affected by the state. The Oregon Plan was endorsed and funded by the Oregon Legislature in 1997 through Oregon Senate Bill 924 (1997 Or. Laws, ch. 7) and House Bill 3700 (1997 Or. Laws, ch. 8). The Oregon Plan is described in two principal documents: "The Oregon Plan," dated March 1997, and "The Oregon Plan for Salmon and Watersheds, Supplement I -- Steelhead," dated January 1998. As used in this Executive Order, the Oregon Plan also incorporates the Healthy Streams Partnership (Oregon Senate Bill 1010, 1993 Or. Laws, ch. 263).

The Oregon Plan is a cooperative effort of state, local, federal, tribal and private organizations and individuals. Although the Oregon Plan contains a strong foundation of protective regulations -- continuing existing regulatory programs and speeding the implementation of others -- an essential principle of the Plan is the need to move beyond prohibitions and to encourage efforts to improve conditions for salmon through non-regulatory means. Many of the most significant contributions to the Oregon Plan are private and quasi-governmental efforts to protect and restore salmon on working landscapes, including efforts by watershed councils.

Salmon and trout restoration requires action and sacrifice across the entire economic and geographic spectrum of Oregon. The commercial and sport fishing industries in Oregon have been heavily affected by complete or partial closures of fisheries. The forest industry operates under the Oregon Forest Practices Act, and has contributed substantially to salmon recovery through habitat restoration projects on private lands and by funding a large part of the state recovery efforts. The agriculture and mining industries are also taking actions that will protect and restore salmon and trout habitat and improve water quality (including financial support of restoration efforts by the mining industry). Urban areas are developing water conservation programs, spending funds for wastewater treatment improvements to reduce point source pollution, reducing non-point source pollution and reducing activities that degrade riparian areas.
All citizens of Oregon share responsibility for declining populations of wild salmon and trout, and it is important that there be both a broad commitment to reversing these historic trends and a sense that the burdens of restoration are being shared by all of society.

It is also important that there be independent scientific oversight of the Oregon Plan. This oversight is being provided by the Independent Multidisciplinary Science Team (IMST), established under Oregon Senate Bill 924 (1997 Or. Laws, ch. 7). Additional legislative oversight for the Oregon Plan is being provided by the Joint Legislative Committee on Salmon and Stream Enhancement (the "Joint Committee").

Under the federal Endangered Species Act (ESA) the U.S. Fish & Wildlife Service (F&WS) and the National Marine Fisheries Service (NMFS) are responsible for identifying species that are threatened or endangered, and for developing programs to conserve and recover those species. F&WS and NMFS have now listed salmonids under the ESA on the entire Oregon Coast, the lower Columbia River (including most of the Portland metropolitan area), the Klamath River basin, and in the upper Columbia and Snake River basins. More listings are expected within the next year.

To date, the F&WS and NMFS generally have not had the resources to develop and implement effective recovery plans for fisheries. In addition, in many areas a large proportion of the habitat that listed salmonids depend on is located on private lands, where the regulatory tools under the ESA are relatively ill-defined and indirect. Finally, federal agencies alone, even if they take an active regulatory approach to recovery, will not restore listed salmonids. The federal ESA may work to prohibit certain actions, but there is simply too much habitat on private lands for restoration to succeed without pro-active involvement and incentives for individuals, groups, and local governments to take affirmative actions to restore habitat on working landscapes.

In April, 1997 the State of Oregon and NMFS entered into a Memorandum of Agreement (MOA) under which the State agreed to continue existing measures under the March 1997 Oregon Plan and to take certain additional actions to protect and restore coho salmon on the Oregon Coast. On May 6, 1997, NMFS determined that the Oregon Coast Evolutionarily Significant Unit (ESU) of coho salmon did not warrant listing as a threatened or endangered species under the ESA.

On June 2, 1998, the U.S. District Court for Oregon ordered NMFS to reconsider its decision without taking into account any parts of the Oregon Plan or MOA that are not "current enforceable measures." The U.S. District Court for Oregon also held that the MOA was speculative, due to the fact that it provided for termination by either party on thirty days notice, and that therefore the MOA could not be considered by NMFS in its listing decision.
Under court order, NMFS reconsidered its decision without taking into account the application in the future of the harvest and hatchery measures contained in the Oregon Plan, or the habitat improvement programs being undertaken under the Oregon Plan, or the commitments made by the State of Oregon in the MOA for improvement of applicable habitat measures. Accordingly, NMFS listed Oregon Coast coho as threatened under the ESA on or about October 2, 1998.

The MOA provided for the State of Oregon to take actions necessary to ensure that Oregon Coast coho did not warrant listing as a threatened or endangered species under the federal ESA. Now that Oregon Coast coho are listed as a threatened species as a result of the U.S. District Court's order, the central purpose of the MOA has been eliminated. Due to the uncertainties created by the District Court's decision and the increasing extent of salmonids listed or proposed for listing under the federal ESA, it is important that the status of the State of Oregon's substantive commitments under the MOA and the purpose of the Oregon Plan be clarified.

Through this Executive Order, the State of Oregon reaffirms its intent to play the leading role in protecting and restoring Oregon Coast coho and other salmonids through the implementation of the Oregon Plan. This Executive Order provides the framework and direction for state agencies to implement (to the extent of their authorities) the Oregon Plan in a timely and effective manner. This Executive Order also provides a framework for extending the state's efforts beyond a focus on Oregon Coast coho, to watersheds and fisheries statewide. Consistent with the principle of adaptive management, this Order applies the experience gained to date in implementing the Oregon Plan to provide additional detailed direction to state agencies. Finally, this Executive Order establishes a public involvement process to prioritize continuing efforts under the Oregon Plan.

NOW THEREFORE, IT IS HEREBY ORDERED AND DIRECTED:

(1) Overall Direction

(a) Agencies of the State of Oregon will, consistent with their authorities, fully implement the state agency efforts described in the Oregon Plan and in this Executive Order.

(b) The overall objective for state agencies under the Oregon Plan and this Executive Order is to protect and restore salmonids and to improve water quality.

(c) The Governor will, in cooperation with the Joint Committee, IMST, affected state agencies, watershed councils, and other affected local entities and persons develop and implement a process to set biological and habitat goals and objectives to protect and restore salmonids on a basin or regional basis as soon as practicable. Once these goals and objectives are established, they will be used by state agencies to evaluate their regulatory and non-
regulatory programs and measures relating to the protection and restoration of salmonids. Through this on-going evaluation, state agencies will determine any changes to their programs or measures that may be necessary to meet the biological and habitat goals and objectives. In the interim, the following objectives in subsections (d) and (e) shall apply to agencies' implementation of the Oregon Plan and this Executive Order.

(d) Actions that state agencies take, fund and/or authorize that are primarily for a purpose other than restoration of salmonids or the habitat they depend upon will, considering the anticipated duration and geographic scope of the actions:

(A) to the maximum extent practicable minimize and mitigate adverse effects of the actions on salmonids or the habitat they depend on; and

(B) not appreciably reduce the likelihood of the survival and recovery of salmonids in the wild.

(e) State agencies will take, fund and/or authorize actions that are primarily for the purpose of restoring salmonids or the habitat they depend upon, including actions implementing the Oregon Plan, with the goal of producing a conservation benefit that (if taken together with comparable and related actions by all persons and entities within the range of the species) is likely to result in sustainable population levels of salmonids in the foreseeable future, and in population levels of salmonids that provide substantial environmental, cultural and economic benefits to Oregonians in the long term.

(f) With the broadening of the Oregon Plan, prioritizing all agency actions according to coho core areas is no longer appropriate. Each state agency participating in the Oregon Plan, in consultation with ODFW and other partners involved in the implementation of the Plan and through a public involvement process, will modify their existing work programs in the Oregon Plan to prioritize agency measures to protect and restore salmonids in a timely and effective manner. The work programs will continue to identify key specific outcomes, refine and improve designations of priority areas, and establish completion dates. These modifications will be submitted to the Governor, the Joint Committee, and to the appropriate boards and commissions as soon as possible, but in no event later than June 1, 1999. Progress reports on action plans will be submitted to the Governor, the Joint Committee, and to the appropriate boards and commissions on an annual basis. In prioritizing their efforts, state agencies shall consider how to maximize conservation benefits for salmonids and the habitat they depend on within limited resources and whether their actions are likely to increase populations of salmonids in the foreseeable future.
(g) State agencies will work cooperatively with landowners, local entities and other persons taking actions to protect or restore salmonids.

(h) As the Oregon Plan grows in geographic scope and in intensity of activity, there is a growing need to streamline and prioritize state agency activity at the regional level. One proposal has been to organize state natural resource agency field operations along hydrologic units. Therefore, state agencies will consider this proposal and, through the collective efforts of state agency directors, develop an organization plan that focuses state agency field effort on the activities and areas of highest priority under the Oregon Plan.

(i) State agencies will continue to encourage and work with agencies of the U.S. government to implement the federal measures described in the Oregon Plan. In addition, the state agencies will work with the federal government to develop additional means of protecting and restoring salmonids. Where appropriate, state agencies will request that federal agencies obtain incidental take permits under Section 7 of the federal ESA for state actions that are funded or authorized by a federal agency.

(j) State agencies will help support efforts to evaluate watershed conditions, and to develop specific strategic plans to provide for flood management, water quality improvement, and salmonid restoration in basins around the state, including the Willamette basin through the Willamette Restoration Initiative.

(k) The IMST will continue to provide oversight to ensure the use of the best scientific information available as the basis for implementation of and for adaptive changes to the Oregon Plan. State agencies will ensure that the IMST receives data and other information reasonably required for its functions in a timely manner. The Governor's Natural Resources Office (GNRO) has requested that the IMST's initial priority be review of the freshwater habitat needs of coho and the relationship between population levels, escapement levels, and habitat characteristics. The GNRO also will continue to request that the IMST annually review monitoring results and identify where the Oregon Plan warrants change for scientific or technical reasons and make recommendations to the appropriate agency on those adjustments that appear necessary. Agencies will report their responses to any recommendations by the IMST to the Governor and to the Joint Committee. Any other changes identified by the IMST as necessary to achieve properly functioning riparian and aquatic habitat conditions required to protect and restore salmonids will be forwarded to the appropriate governmental entity for its consideration of the adoption of new, changed, or supplemental measures as rapidly as possible while providing for public involvement. Each state agency, by June 1, 1999, will ratify a monitoring team charter through an interagency memorandum. A draft of the charter is contained in the 1998 Oregon Plan Annual Report.
(l) Monitoring is a key element of the Oregon Plan. Each state agency will actively support the monitoring strategy described in the Oregon Plan. Each affected agency will participate on the monitoring team to coordinate activities and integrate analyses. Each agency will implement an appropriate monitoring program to assess the effectiveness of their programs and measures in meeting the objectives set forth in the Oregon Plan on an annual basis. In addition, agencies with regulatory programs that are included in the Oregon Plan will determine levels of compliance with regulatory standards and identify and act on opportunities to improve compliance levels.

(m) If information gathered regarding the effectiveness of measures in the Oregon Plan shows that existing strategies within state control are not achieving expected improvements and objectives, the agency(ies) responsible for those measures will seek appropriate changes in their regulations, policies, programs, measures and other areas of the Oregon Plan, as required to protect and restore coho and other salmonids. Such modification or supplementation will be done as rapidly as possible, consistent with public involvement.

(n) Agencies are using geographically-referenced data in their efforts under the Oregon Plan, and will be using Geographic Information Systems (GIS) in the analysis of these data. In doing so, the State GIS Plan, developed by the Oregon Geographic Information Council (OGIC) (see Executive Order 96-40) will be followed, with specific adherence to the Plan guidance on data documentation, coordination and data sharing. The agency with primary responsibility for gathering and updating the specific data will be responsible for meeting the requirements of the Plan, and to ensure coordination with OGIC, the State Service Center for GIS and other cooperating agencies. In addition, state agencies will cooperate with the Governor’s Watershed Enhancement Board (GWEB), Soil and Water Conservation Districts (SWCDs), local watershed councils, landowners and others in making these essential data available.

(o) Geographically-based strategies to assess and achieve habitat needs and adequate escapement levels will be used, and the state agencies will continue with the development of standardized watershed assessment protocols, including a cumulative effects assessment. State agencies will also continue with the development of habitat restoration guides to evaluate and direct habitat restoration efforts.

(2) Continuation and Expansion of Existing Efforts. Without limiting the generality of section (1)(a) of this Executive Order, the following subsections of this Executive Order describe some of the many efforts in the Oregon Plan where the initial phase of work has been completed, and where efforts will be continued.

(a) The Oregon Fish & Wildlife Commission (OFWC), the Oregon Department of Fish & Wildlife (ODFW), and the Pacific Fishery Management Council (PFMC) are managing ocean
and terminal fisheries according to the measures set forth in the Oregon Plan (ODFW I-A.1 and III-A.1). These measures set a maximum mortality rate (resulting from other fisheries) for any of four disaggregated stocks of coho of fifteen percent (15%) under poor ocean conditions. In 1997, the mortality rate from harvest is estimated to have been between nine and eleven percent (9-11%). ODFW and OFWC will continue these measures in state waters, and will actively support continued implementation of the ocean harvest measures by the PFMC (Amendment 13 to the Council's salmon management plan) until and unless a different management regime agreeable to NMFS is adopted.

(b) The OFWC and ODFW will ensure that the fish hatchery measures set forth in the Oregon Plan are continued by the OFWC and ODFW. ODFW is marking all hatchery coho on the Oregon Coast. This marking will allow increased certainty in estimating hatchery stray rates beginning in 1999. Available data on hatchery stray rates for coho and steelhead are being provided to NMFS on an annual basis. The number of hatchery coho released is estimated to have been 1.7 million in 1998 -- substantially below the level called for in the Oregon Plan. This number will be reduced to 1.2 million in 1999. In addition, ODFW has, and will continue to provide annual reports regarding: (i) the number of juvenile hatchery coho that are released by brood year, locations and dates of release, life stage, and broodstock origin; (ii) the number of adult coho taken for broodstock for each hatchery, the location and date of collection, and the origin (hatchery or natural); (iii) the number of hatchery coho estimated to have spawned in natural habitat by basin; (iv) the estimated percentage of hatchery coho in the total natural spawning population; and (v) the mortality of naturally-spawning coho resulting from each fishery. NMFS may provide comments about hatchery programs affecting coho to ODFW, with any concerns to be resolved between NMFS and ODFW.

(c) In addition to recent modifications to hatchery practices and programs, a new vision is needed for how Oregon will utilize hatcheries in the best and most effective manner. Therefore, the ODFW and the OFWC shall engage in a process to create a strategic plan for fish hatcheries in Oregon over the next decade (including state and federally-funded hatcheries, private hatcheries, and the STEP program). The essential elements of this process are as follows: (i) Impartial analysis -- conduct an impartial analysis of the scientific bases, and the social and economic effects of Oregon hatchery programs utilizing existing analyses and review where feasible, but conducting new analyses if necessary; (ii) Review the Wild Fish Management Policy (WFMP) -- because the future plan for hatcheries in Oregon is dependent on implementation of the WFMP, ODFW shall conduct a science and stakeholder review to determine if this significant policy should be revised and shall make any revision by July 2000; (iii) Frame alternative strategies -- convene a group of stockholders to frame alternative strategies, including outcomes and descriptions, of how hatcheries will be used in Oregon over the next decade (these strategies will address the use of hatcheries for wild fish population recovery including supplementation, research and monitoring, public education, and sport and
commercial fishing opportunities); (iv) Public review and selection of a strategy -- the OFWC shall, after public review and comment, adopt a strategic plan to guide development of future hatchery programs, incorporating the strategy developed and adopted in accordance with subpart (iii) of this paragraph.

(d) Criteria and guidelines directing the design of projects that may affect fish passage have been established in a Memorandum of Understanding (MOU) between the Oregon Department of Transportation (ODOT), ODFW, the Oregon Department of Forestry (ODF), the Oregon Department of Agriculture (ODA), the Division of State Lands (DSL) and the Federal Highway Administration. These guidelines apply to the design, construction and consultations of projects affecting fish passage. Under the MOU, projects requiring regulatory approvals that follow these criteria and guidelines are expedited. Oregon agencies will continue to provide technical assistance to ensure that the criteria and guidelines are applied appropriately in restoration projects, as well as any other projects that may affect fish passage through road crossings and similar structures. ODFW will work with state agencies, local governments, and watershed councils to ensure that Oregon's standards for fish passage set forth in Exhibit A to the MOU are understood and are implemented.

(e) Fish presence, stream habitat, road and culvert surveys have been conducted for roads within ODOT jurisdiction and county roads in coastal basins, the Lower Columbia basin, the Willamette basin, and the Grande Ronde/Imnaha basins. Among the results of these surveys is the finding that culvert barriers to fish passage affect a substantial quantity of salmonid habitat. For example, surveys of county and state highways in western Oregon found over 1,200 culverts that are barriers to passage. As a result, ODOT is placing additional priority on restoring fish access. For 1998, ODOT repaired or replaced 35 culverts restoring access to 101 miles of salmonid habitat. For 1999, the Oregon Transportation Commission will be asked to fund approximately $4.0 million for culvert modification. ODOT and the Commission will continue to examine means to speed restoration of fish passage and to coordinate priorities with ODFW.

(f) Draft watershed assessment protocols have been developed and are being field tested. Beginning in 1999, SWCDs, watershed councils and others will be able to use the protocols as the basis for action plans to identify and prioritize opportunities to protect and restore salmonids. Watershed action plans have already been completed in a number of basins including the Rogue, Coos, Coquille and Grande Ronde. State agencies will work to support these watershed assessments and plans to the maximum extent practicable. Where watershed action plans have been developed under the protocols, GWEB will ensure that projects funded through the Watershed Improvement Grant Fund are consistent with watershed action plans, and other state agencies will work with SWCDs and watershed councils to ensure that activities they authorize, fund or undertake are consistent with watershed action plans to the maximum extent practicable.
(g) The State of Oregon has developed interim aquatic habitat restoration and enhancement guidelines for 1998. State agencies involved with restoration activities (ODFW, ODF, DSL, ODA, DEQ, and GWEB) will continue to develop and refine the interim guidelines for final publication in April 1999. The guidelines will be applied in restoration activities funded or authorized by state agencies. The purpose of the guidelines will be to define aquatic restoration and to identify and encourage aquatic habitat restoration techniques to restore salmonids.

(h) ODA and ODF have each entered into a Memorandum of Understanding with the Oregon Department of Environmental Quality relating to the development of Total Maximum Daily Loads (TMDLs) and Water Quality Management Area Plans (WQMAPs). ODA will adopt and implement WQMAPs (through the Healthy Streams Partnership) and ODF will review the adequacy of forest practices rules to meet water quality standards. ODF and ODA will evaluate the effectiveness of these measures in achieving water quality standards on a regular basis and implement any changes required to meet the standards.

(i) Agencies are implementing a coordinated monitoring program, as described in the Oregon Plan. This program includes technical support and standardized protocols for watershed councils, stream habitat surveys, forest practice effectiveness monitoring, water withdrawal monitoring, ambient water quality monitoring, and biotic index studies, as well as fish presence surveys and salmonid abundance and survival monitoring in selected subbasins. State agencies are also working to coordinate monitoring efforts by state, federal, and local entities, including watershed councils. State agencies will work actively to ensure that the monitoring measures in the Oregon Plan are continued.

(j) GWEB has put into place new processes for identifying and coordinating the delivery of financial and technical assistance to individuals, agencies, watershed councils and soil and water conservation districts as they implement watershed restoration projects to improve water quality and restore aquatic resources. Over $25 million has been distributed for watershed restoration projects in the last ten years. During the present (1997-99 biennium) GWEB has awarded over $12 million dollars in state and federal funds for technical assistance and watershed restoration activities to implement the Oregon Plan. GWEB and state agencies will continue to seek financial resources to be allocated by GWEB for watershed restoration activities at the local and statewide levels.

(k) State agencies will continue to encourage, support and work to provide incentives for local, tribal, and private efforts to implement the Oregon Plan. In addition, state agencies will continue to provide financial assistance to local entities for projects to protect and restore salmonids to the extent consistent with their budgetary and legal authorities, and consistent with their work programs in the Oregon Plan. To the maximum extent practicable, state agencies will
also provide technical assistance and planning tools to provide local conservation groups to assist in and target watershed restoration efforts. These efforts (during 1996 and 1997) are reported in "The Oregon Plan for Salmon and Watersheds: Watershed Restoration Inventory, 1998." Just a few of the important efforts that have been completed include:

(A) Eighty-two watershed councils have joined with forty-five Soil and Water Conservation Districts as well as private and public landowners to implement on-the-ground projects to protect and restore salmonids. During 1996 and 1997, a reported $27.4 million was spent on 1,234 watershed restoration projects on non-federal lands. Both the amount spent and the number of projects represent significant increases (of over 300 percent) over prior years. In 1996-97, watershed councils, SWCDs and other organizations and individuals completed: (i) 138 stream fencing projects, involving at least 301 miles of streambank; (ii) 196 riparian area planting projects, involving at least 111 miles of streams; and (iii) 458 instream habitat improvement projects.

(B) Private and state forest landowners are implementing key efforts under the Oregon Plan, including the road risk and remediation program (ODF-1 and 2). Under this effort in 1996 and 1997, close to 4,000 miles of roads have been surveyed to identify risks that the roads may pose to salmonid habitat. As the risks are identified, they are then prioritized for remediation following an established protocol. Already, 52 miles of forest roads have been closed, 843 miles of road repair and reconstruction projects to protect salmonid habitat have been completed, and an additional 14 miles of roads have been decommissioned or relocated. In addition, 530 culverts have been replaced, upgraded or installed for fish passage purposes, improving access to a reported 146 stream miles.

(C) Organizations working in Tillamook County have developed the Tillamook County Performance Partnership. The Partnership is implementing the Tillamook Bay National Estuary Program by addressing water quality, fisheries, floodplain management and economic development in the county. Among the actions that the Partnership has already accomplished are: (i) the closure of seven miles of degraded forest roads and the rehabilitation of 469 miles of roads to meet current standards, at a cost of $18 million; (ii) the fencing of 53 miles of streambank, and the construction of three cattle bridges and 100 alternative cattle watering sites, at a cost of $214,000; and (iii) the completion of 24 instream restoration projects and 34 barbs protecting 4,200 feet of streambank, at a cost of $1.3 million dollars.

(D) The Confederated Tribes of the Grande Ronde Community of Oregon have completed a forest management plan that establishes standards for the protection of aquatic resources that are comparable to those found in the Aquatic Conservation Strategy of the Northwest Forest Plan.
(E) A combination of funding from the Oregon Wildlife Heritage Foundation and the National Fish and Wildlife Heritage Foundation (private, non-profit organizations) is providing support for seven biologists to design restoration projects. These projects are prioritized based on stream surveys, and are carried out with the voluntary participation and support of landowners. A ten-year monitoring plan has been funded and implemented to determine project effectiveness.

(F) The Oregon Cattlemen's Association has implemented its WESt Program that is designed to help landowners better understand their watersheds and stream functions through assessments and monitoring. The WESt Program brings landowners together along stream reaches, and offers a series of workshops, conducted on a site specific basis, free of charge. The workshops include riparian ecology, setting goals and objectives, Proper Functioning Condition (PFC), data collection and monitoring. Over 25 workshops have been held, with attendance ranging from 5 to 30 landowners per workshop. The WESt Program is sponsored by the Oregon Cattlemen's Association, DEQ, Oregon State University, and GWEB.

(G) Within the Tillamook State Forest road network 1,902 culverts have been replaced or added to improve road drainage and to disconnect storm water runoff from roads reducing stream sediment impacts. Additionally, some of these culverts also improved fish passage at stream crossings. In this process, ODF has also replaced six culverts with bridges improving fish passage to approximately four miles of stream. The Tillamook State Forest in conjunction with many partners, such as the Association of Northwest Steelheaders, GWEB, Simpson Timber Company, Tillamook County, the Fish America Foundation, Hardrock Construction Company, the Oregon Wildlife Heritage Foundation, the F&WS, the Oregon Youth Conservation Corps, Columbia Helicopters and Terra Helicopters, has also recently completed instream placement of over 400 rootwads, trees and boulders at a cost of $300,000 for habitat enhancement.

(3) **Key Agency Efforts.** Continuation and completion of the following state agency efforts is critical to the success of the Oregon Plan. State agencies will make continuation or completion (as appropriate) of the following efforts a high priority.

(a) The State of Oregon and the U.S. Department of Agriculture have entered into a Conservation Reserve Enhancement Program (CREP). This cost-share program, one of the first of its kind, will be used to reduce the impacts of agricultural practices through water quality and habitat improvement. The objectives of the CREP are to: (i) provide incentives for farmers and ranchers to establish riparian buffers; (ii) protect and restore at least 4,000 miles of stream habitat by providing up to 95,000 acres of riparian buffers; (iii) restore up to 5,000 acres of wetlands that will benefit salmonids; and (iv) provide a mechanism for farmers and ranchers to comply with Oregon's Senate Bill 1010 (1993 Or. Laws, ch. 263).
(b) ODF will work with non-industrial forest landowners to administer the Stewardship Incentive Program and the Forest Resources Trust programs to protect and restore riparian and wetland areas that benefit salmonids.

(c) The Oregon Board of Forestry will determine, with the assistance of an advisory committee, to what extent changes to forest practices are needed to meet state water quality standards and to protect and restore salmonids. A substantial body of information regarding the effectiveness of current practices is being developed. This information includes: (i) the IMST report regarding the role of forest practices and forest habitat in protecting and restoring salmonids; and (ii) a series of monitoring projects that include the Storms of 1996 study, a riparian areas study, a stream temperature study, and a road drainage study. Using this information, as well as other available scientific information including scientific information from NMFS, the advisory committee will make recommendations to the Board at both site and watershed scales on threats to salmonid habitat relating to sediment, water temperature, freshwater habitat needs, roads and fish passage. Based on the advisory committee's recommendations and other scientific information, the Board will make every effort to make its determinations by June 1999. The Board may determine that the most effective means of achieving any necessary changes to forest practices is through regulatory changes, statutory changes or through other programs including programs to create incentives for forest landowners. In the event that the Board determines that legislative changes are necessary to carry out its determinations, the Board will transmit any recommendations for such changes to the Governor and to the Joint Committee at the earliest possible date.

(d) Consistent with administrative rule, and statutory and constitutional mandates for the management of state forests, ODF State Forest management plans will include an aquatic conservation strategy that has a high likelihood of protecting and restoring properly functioning aquatic habitat for salmonids on state forest lands.

(e) ODF will present to NMFS a Habitat Conservation Plan (HCP) under Section 10 of the federal ESA that includes the Clatsop and Tillamook State Forests. ODF has already completed scientific review and has public review underway for this draft HCP. The scientific and public review comments will be considered by ODF in completing the draft HCP. The draft HCP will be presented to NMFS by June 1999. An HCP for the Elliott State Forest was approved by the U.S. Fish & Wildlife Service in 1995. In October of 1997, ODF and DSL forwarded the Elliott State Forest HCP to NMFS with the request that it be reviewed to determine whether it has a high likelihood of protecting and restoring properly functioning aquatic habitat conditions on state forest lands necessary to protect and restore salmonids. Based on discussions surrounding the NMFS review, ODF and DSL will determine what revisions, if
any, are required to the Elliott HCP and/or Forest Management Plan to ensure a high likelihood of protecting and restoring properly functioning aquatic habitat for salmonids.

(f) Before the OFWC adopts and implements fishery regulations that may result in taking of coho, ODFW will provide NMFS with all available scientific information and analyses pertinent to the proposed regulation where the harvest measures are not under the jurisdiction of the PFMC, including results of the Oregon Plan monitoring and evaluation program. This information, together with the proposed regulation and supporting analysis, will be provided at least two weeks prior to the OFWC's action, to give NMFS time to review and comment on the proposed regulations.

(g) ODFW will evaluate the effects of predation on salmonids, and will work with affected federal agencies to determine whether changes to programs and law relating to predation are warranted in order to protect and restore salmonids.

(h) Under Oregon Senate Bill 1010 (1993 Or. Laws, ch. 263), ODA will adopt Agricultural Water Quality Management Area Plans (AWQMAPs) for Tier I and Tier II watersheds by the end of 2002. The AWQMAPs will be designed and implemented to meet load allocations for agriculture needed to achieve state water quality standards. In addition, ODA will work with ODFW, DEQ, GWEB, SWCDs, federal agencies and watershed councils to determine to what extent additional measures related to achieving properly functioning riparian and aquatic habitat on agricultural lands are needed to protect and restore salmonids, giving attention first to priority areas identified in the Oregon Plan. In the event ODA is unable to reach a consensus regarding such measures, ODA will ask the IMST to review areas of substantive scientific disagreement and to make recommendations to ODA regarding how they should be resolved. In the event that legislative changes are needed to implement such measures, ODA will transmit any recommendations for such changes to the Governor and to the Joint Committee at the earliest possible date. In addition, any measures identified as needed by ODA will be implemented at the earliest practicable time.

(i) ODFW will expedite its applications for instream water rights and OWRD will process such applications promptly where flow deficits are identified as adversely affecting salmonids, and where such rights are not already in place. The Oregon Water Resources Department (OWRD) and the Oregon Water Resources Commission (OWRC) will also seek to facilitate flow restoration targeted to streams identified by OWRD and ODFW as posing the most critical low-flow barriers to salmonids. In addition, where necessary, OWRD will continue to work with the Oregon State Police to provide enforcement of water use. Where illegal water uses are identified, OWRD will ensure outcomes consistent with maintenance and restoration of flows.
(j) The Oregon Environmental Quality Commission (EQC) and DEQ will evaluate and will make every effort to utilize their authorities to continue to provide additional protection to priority areas (as determined under section 1(f) of this Executive Order), including in-stream flow protection under state law, and antidegradation policy under the federal Clean Water Act (including Outstanding Resource Waters designations and high quality waters designations).

(k) DSL has proposed to adopt changes to its Essential Salmonid Habitat rules that will provide additional protection for spawning and rearing areas of anadromous salmonids. In addition, ODFW and DSL will consult with the OWRC to determine where it is necessary to administratively close priority areas (including work under General Authorizations) to fill and removal activities in order to protect salmonids. DSL, ODFW, ODF and ODA also will work together to identify means of regulating the removal of organic material (such as large woody debris) from streams where such removal would adversely affect salmonids and would not be contrary to other agency mandates.

(l) DSL will seek the advice of the IMST regarding whether gravel removal affects gravel and/or sediment budgets in a manner that adversely affects salmonids.

(m) The Department of Land Conservation and Development (DLCD), and the Land Conservation and Development Commission (LCDC) will evaluate and, to the extent feasible, speed implementation of existing Goal 5 requirements for riparian corridors.

(n) DLCD, DEQ, ODF, ODA, ODFW, and DSL and their respective boards and commissions will evaluate and implement programs to protect and restore riparian vegetation for the purposes of achieving statewide water quality standards and protecting and restoring aquatic habitat for salmonids.

(o) DLCD, with the assistance of DSL and ODFW, and in consultation with coastal cities and counties, shall review the requirements of Statewide Planning Goal 16 as they pertain to estuarine resources important to the restoration of salmonids, and shall, report its findings to LCDC for its consideration.

(p) The Oregon State Police will work to facilitate the existing cooperative relationship with the NMFS Office of Law Enforcement, as well as to maintain cooperation with other enforcement entities, in order to enhance law enforcement, public awareness and voluntary compliance related to harvest, habitat and other issues addressed in the Oregon Plan.

(q) The Oregon Parks and Recreation Department will continue to work to provide information and education to the public on salmon and steelhead needs through park programs and interpretive aids.
(r) The Oregon Marine Board will work to ensure fish friendly boating and to develop boating facilities that protect salmonids.

(s) State natural resource agencies will continue, to the extent feasible, to support watershed councils by providing technical assistance to develop watershed assessments, restoration plans and to develop watershed priorities to benefit salmonids. In addition, state natural resource agencies will work on a larger watershed scale to develop basin-wide restoration priorities.

(4) Future Modifications; Public Involvement for the Oregon Plan Generally. The GNRO will solicit public comments and input from participants in the Oregon Plan regarding whether there are refinements or changes to the Plan and/or the organizational framework for implementing the Plan that are necessary or desirable based on the experience gained over the past three years, or resulting from the widespread listings and proposed listings of salmon and trout under the federal ESA. Based on this public involvement, the GNRO will provide a report and recommendations to the Governor and the Joint Committee regarding whether modifications are necessary to the Oregon Plan in order to protect and restore coho and other salmonids.

(5) Definitions. For purposes of this Executive Order:

(a) The "Oregon Plan" means the Oregon Coastal Salmon Recovery Initiative, dated March 1997, and the Steelhead Supplement, dated January 1998. "Oregon Plan," as used in this Order, is intended to be consistent with the definition of the Oregon Coastal Salmon Recovery Initiative in Oregon Senate Bill 924 (1997 Or. Laws, ch. 7), and to include the Healthy Streams Partnership (1993 Or. Laws, ch. 263).

(b) "Protect" has the meaning given in section (1)(d) of this Executive Order.

(c) "Restore" has the meaning given in section (1)(e) of this Executive Order. Restore necessarily includes actions to manage salmonids to provide for adequate escapement levels, and actions to increase the quantity and improve the quality of properly functioning habitat upon which salmonids depend.

(d) "Coho" means native wild coho salmon found in rivers and lakes along the Oregon Coast.

(e) "Salmonids" means native wild salmon, char and trout in the State of Oregon.
(6) Effective Date; Relation to Federal ESA. This Executive Order will take effect on the date that it is filed with the Secretary of State. The State of Oregon will continue to work with NMFS to determine the appropriate relationship between the Oregon Plan and NMFS's efforts under the federal ESA.

Done at Salem, Oregon, this 8th day of January, 1999.

/S/ John A. Kitzhaber, M.D.
GOVERNOR

ATTEST:

/S/
Suzanne Townsend
DEPUTY SECRETARY OF STATE
APPENDIX B

COMMITTEE CHARTER, WORK PLAN, AND DECISION PROTOCOL
Charter of the Eastside Riparian Function
Advisory Committee

Background and Purpose
Executive Order 99-01 signed by Oregon Governor Kitzhaber directed the Board of Forestry with the assistance of an advisory committee to determine what, if any, changes to forest practices are necessary to meet water quality standards and to protect and restore salmonids.

The thirteen member Forest Practices Advisory Committee on Salmon and Watersheds was formed and charged with making recommendations to the Board. The committee made specific recommendations to the Board of Forestry in August 2000. Ron Cease, Chair of the Committee, identified in his transmittal letter of August 14, 2000, to Chair David Gilbert and members of the Board of Forestry a specific follow-up task of directing the Department of Forestry “to work with interests in eastern Oregon to develop riparian measures for eastern Oregon forests.”

The Eastside Riparian Functions Advisory Committee (ERFAC) has been formed by the department and charged to address this task.

Parameters and Assumptions
The Board recognizes that forest practice rules, incentives, and voluntary measures are all important elements in an integrated effort to protect and restore Oregon’s fish habitat. Consistent with ORS 527.765, forest practice rules are to be designed to meet state water quality standards to the maximum extent practicable.

ERFAC recommendations may include regulatory or statutory changes, incentives and/or voluntary measures. To the extent possible, any recommendations for rule additions or revisions must consider and reflect the standards contained in ORS 527.714 (attachment 1).

The Committee will seek consensus about recommendations when possible and clearly articulate the range of views when consensus is not possible. Significant differences of opinion, if any, will be highlighted in the Committee’s report to the Board. Significant revisions to the Committee charter will be subject to department approval.

Charge for the Committee (Objectives)
Consistent with Executive Order 99-01, the mission and objectives of the Oregon Plan for Salmon and Watersheds, and in consideration of eastside riparian conditions, determine what, if any, modifications to forest practices that are associated with riparian functions are necessary to meet water quality standards and to protect and restore salmonid habitat in eastern Oregon. The committee shall give consideration to the following recommendation and options of the Forest Practices Advisory Committee report:

- Recommendation V—Changes needed to increase protection and restoration of riparian functions.
- Option 22—Manage Riparian Management Areas for Shade
- Option 26—Riparian Management Area Basal Area Targets and Management Prescriptions
- Option 38—Large Wood Inputs and Shade Functions for Small Perennial Type N Streams
- Option 62—Riparian Management Area Widths
- Option 63—Floodplain Protection
The Committee should consider questions such as:

- Are elements of Recommendation V and the listed options applicable?
- Are current stocking level targets within riparian management areas feasible?
- What are the forest health implications?
- Should stocking level targets be more reflective of site potential?
- What are the thermal loading implications that include other land uses?
- What are the effects of stream width and stream flow?
- What effect does riparian vegetation have on thermal loading?

Committee deliberations should result in specific recommendations to the Department and Board of Forestry.

The Committee will:

1. Determine the Committee’s decision-making process, work schedule, and meeting mechanics.
2. Develop a common understanding of the science, policy, and operational considerations for forest operations and riparian conditions on nonfederal lands in eastern Oregon.
3. Evaluate how well the forest practice rules meet water quality standards and protect and restore fish habitat in eastern Oregon using the best available information, including monitoring data, field evaluations, the IMST Eastern Oregon Resources Report, and other scientific information from state and federal agencies, universities, private entities, or other sources.
4. Building on the findings from the third charge in this list, and in the context of contributions from other land uses, determine if the combination of (a) current forest practice rules related to riparian functions and protection, and (b) forestry-related voluntary enhancement and protection measures, will achieve Oregon Plan recovery objectives. Where possible, evaluate the likelihood that the rules and measures will achieve the objectives.
5. Identify any additional practices or programs related to eastside riparian functions and protection that might be necessary to meet commitments to the Oregon Plan and Executive Order 99-01.
6. Consider the relative costs and benefits of additional practices identified in the fifth charge in this list. This discussion should include consideration of the relative impacts on landowners, the relative contributions of other land uses, and consideration of alternatives including non-regulatory approaches and alternatives which could achieve the desired level of protection and would be least burdensome to landowners.
7. Building on the work of the preceding charges in this list, recommend a package that is necessary to meet commitments in the Oregon Plan and Executive Order 99-01. If rule changes are recommended, develop recommendations that include a general consideration for the subsequent economic impact analysis as required by ORS 527.714. Identify limitations in data and recommend appropriate monitoring or research.
8. Complete evaluations and recommendations to the extent possible by October 2002 to present to the Department of Forestry and the Board of Forestry.
Membership, Roles, and Responsibilities

Chair
Directs the development of agendas, runs the meetings, and ensures that the minutes are correct and approved by the Committee.

Committee Members
Determine committee work schedule, analyze issues, network with others, provide input and guidance to staff, and make recommendations to the Department of Forestry and Board of Forestry.

Stan Benson, Consultant, Eastern Oregon Regional Forest Practices Committee (EORFPC) Representative, Hood River/Wasco Co.
Steve Courtney, Malhuer Lumber, EORFPC Representative, Grant Co.
John Howard, Union County Commissioner, Elected Official Representative, Union Co.
Marilyn Livingston, Public At Large Representative, Klamath Co.
Bob Messinger, Boise Cascade Corporation, Oregon Forest Industries Council Representative, Northeast Oregon Counties
Jason Miner, Oregon Trout, Environmental Representative, Statewide
Brad Nye, Confederated Tribes of Warm Springs, Tribal Representative.
John Rounds, Woodland Owner, Oregon Small Woodlands Association Representative, Crook Co.
Rex Storm, Associated Oregon Loggers (AOL), AOL Representative, Statewide
John Ward, Friends of the Greensprings, Conservation Representative, Klamath Falls
Berta Youtie, The Nature Conservancy, Conservation Representative, Union and Crook Co

Technical Staff
Provide technical and policy information and advice, answer questions on technical, policy and legal issues, and offer issue presentations to aid committee deliberation. Identify scientists and others that have information of value to the Committee and invite these parties to present information to the Committee. Provide logistical support.

The following staff will sit at the table to provide support:
Forest Practices Policy – Lanny Quackenbush, Department of Forestry
Forest Practices Policy – Jim Paul, Department of Forestry
Forest Practices Policy – Brad Knotts, Department of Forestry
Forest Practices Policy – Jo Emrick, Department of Forestry
Forest Practices Monitoring – Liz Dent, Department of Forestry
Committee Field Coordination – John Buckman, Department of Forestry
Plant Ecology – Fred Hall, Retired, US Forest Service Region 6
Forestry Science – Steve Fitzgerald, Oregon State University Extension Service
Fish and Wildlife Issues – Jon Germond, Department of Fish and Wildlife
Water Quality Issues – Tom Rosetta, Department of Environmental Quality
Administrative Support – Julie Welp, Department of Forestry
Logistical Support – Pat Rudisill, Department of Forestry
Other Scientific Disciplines – Selected as necessary

Other State and Federal Agency Participants
Provide technical and policy information and advice upon request of the Committee and answer Committee questions.

Citizen and Scientist Participants
Provide information and input to the Committee at specified times to be determined by the Committee.

Statement of Individual Commitment and Accountability: Working Guidelines
Working guidelines are statements of behavior, which, if mutually understood, accepted, and supported by members of a group or team, improve the flow of useful information and create a climate for increased effectiveness and enjoyment of work.

Members commit to participate actively and will strive to attend all meetings and field trips.

Members will foster collaborative discussion by:
• Listening actively and demonstrating that you understand.
• Making clear you are speaking for yourself or the group.
• Respecting the difference between fact and opinion.
• Avoiding jargon and “loaded” words.
• Remaining focused on the charges outlined in the ERFAC charter and refraining from pursuing additional issues or objectives.

Members will be respectful of a diversity of opinion and allow for an open, constructive dialogue.

Members will be sensitive to time constraints and keep remarks concise and to the point.

Members will focus on interests/ideas not on positions and persons.

Members will strive for seeking a range of information sources, recognizing that good information is needed for good decisions.

Members recognize that appropriate humor is important to enjoying the process and building a team and that inappropriate humor may have the opposite result.
ORS 527.714 Types of rules; procedure; findings necessary; rule analysis.

(1) The rulemaking authority of the State Board of Forestry under ORS 527.610 to 527.770 consists generally of the following three types of rules:
(a) Rules adopted to implement administration, procedures or enforcement of ORS 527.610 to 527.770 that support but do not directly regulate standards of forest practices.
(b) Rules adopted to provide definitions or procedures for forest practices where the standards are set in statute.
(c) Rules adopted to implement the provisions of ORS 527.710 (2), (3), (6), (8), (9), (10) and (11) that grant broad discretion to the board and that set standards for forest practices not specifically addressed in statute.
(2) When considering the adoption of a rule, and prior to the notice required pursuant to ORS 183.335, the board shall determine which type of rule described in subsection (1) of this section is being considered.
(3) If the board determines that a proposed rule is of the type described in subsection (1)(a) or (b) of this section, or if the proposed rule is designed only to clarify the meaning of rules already adopted or to make minor adjustments to rules already adopted that are of the type described in subsection (1)(c) of this section, rulemaking may proceed in accordance with ORS 183.325 to 183.410 and is not subject to the provisions of this section.
(4) If the board determines that a proposed rule is of the type described in subsection (1)(c) of this section, and the proposed rule would change the standards for forest practices, the board shall describe in its rule the purpose of the rule and the level of protection that is desired.
(5) If the board determines that a proposed rule is of the type described in subsection (1)(c) of this section, including a proposed amendment to an existing rule not qualifying under subsection (3) of this section, and the proposed rule would provide new or increased standards for forest practices, the board may adopt such a rule only after determining that the following facts exist and standards are met:
(a) If forest practices continue to be conducted under existing regulations, there is monitoring or research evidence that documents that degradation of resources maintained under ORS 527.710 (2) or (3) is likely, or in the case of rules proposed under ORS 527.710 (11), that there is a substantial risk of serious bodily injury or death;
(b) If the resource to be protected is a wildlife species, the scientific or biological status of a species or resource site to be protected by the proposed rule has been documented using best available information;
(c) The proposed rule reflects available scientific information, the results of relevant monitoring and, as appropriate, adequate field evaluation at representative locations in Oregon;
(d) The objectives of the proposed rule are clearly defined, and the restrictions placed on forest practices as a result of adoption of the proposed rule:
(A) Are to prevent harm or provide benefits to the resource or resource site for which protection is sought, or in the case of rules proposed under ORS 527.710 (11), to reduce risk of serious bodily injury or death; and
(B) Are directly related to the objective of the proposed rule and substantially advance its purpose;
(e) The availability, effectiveness and feasibility of alternatives to the proposed rule, including nonregulatory alternatives, were considered, and the alternative chosen is the least burdensome to landowners and timber owners, in the aggregate, while still achieving the desired level of protection; and

(f) The benefits to the resource, or in the case of rules proposed under ORS 527.710 (11), the benefits in reduction of risk of serious bodily injury or death, that would be achieved by adopting the rule are in proportion to the degree that existing practices of the landowners and timber owners, in the aggregate, are contributing to the overall resource concern that the proposed rule is intended to address.

(6) Nothing in subsection (5) of this section:
(a) Requires the board to call witnesses;
(b) Requires the board to allow cross-examination of witnesses;
(c) Restricts ex parte communications with the board or requires the board to place statements of such communications on the record;
(d) Requires verbatim transcripts of records of proceedings; or
(e) Requires depositions, discovery or subpoenas.

(7) If the board determines that a proposed rule is of the type described in subsection (1)(c) of this section, and the proposed rule would require new or increased standards for forest practices, as part of or in addition to the economic and fiscal impact statement required by ORS 183.335 (2)(b)(E), the board shall, prior to the close of the public comment period, prepare and make available to the public a comprehensive analysis of the economic impact of the proposed rule. The analysis shall include, but is not limited to:
(a) An estimate of the potential change in timber harvest as a result of the rule;
(b) An estimate of the overall statewide economic impact, including a change in output, employment and income;
(c) An estimate of the total economic impact on the forest products industry and common school and county forest trust land revenues, both regionally and statewide; and
(d) Information derived from consultation with potentially affected landowners and timber owners and an assessment of the economic impact of the proposed rule under a wide variety of circumstances, including varying ownership sizes and the geographic location and terrain of a diverse subset of potentially affected forestland parcels.

(8) The provisions of this section do not apply to temporary rules adopted by the board. [1996 c.9 s.16 (enacted in lieu of 527.713); 1999 c.1103 s.13]

Note: 527.714 was enacted into law by the Legislative Assembly but was not added to or made a part of ORS chapter 527 or any series therein by legislative action. See Preface to Oregon Revised Statutes for further explanation.
WORK PLAN OF THE EASTERN OREGON RIPARIAN
FUNCTIONS ADVISORY COMMITTEE

I. PURPOSE

The purpose of this project work plan is to outline the actions and work products requested from the Eastside Riparian Functions Advisory Committee (ERFAC) by the Department of Forestry and Board of Forestry. This work plan is an extension of the work completed by the Forest Practices Advisory Committee (FPAC) formed by the Board of Forestry through the direction of Executive Order 99-01. The end product of this work plan is a report that provides riparian function recommendations to the Board of Forestry that reflect the perspectives of eastside interests and the diversity and complexity of eastside riparian systems.

II. PROJECT IDENTIFICATION

The FPAC deliberations and subsequent “Recommendation V” were targeted primarily toward Oregon westside riparian systems. The FPAC acknowledged but was not able to comprehensively consider the biological, hydrological, and geological diversity of Oregon eastside riparian systems. With this in mind, the FPAC recommended that a separate effort be initiated to further develop this recommendation for specific application to the protection and enhancement of eastside riparian functions.

Specific issues for ERFAC deliberation:

- Identify aspects the following elements of the FPAC report that are applicable to eastside riparian systems:
  - Recommendation V—Changes needed to increase protection and restoration of riparian functions.
  - Option 22—Manage Riparian Management Areas for Shade
  - Option 26—Riparian Management Area Basal Area Targets and Management Prescriptions
  - Option 38—Large Wood Inputs and Shade Functions for Small Perennial Type N Streams
  - Option 62—Riparian Management Area Widths
  - Option 63—Floodplain Protection
The Committee should consider questions such as:

- Which elements are applicable?
- What modifications are needed?
- Where would elements of Recommendation V and the listed options be applicable?
- Are current stocking level targets within riparian management areas feasible?
- What are the forest health implications?
- Should stocking level targets be more reflective of site potential?
- What are the thermal loading implications that include other land uses?
- What are the effects of stream width and stream flow?
- What effect does riparian vegetation have on thermal loading?

III. COMMITTEE COMPOSITION

Field Coordinator: John Buckman, Pendleton, Oregon Department of Forestry
Committee Chair: John Howard
Committee Members:

**Eastern Oregon Regional Forest Practice Committee Representatives (2)**
- Stan Benson – Wasco and Hood River Counties
- Steve Courtney – Malheur Lumber Co. - John Day

**Forest Industry Representative (1)**
- Bob Messinger - Boise Cascade Corporation– La Grande

**Oregon Small Woodland Association (1)**
- John Rounds - Prineville

**Environmental – Conservation Representatives (3)**
- Jason Miner - Oregon Trout
- Berta Youtie – The Nature Conservancy
- John Ward – Friends of the Greensprings

**Local Government Representative (1)**
- John Howard - Union County Commissioner

**Tribal Representative (1)**
- Brad Nye, Confederated Tribes of Warm Springs

**Associated Oregon Loggers Representative (1)**
- Rex Storm - AOL

**Public at Large (1)**
- Marilyn Livingston - Bonanza

Technical Staff:

**Oregon Department of Forestry**
- Policy Unit Manager – Gregg Cline
- Hydrologist - Jim Paul
- Aquatic Analyst – Jo Emrick
- Silvicultural Analyst- Brad Knotts

**Oregon State University- Extension Service** – Steve Fitzgerald

**Oregon Department of Fish and Wildlife** – Jon Germond

**Department of Environmental Quality** – Tom Rosetta

**Plant Ecology** – Fred Hall

**Other Scientific Disciplines** – As necessary
IV. PROJECT WORK PLAN ELEMENTS

1. Draft project work plan.

2. Finalize committee members.

3. Hold first meeting - select Committee Chair, form guiding principles for committee deliberations/behaviors and how deliberations are finalized as recommendations.

4. Conduct at least two (preferably three) field tours for committee members and other interested parties highlighting the issues and range of diversity in geo-regions and riparian systems (Northeast area, Klamath Falls area, John Day/Prineville area).

5. Conduct a series of work sessions to identify issues, categorize issues if necessary, identify key policy questions to focus attention, identify useful existing scientific data and analysis, identify gaps in scientific knowledge, form recommendations, develop final report to present to Board of Forestry.

6. As necessary develop sub-committees for specific tasks as determined and recommended by the committee. The sub-committees would meet separately to complete issue development and analysis and to develop recommendations for their respective tasks.

7. ODF staff to develop drafts of report and distribute for review and comment by committee members and other interested parties.

8. ODF staff to develop final report for committee approval.

9. Committee Representative(s) and ODF staff to present report to Board of Forestry.

10. Consistent with Board of Forestry direction, ODF staff would draft necessary legislative concepts or draft administrative rule changes, as necessary.

V. DESIRED PRODUCTS

1. An approved project plan with guiding principles.
2. A completed final report with recommendations.
VI. PROJECT TIME LINE (Subject to change)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>February, 2001</td>
<td>Eastern Oregon Regional Forest Practices Committee consulted and work plan developed</td>
</tr>
<tr>
<td>May, 2001</td>
<td>Committee members confirmed and first meeting scheduled</td>
</tr>
<tr>
<td>June, 2001</td>
<td>First meeting, orientation to issues and tour</td>
</tr>
<tr>
<td>July, 2001</td>
<td>Second tour</td>
</tr>
<tr>
<td>September, 2001</td>
<td>Third tour or work session (dependent on fire severity)</td>
</tr>
<tr>
<td>October, 2001</td>
<td>Work session</td>
</tr>
<tr>
<td>January, 2002</td>
<td>Work session</td>
</tr>
<tr>
<td>February, 2002</td>
<td>Work session to complete draft recommendations</td>
</tr>
<tr>
<td>March, 2002</td>
<td>Work session to finalize recommendations</td>
</tr>
<tr>
<td>April, 2002</td>
<td>Final recommendations approved by committee</td>
</tr>
<tr>
<td>June, 2002</td>
<td>Draft report distributed for review</td>
</tr>
<tr>
<td>September, 2002</td>
<td>Final report completed and approved by committee</td>
</tr>
<tr>
<td>October, 2002</td>
<td>Report recommendations presented to the Board of Forestry</td>
</tr>
</tbody>
</table>
Eastside Riparian Functions Advisory Committee
Decision Protocol

Committee Charter: The committee’s charter directs the committee to seek consensus when possible and clearly articulate the range of views when consensus is not possible. Significant differences of opinion will be included in the committee’s report.

Quorum: A quorum of nine committee members or designated proxy must be present to deliberate on recommendations for inclusion into the Eastside Riparian Functions Advisory Committee’s report.

Voting: Each of the eleven interests, as identified in the committee charter, will have one vote. The sovereign interests of each respective tribe that participates in the committee deliberations is acknowledged; however, total tribal representation is provided one vote.

Proxy: Committee members will designate one individual as their proxy for the duration of the committee’s deliberations. The proxy will not be a chartered committee member and will not be designated as a proxy for more than one committee member.

Facilitation: The Chair will determine if the use of an external facilitator would be beneficial to the committee and increase the likelihood that the committee would reach consensus on one or more options. The Chair may request that the Department of Forestry provide a facilitator if resolving an impasse or difference of opinion is crucial for reaching committee support for final recommendations.

Support: “Consensus” support means all committee members, present or represented by their proxy at the meeting where the recommendation was discussed, expressed support. “Strong Agreement” means no more than three of the eleven committee members expressed nonsupport. “Majority ” support referenced in the body of the report means at least six committee members expressed support, but two to five committee members expressed nonsupport.

Options: Options considered and discussed by the committee but not supported by consensus, strong agreement, or majority agreement will be documented in the committee’s report. The specific views and points of disagreement between committee members will be included.
APPENDIX C

ISSUE QUESTIONS AND DELIBERATION TABLES, AND FPAC RECOMMENDATION V
NOTE: The items in the issue deliberation tables were used by ERFAC for discussion purposes and do not necessarily reflect the final recommendations approved by the committee.

- **ERFAC Issue 1: Desired Future Condition**

  *What is the structural and functional definition of the desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?*

The committee wrote this definition in January to replace current rule language based on “mature streamside stands”.

<table>
<thead>
<tr>
<th>Goal of the riparian rules, desired future condition</th>
<th>May Deliberations</th>
<th>Tentative Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal of the riparian rules, desired future condition</td>
<td>Although the ERFAC agreed the wording is ok, further discussion pointed out a discrepancy between the Board’s direction to first protect RMA functions with economics a secondary goal; whereas the overarching rule intent seems to give equal weight to economic, social, and environmental needs.</td>
<td>2a) Eastern Oregon has a tremendous diversity of riparian forest conditions. The desired future riparian condition for fish use streams is to grow and retain vegetation so that over time and across the landscape riparian forests are vigorous and structurally diverse. Riparian forest structures vary across the eastern Oregon landscape and within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs. The functions and values of riparian forests include water quality, hydrologic function, the growing and harvesting of trees, and fish and wildlife resources. These riparian forests provide ample shade over the channel, a relative abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.</td>
</tr>
</tbody>
</table>

**June Meeting Outcome:**

A. The following definition for the “desired future condition” should be used for eastern Oregon (OAR 629-640-000 (2)(a)):

“Eastern Oregon has a tremendous diversity of riparian forest conditions. The desired future riparian condition for fish use streams is to grow and retain vegetation so that over time and across the landscape riparian forests are vigorous and structurally diverse. Riparian forest structures vary across the eastern Oregon landscape and within the limits of site productivity there exists a broad range of tree species, size and age classes with an understory of shrubs and herbs. The functions and values of riparian forests include water quality, hydrologic function, the growing and harvesting of trees, and fish and wildlife resources. These riparian forests provide ample shade over the channel, a relative abundance of large woody debris in the channel, channel influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.”
**ERFAC Issue 2: Fish Bearing Streams**

*Are current forest practice rules and voluntary measures on fish use streams resulting in or likely to result in “desired future condition (addressing both the range and diversity of conditions) for riparian areas in eastern Oregon?*

As requested at the May meeting, staff has developed this issue further for ERFAC’s consideration.

<table>
<thead>
<tr>
<th>Elements</th>
<th>(1) Subcommittee</th>
<th>(3) Other Concepts</th>
<th>Current Rule</th>
<th>Tentative Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type F RMA Widths</td>
<td>50/70/100 Feet</td>
<td>50/70/100 Feet</td>
<td>50/70/100 Feet</td>
<td>50/70/100 Feet</td>
</tr>
<tr>
<td>2. Basal Area Options</td>
<td>Three (4,5,6/7)</td>
<td>• Two (4/5, 6/7)</td>
<td>General Prescription OAR 629-640-0100; Alternate Plans OAR 629-640-0300; and Site Specific Plans OAR 629-640-0400</td>
<td>Two (4/5, 6/7)</td>
</tr>
<tr>
<td></td>
<td>Approx. 40% GBA</td>
<td>• June Alternative Options—see details below (pp. 4-5)</td>
<td></td>
<td>30 or 40% GBA, depending on harvest type</td>
</tr>
<tr>
<td>3. Near Stream Protection</td>
<td>All trees within high water mark</td>
<td>June Alternative Options—see details below (p. 6)</td>
<td>Retain all trees within 20 feet of high water level with caveats (OAR 629-640-0100)</td>
<td>Protect/Maintain Function</td>
</tr>
<tr>
<td>4. Stratification</td>
<td>Not Addressed</td>
<td>June Alternative Options—see details below (p. 7)</td>
<td>Stratification within the 20 foot no-harvest zone can be provided by thinning (OAR 629-640-0100 (9)</td>
<td></td>
</tr>
<tr>
<td>5. CMZ’s*</td>
<td>Not addressed</td>
<td>June Meeting Options—see details following</td>
<td>Not addressed</td>
<td></td>
</tr>
</tbody>
</table>

**Acronym Key:**

GBA = Growth Basal Area  
N = Type N streams  
F = Type F streams  
CMZ = Channel Migration Zone  
SSP = Site
ERFAC Issue 2: Fish Bearing Streams

June Meeting Outcome:

B. Retain current RMA widths (50, 70, & 100 feet for small, medium, & large type F streams, respectively).

C. Use two site classes for basal area retention in RMAs to reflect variability in site capability in eastern Oregon riparian forests, as follows:

<table>
<thead>
<tr>
<th>Site 4/5 (moist)</th>
<th>L</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% GBA</td>
<td>170</td>
<td>120</td>
<td>85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 6/7 (dry)</th>
<th>L</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% GBA</td>
<td>110</td>
<td>80</td>
<td>55</td>
</tr>
</tbody>
</table>

For partial harvest or Type 1(BA/1000ft)

For final harvest (Type 2 & 3) and ‘brush credit’ or ‘ungulate alternative’ (BA/1000ft)

<table>
<thead>
<tr>
<th>Site 4/5 (moist)</th>
<th>L</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% GBA</td>
<td>130</td>
<td>90</td>
<td>65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 6/7 (dry)</th>
<th>L</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% GBA</td>
<td>90</td>
<td>65</td>
<td>45</td>
</tr>
</tbody>
</table>

The following conditions must be present in order for the ‘brush credit’ or ‘ungulate alternative’ basal area targets to be applicable: existing understory vegetation (grasses, shrubs, and non-merchantable trees) retained along the stream have a high likelihood to persist over time.

D. Near Stream Protection (NSP) under an active management approach within the RMA will be provided by the protections described below. If this approach is not utilized in the RMA, then the default is the 20-foot, no-harvest zone:

- Retain 5 well-distributed trees per 1000 feet, 16 inches or larger, within the first half of the RMA (can also serve as channel stabilizing and/or leaning over the channel—see below). If no trees over 16 inches are present, retain the 5 largest trees. Create an active placement incentive as an alternative for meeting this requirement.
- Within the first 20 feet adjacent to type F streams, retain all understory vegetation and all trees up to 6-inches in DBH, unless management is necessary for regeneration or pre-commercial thinning to achieve the DFC.
- Retain all trees leaning over the channel as required by current rule.
- 35-foot equipment exclusion zone on all fish use streams would be the standard prescription. Prior approval for entering the 35-foot zone would be allowed under certain circumstances and would be addressed in the written plan.
- Retain all ‘channel stabilizing trees’ that have exposed roots within the active channel.

E. ERFAC agrees with the concept of stratification and recommends that the department develop rule language and guidance specific to eastern Oregon. All trees should be retained in segments of the RMA that are below the standard basal area target, and trees retained within the ‘overstocked’ area can be at or above the standard target.

F. ERFAC recommends that the department develop guidance on eastern Oregon CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

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3 16 inches is proposed because trees growing at 3 inches diameter per decade will be 20 inches at the mid-point of the re-entry period. Trees 20-inches in DBH and greater are generally believed to function as “key pieces” for creating jams and pools.
ERFAC Issue 2-2: Fish Bearing Streams
Basal Area Options

At the May ERFAC meeting, the committee made a request of staff to generate options or alternative approaches for the Basal Area discussions. The specific requests were to generate numbers that might reflect retention levels if, 1) a two site class approach was used versus the three site class approach that has been illustrated and discussed to date and, 2) to look at a partial cut and a final harvest approach for the current numbers.

This information is being provided because it was requested by the committee and it should not be viewed as a Staff recommendation. The intent is to provide the committee information to help facilitate discussions on this issue.

Two-Site Classification Approach: The committee has discussed the benefits and drawbacks of using a three-site class approach. As an alternative, the committee requested that a two-tier approach be developed for comparison purposes. The numbers in the following table have been derived by using a weighted average of the land base (site four and above 7%, site five at 31% and site six/site seven at 62%) and by equally dividing site five land into a moist site category and a dry site category. To illustrate the range of discussion that has occurred to date, the numbers provided reflect 40%, 35% and 30% GBA based on the table provided by Fred Hall and Steve Fitzgerald dated 27 Feb 2 (minor corrections 26 Apr 02). The units are in square feet of BA per 1000 feet for small Type F streams, rounded to the nearest increment of five.

<table>
<thead>
<tr>
<th></th>
<th>40% GBA</th>
<th>35% GBA</th>
<th>30% GBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moist Site</td>
<td>90</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>Dry Site</td>
<td>60</td>
<td>55</td>
<td>50</td>
</tr>
</tbody>
</table>

Partial Cut verses a Final Harvest Approach: The committee has discussed RMA alternatives that reflect the management regimes (Partial Harvest verses a Final Harvest approach) for the adjacent stand at several ERFAC meetings. This approach is currently being utilized in the FPA. For illustration purposes, the following table utilized the three sites that have been discussed throughout the ERFAC process (described on the next page) and allocated 35% GBA for a one target approach and 40% GBA for a partial harvest scenario and 30% GBA for a final harvest scenario. The units are in square feet of BA per 1000 feet for small Type F streams, rounded to the nearest increment of five.

<table>
<thead>
<tr>
<th></th>
<th>One Basal Area Standard for Partial Cuts and Final Harvest – based on 35% GBA</th>
<th>Partial Harvest Basal Area Approach – Similar to a Type 1 Harvest – based on 40% GBA</th>
<th>Final Harvest Basal Area Approach – Similar to a Type 2 and 3 Harvest – based on 30% GBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 4</td>
<td>95</td>
<td>110</td>
<td>80</td>
</tr>
<tr>
<td>Site 5</td>
<td>70</td>
<td>85</td>
<td>60</td>
</tr>
<tr>
<td>Site 6</td>
<td>50</td>
<td>60</td>
<td>45</td>
</tr>
</tbody>
</table>
**IDENTIFICATION OF ERFAC FOREST SITE CLASSES 4, 5, AND 6 (**REVISED 24 June 2002**6)

[From presentation by Frederick C Hall, Plantecol NW, LLC:  *Applicable to private forestlands.*]

The Eastside Riparian Functions Advisory Committee, Oregon Department of Forestry, has established three site productivity classes for riparian forested communities. These are shown in “Revised forest productivity classes and site data” of 27 Feb 02. Identification of these site classes in the field may be facilitated by the following criteria.

<table>
<thead>
<tr>
<th>Site 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa pine is the only tree present (or the only stumps); basal area as trees or old stumps is less than 130 sq. ft. per acre. [From Fred Hall presentation:  <em>This describes a forest that grew into range lands or meadow lands after fire exclusion.</em>]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa pine is the dominant tree: more than 60 percent of present or past basal area; other trees may be Douglas-fir or juniper. Around the Fremont N.F., dry site white fir may be present. Basal area as trees or old stumps is less than 130 sq. ft. per acre. [From Fred Hall presentation:  <em>This describes a ponderosa pine forest that was historically maintained by periodic fire before fire suppression.</em>]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lodgepole pine is clearly dominant. Basal areas are between 100 and 200 sq. ft. per acre (either live trees or stumps)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaking aspen or cottonwood are dominant; other trees may be present such as juniper, ponderosa pine, or Douglas-fir. [From Fred Hall presentation:  <em>White fir takes the place of Douglas-fir on the Fremont.</em>]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa pine may be present but is less than 60 percent of present or past basal area; other trees present are Douglas-fir, white or grand fir, or larch. Some Englemann spruce or sub-alpine fir may be present but not dominant. Basal area of trees or old stumps (not counted together) is between 130 and 190 sq. ft. per acre.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponderosa pine is absent; it was part of the old growth basal area. Dominant trees are Douglas-fir and/or grand or white fir. Larch may be dominant in some cases. Some Englemann spruce or sub-alpine fir may be common. Basal area of trees or old stumps (not counted together) is between 130 and 190 sq. ft. per acre.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand or white fir and Douglas-fir [italic font indicates revised text] dominate the stand or old growth basal area. Englemann spruce or sub-alpine fir may dominate some stands. Larch may dominate but usually has a grand or white fir or Englemann spruce understory. Basal area per acre is between 180 and 250 sq. ft. per acre</td>
</tr>
</tbody>
</table>

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*6 Revised and annotated by ODF on June 24, 2002 from Fred Hall’s comments at the April 2002 ERFAC meeting.*
Discussions on appropriate measures for “Near Stream Protection” have been held at prior ERFAC committee meetings. This paper attempts to respond to a request from the committee to provide options for “Near Stream Protection” (NSP) under an active management approach within the RMA. If this approach was not utilized in the RMA, then the default would be the 20-foot no-harvest zone to address NSP.

The Committee has heard that the primary areas of concern for NSP relates to shading, sediment delivery protection, stream bank stabilization, and large wood recruitment. The measures below are intended to provide for those functions, balancing both short and long-term protection levels, and should be viewed as information to help facilitate the discussion of this issue.

**NEAR STREAM PROTECTIONS**

**Shading:**
- Within the first 20 feet adjacent to type F streams, retain all understory vegetation and all trees up to a specified DBH (such as 6” DBH).
- Channel stabilizing trees (see below)
- Retain all trees leaning over the channel as required by current rule.
- Large-tree retention (see below)
- Enhanced growth of brush and understory due to active management

**Sediment delivery protection & stream bank stabilization:**
- 35-foot equipment exclusion zone on all fish use streams would be the standard prescription. Prior approval for entering the 35-foot zone would be allowed under certain circumstances (road crossing construction, log placement, restoration work etc.) and would be addressed in the written plan.
- Retain all ‘channel stabilizing trees’ that have exposed roots within the active channel.
- Management of the near-stream area will also enhance brush species and understory growth that can add to bank stability as well.

**Large wood recruitment:**
- Channel stabilizing trees (from above)
- Retain all trees leaning over the channel as required by current rule.
- Retain X trees per 1000 feet (5, 10, 20), 16*7 inches or larger within the first half of the RMA. If no trees over 16 inches are present, retain the X largest trees. Create an active placement incentive as an alternative for meeting this requirement.
- Enhanced growth of trees retained in the RMA due to active management (reduced stocking)

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7 16 inches is proposed because trees growing at 3 inches diameter per decade will be 20 inches at the mid-point of the re-entry period. Trees 20-inches in DBH and greater are generally believed to function as “key pieces” for creating jams and pools. The committee may choose to discuss other diameter options.
Several committee members have expressed interest in exploring the option of allowing stratification within RMAs. Under current general prescription guidelines within the FPA for the RMAs, stratification is not allowed. The concept of stratification may allow landowners to manage or thin overstocked portions of the RMA in order to better achieve the desired future condition as defined by the ERFAC.

**FPAC Approach**

FPAC took the following approach: Recommendation V - 12 “In recognizing that riparian stands are not homogenous and that applying a single target for the RMA can prevent appropriate management with conifer overstocking, agreement was reached on the concept of stratification. The details of how to do it in the field are to be developed. Stratification could allow an RMA to be divided into segments with a different management approach applied to each segment based on the specific conditions in the segment.”

**Options and alternative approaches:**

1. ERFAC could elect to maintain the current FPA approach in regards to not allowing stratification within a harvest operation.

2. ERFAC could designate a minimum size by lineal stream distance or acreage in which stratification would be allowed within an operation area.

3. ERFAC could agree to the concept of stratification and would direct the Staff to develop rule language and guidance. This is similar to the FPAC approach.

4. ERFAC could agree to manage overstocked areas to the standard target on a pro-rated area basis. The size of the area would need to be defined.

5. ERFAC could agree to require that all trees be retained in segments of the RMA that are below the standard Basal Area target and allow for management of overstocked areas to the standard target on a pro-rated area basis.

6. Others?
**Background**

A channel migration zone, or CMZ, is the lateral extent of likely movement along a stream reach with evidence of active stream channel movement over the last 100 years. (WA DNR, 9/21/00) The FPAC defined a CMZ as “an unconstrained reach of stream that, in the judgement of the state forester, is an area likely to have channel movement within the time period of 50 to 100 years.” CMZs generally make up a small percentage of the entire stream network, but can be a large percentage of a mainstem river. Characteristics of CMZs include numerous side channels with bed elevations at or below the bankfull width elevation (figure 1), as well as signs of bank migration at meander bends (figure 2). Where CMZs do not occur, channel movement is accounted for within the bankfull channel width.

**Figure 1:** Example of a CMZ associated with an avulsing channel. Avulsing channels can abruptly change location during a single runoff event, while remaining relatively stable between events.

**Figure 2:** Example of a CMZ associated with a meandering channel. Meandering channel typically migrate incrementally over time.
Areas where CMZs do occur include stream channels with any one of the following characteristics:
• Where there is an abrupt decrease in channel gradient or abrupt widening of the valley width
• At the confluence of larger streams
• Glacial-fed streams
• Where there is high sediment input relative to stream transport capacity

Areas where they do not occur include stream channels with any one of the following characteristics:
• Confined channels
• Where secondary channels are not present
• Streambed and banks that have bedrock outcrops

While the ODF monitoring program has not collected data on CMZs, data were collected on the flood-prone width. Flood-prone width is a measure of the channel width when the stream stage is estimated at a frequent flood event. In this case the flood-prone width was estimated for a 50-year peak flow event. While the floodplain does not directly correspond to the CMZ, it gives some idea of the possible extent of a CMZ of the same return interval. Data from 31 sites in the Blue Mountain Georegion indicate that flood-prone width varied greatly on small streams (11 – 104 feet). The ranges in flood-prone widths for medium and large streams were similar (30–87 feet and 45–88 feet, respectively). On average the flood-prone widths for small, medium and large streams were 37, 52, and 70 feet respectively.

![Floodprone Width by Stream Size](image)

**Figure 3**: Mean and range of 50-year flood-prone from study sites monitored as part of the ODF Shade Study (2001).
Discussion

Where CMZs extend beyond areas where vegetation has been retained in order to provide desirable levels of riparian functions, it is possible that the channel could migrate to a location where less-than desirable levels of riparian functions are provided. Ensuring that riparian vegetation is retained within CMZs can better ensure that desirable levels of riparian functions will be provided over time.

Adequate data is currently not available to make quantifiable statements about the extent to which riparian functions are currently being provided along stream channel that have CMZs. It is possible, however, that current protection is already at a desirable level under the various protections currently provided for waters of the state under the FPA (RMAs along streams and stream-associated wetlands). The following are suggested options for a recommendation on the issue of CMZs, intended to provide the committee information to help facilitate discussions on this issue.

Options

1. ERFAC could recommend that the department develop guidance on CMZs to help evaluate the current level of CMZ protections, and make a determination on the desirable level of protection for these areas.

2. ERFAC could adopt the FPAC recommendation:
   
   "The riparian management area (RMA) will be measured from the current points of measurement except for areas designated by the State Forester as a channel migration zone (CMZ). A CMZ is an unconstrained reach of stream that, in the judgment of the forester, is likely to have channel movement that can go outside the RMA widths within the period of a rotation (50-100 years). Within the CMZ, the no-touch area will be measured from the high-water mark of the channel (same as current rules). The outer edge of the CMZ will be based upon guidance to be developed by a technical committee. Retained trees in the CMZ shall be no less than the basal area standard target."

3. ERFAC could recommend that changes to the FPA relative to CMZs are not warranted at this time due to a lack of information to adequately evaluate current protection levels.

4. Others?
ERFAC Issue 3: Non Fish Bearing Streams

- Do current practices minimize sediment delivery and temperature impacts to waters of the state on small Type N streams?
- Do current practices minimize sediment delivery and temperature impacts, and supply desirable levels of large wood for downstream fish-bearing waters on medium and large Type N streams?
- Should the effectiveness of practices along small Type N streams be a monitoring priority?

<table>
<thead>
<tr>
<th>Elements</th>
<th>(1) Subcommittee</th>
<th>(2) Areas of Tentative Agreement</th>
<th>(3) Other Concepts</th>
<th>Current Rule</th>
<th>Concurrent Rule Development</th>
</tr>
</thead>
</table>
| N Streams | • All trees within high water mark of perennial  
• 35’ skid trail set back on all  
• 20’ skid trail set back on all  
• 20’ understory and small-diameter tree retention on small perennial  
• 10’ understory on all other small no other changes for medium and large N  
• Small N stream monitoring should be a priority. | June meeting outcome—see details following (next page) | OAR 629-640-0200  
Retain:  
• All trees within 20 feet of high water level.  
• All trees leaning over the channel  
• Downed wood & snags not a safety or fire hazard  
• Understory within 10 feet of perennial N  
• Except at stream crossings, operators shall not locate skid trails within 35 feet of Type F or Type D streams. | New rule (629-630-0150) to address ground based harvesting on steep or erosion prone slopes. The purpose is to help prevent erosion from skid trail construction or reconstruction in these areas by limiting general ground disturbance due to harvesting and providing a minimum setback for skid trails on steep slopes or easily eroded soils. |

**June Meeting Outcome:**

G. The following additional protections are to apply to small Type N streams:
- Extend the current vegetation retention requirements along small perennial Type N streams out to 20 feet during harvest operations.
- The forest practice rules should be modified to more specifically address the risk of sediment delivery from skid trails\(^8\) located near small type N streams.
- Retain existing forest practices act standards on medium and large type N and type D streams.
- The effectiveness of the small type N stream prescriptions should be a monitoring priority.

\(^8\) As determined by the Department, skid trails include but are not limited to any area where equipment constructs a trail by excavating, filling, and/or compacting. Ground used for a single pass by mechanical shears or feller-bunchers is not considered a skid trail unless ruts develop or the surface organic material is removed.
Discussions on appropriate protection measures for type ‘N’ streams have been held at prior ERFAC committee meetings. This paper attempts to capture the relevant points of tentative agreement based on prior ERFAC discussions.

The Committee has heard that the primary areas of concern on small N streams are related to temperature and sediment delivery into type F streams. In addition to temperature control and sediment delivery, large wood inputs is another important function with the medium and large type ‘N’ streams. The measures below are intended to provide for those functions and should be viewed as information to help facilitate discussions on this issue.

- Within the first 20 feet adjacent to perennial small type ‘N’ streams, retain all understory vegetation and all trees up to a specified DBH (such as 6” DBH).

- Retain understory vegetation within 10 feet of all other small type ‘N’ streams.

- Prior Approval will be required for skid trails located within 20 feet of type ‘N’ streams. A skid trail would be defined as a travel route used by ground-based equipment to yard logs that is both excavated (i.e. goes beyond equipment rolling over existing terrain) and used for more than one turn. The intent of this protection is to minimize soil disturbance that will lead to erosion and that will deliver sediment to a stream. A twenty-foot set-back for skid trails has been suggested to be consistent with the understory retention recommendations identified in the first bullet. The committee has had prior discussions on skid trails and other set-back distances (35 feet) have been discussed. A 20-foot set-back distance takes into consideration operation feasibility, input from Forest Practices Foresters, and recognizes that this applies to new and existing skid trails that pose an elevated risk of sediment delivery to streams. Again, the committee needs to identify the specific set-back distance desired if they choose to forward this issue, be it 20 feet or some other distance.

- Retain existing Forest Practices Act standards on medium and large type ‘N’ and type ‘D’ streams. At the April ERFAC meeting, the Committee deferred consideration of additional measures due to a lack of available information on the number of medium and large type ‘N’ streams in eastern Oregon.

- The effectiveness of the small type ‘N’ stream prescriptions will be a monitoring priority.
ERFAC Issue 4: Rule Flexibility and Effectiveness

- Are current forest practice rules flexible enough to ensure that forest operations near streams result in desirable outcomes while preventing and minimizing unintended negative consequences?
  - Is the use of site-specific plans encouraged, is there adequate support for them, and are they consistent with the rules?
  - Are there adequate incentives for enhancing RMAs (e.g. ‘promise’ of future harvest opportunity; basal area credits)?
  - Is there adequate guidance?

<table>
<thead>
<tr>
<th>Elements</th>
<th>(1) Subcommittee</th>
<th>(2) Areas of Tentative Agreement</th>
<th>(3) Other Concepts</th>
<th>Current Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Prescriptions</td>
<td>Not Addressed</td>
<td>• Shrub: alternate BA targets</td>
<td>Emphasize SSPs for</td>
<td>SSPs are encouraged but not often done because:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Regeneration</td>
<td>vegetation retention</td>
<td></td>
</tr>
</tbody>
</table>

June Meeting Outcome:

H. The forest practice rules should be modified, as necessary, to provide a broad range of options for incentives to improve fish habitat. It should be recognized that multiple methods are available to address protection issues related to ungulates (e.g. see ‘C’ above; OAR 629-640-0110)

J. The department should designate at least one Riparian Specialist for each district in eastern Oregon to inventory and prepare riparian prescriptions for operators and landowners.
ERFAC Issue 5: Grazing

- Is the presence or absence of ungulate activity (wild and domestic) in riparian management areas having an influence on whether or not current forest practice rules and voluntary measures are resulting in or are likely to result in the attainment of a “desired future condition”?

<table>
<thead>
<tr>
<th>Elements</th>
<th>(1) Subcommittee</th>
<th>(2) Areas of Tentative Agreement</th>
<th>(3) Other Concepts</th>
<th>Current Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ungulates</td>
<td>Not Addressed</td>
<td></td>
<td>June Alternative Options—see details below (next page)</td>
<td>Basal Area Credit, OAR 629-640-0110, includes an option for riparian grazing exclosures and water development away from the RMA.</td>
</tr>
</tbody>
</table>

June Meeting Outcome:

I. Urge the Board of Forestry to provide a recommendation to the Statewide Riparian policy group concerning the impacts of both wild and domestic ungulates to forested eastside RMAs. The recommendation should discuss the roles of other regulatory and land-use agencies concerning the maintenance and enhancement of high-quality riparian areas.
ERFAC Issue 5: Grazing
Addressing Ungulates Concerns in RMAs

Discussions on appropriate measures to address ungulate activity within RMA have been brought up at several ERFAC meetings. The views expressed by committee members have been generally in favor of rewarding landowners that have managed their lands to minimize unintended consequences caused by ungulates. Measures and/or recommendations made by the committee members to address this issue are as follows:

- Reiterate the existing measures and options in the Forest Practices Act concerning BA retention credit for improvements or enhancements to RMAs. OAR 629-640-0110 (8) discusses potential measures and options for BA credit for developing a fenced exclosure within an RMA.

- For small type ‘F’ streams that have high levels of understory vegetation present along the streambank likely to persist over time, alternative BA retention targets may be applied. The alternative targets are to be in the range of 30-35% GBA, and based on the site classes alternatives decided by the committee. The following conditions must be present in order for the alternative targets to be applicable: existing understory vegetation (grasses; shrubs; non-merchantable trees) retained along the stream have a high likelihood to persist over time, and are expected to provide desirable levels of all riparian functions other than large wood. When using these targets, two appropriately sized trees will be placed in the stream per 100 feet of RMA. The combination of placing large wood in the stream and the accelerated growth of large wood in the residual riparian forest is anticipated to provide desirable levels of large wood in the short and long-term. The combination of all the components of this alternative are anticipated to ensure that the various riparian functions important to water quality and healthy aquatic habitats will be maintained and enhanced, while maximizing the ability of the riparian area to provide large wood to the stream.

- Urge the Board of Forestry to provide a recommendation to the Statewide Riparian policy group concerning the impacts of both wild and domestic ungulates to forested eastside RMAs. The recommendation should discuss the roles of other regulatory and land-use agencies concerning the maintenance and enhancement of high-quality riparian areas.
• ERFAC Issue 6: Wetlands

• Are protection measures for significant wetlands the appropriate practices for maintaining the functions and values of significant wetlands on eastern Oregon forestlands over time?

<table>
<thead>
<tr>
<th>Areas of Tentative Agreement</th>
<th>(3) Other Concepts</th>
<th>Current Rule</th>
</tr>
</thead>
</table>
|                             | June Alternative Options—see details below (next page) | OAR 629-645-0000
  Significant wetlands are larger than 8 acres |

June Meeting Outcome:

J. The department should develop monitoring strategies that will aid in evaluating the effectiveness of the forest practice rules for significant and other wetlands.
Issue Statement: Are protection measures for significant wetlands the appropriate practices for maintaining the functions and values of significant wetlands on eastern Oregon forestlands over time?

Background

Committee Charter: The Eastside Riparian Functions Advisory Committee has been charged with determining “what, if any, modifications to forest practices that are associated with riparian functions are necessary to meet water quality standards and to protect and restore salmonid habitat in eastern Oregon.” While some significant wetlands may not include, directly connect to, or influence salmonid habitat, within the broader purview of water quality standards, consideration of riparian protection of significant wetlands is within the charter of the committee.

Presentations have been made at a prior committee meeting, outlining the present definition of and protections afforded significant wetlands. The purpose of these rules is to protect the functions and values of significant wetlands. Significant wetlands on forestlands provide a wide range of functions and values, including those related to water quality, hydrologic function, fish and other aquatic organisms, and wildlife. In eastern Oregon, significant wetlands are those wetlands larger than eight acres and important springs identified by the State Forester. The forest practice rules require operators to provide the following for all significant wetlands: 1) soil and hydrologic function protection, 2) understory vegetation retention, 3) snag and down wood retention, and 4) live tree retention. Specifically, in significant wetlands and their riparian management areas, operators shall retain approximately 50 percent of the original live trees, by species, in four diameter classes.

The primary concern discussed was the wide variability of eastern Oregon wetlands meeting the current definition of a significant wetland. Seasonally flooded flats and basins, deep and shallow marshes, open water, and riverine systems are wetlands habitats represented in eastern Oregon. In some cases wetlands are ephemeral, and may be subjected to typical upland use such as grazing for a significant portion of the year. In some geological areas, these wetlands are catchment basins that collect and store run-off and precipitation from a small surrounding area, but do not connect to other surface waters. The question is whether the same riparian management area protections are needed to protect these wetlands as is required for all significant wetlands.
Options:

- ERFAC may determine that this issue is not within the primary purpose of their charter and make no recommendation.
- ERFAC may recommend that the department initiate a monitoring study to evaluate the effectiveness of the Forest Practices significant wetland rules.
- ERFAC may recommend further evaluation of wetlands statewide, with the intent of developing protection rules based upon a wetland classification system and functions and values assessment.
- ERFAC may make specific recommendations to revise the Forest Practices significant wetland rules.

Recommended Alternative:

Wetland functions and values are complex. The department does no currently have research and/or monitoring information to reliably assess the effectiveness of significant wetland protections under the Forest Practices Act. Therefore, ERFAC is encouraged to recommend the department develop monitoring strategies that will aid in evaluating the effectiveness of the forest practice rules for significant wetlands.
- **ERFAC Issue 7: Training**

  - *Are the mechanisms/opportunities for landowner training adequate to achieve high levels of compliance?*

<table>
<thead>
<tr>
<th>Elements</th>
<th>Areas of Tentative Agreement</th>
<th>Current Rule/Practices</th>
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<tbody>
<tr>
<td></td>
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<td>BMP Compliance Monitoring coupled with ongoing operator training programs and certification.</td>
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</table>

**June Meeting Outcome:**

K. The department is encouraged to emphasize Forest Practices Act training and education opportunities for landowners, operators, and the public; and to emphasize FPF training to ensure compliance and consistency with the Forest Practices Act.
**ERFAC Issue 8: Incentives**

- *Are current forest practice incentive efforts achieving the desired result?*

<table>
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<tr>
<th>Elements</th>
<th>Areas of Tentative Agreement</th>
<th>Current Rule</th>
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| Large wood and boulder placement | OAR 629-640-0110  
  - Applies to Type F streams  
  - Prior Approval Required  
  - For every log placed in a large or medium Type F stream, twice the basal area can be harvested  
  - For every log placed in a small Type F stream an equal basal area can be harvested  
  - BA may not be reduced below the active management target; small Type F in eastern Cascade and Blue Mountain geographic regions, BA may be reduced to 30 sq. ft.  
  - Creation of alcoves, grazing exclosures, and boulder and rootwad placement can also receive credit.  
  - The department consults with the ODFW on these projects. | |
| Federal Policies | The Army Corps of Engineers Regional General Permit for Placement of Large Wood and Boulders does not allow the use of the basal area credit afforded by the FPA. This change in policy took place in June 2000. | |
| Were Rex and Mike Barsotti doing some work here? | | |

**June Meeting Outcome:**

L. The department is encouraged to emphasize Forest Practices Act training and education opportunities for landowners, operators, and the public; and to emphasize FPF training to ensure compliance and consistency with the Forest Practices Act.
FPAC Recommendation V

Recommendation V: The following list of changes are recommended to increase the protection and restoration of riparian functions. Further clarification and/or guidance on a number of these points will be needed to further develop these concepts.

1. **Harvesting Cap 40%**
   In western Oregon, manage any harvesting within the Riparian Management Area (RMA) so that the retained conifer basal area exceeds the basal area standard target, or 60 percent of the pre-harvest basal area, whichever is greater.

2. **No Touch Area ½ of RMA**
   The no-touch width will be equal to one-half the width of the entire RMA.

3. **Largest Trees 10 Out of 20 Largest**
   Retain 10 of the 20 largest trees per 1,000 feet outside of the no-touch width that will best achieve aquatic riparian functions. Subject to FPF approval, the landowner would identify tree locations in a written plan demonstrating how this objective will be met. There would be discretion to also consider operational issues and the value of the trees, as long as best achieving aquatic riparian functions remains the primary objective.

4. **Type N Streams (Nonfish Bearing) Forest Practice Forester Discretion**
   a. **Small Type NT streams are:** 1) Perennial Small Type N (temperature) streams that are tributary and contribute at least 30% of the flow to small and medium Type F streams and that have a drainage area larger than “X” acres (basin size to be set by georegion, 40 acres for the coast range). Initial classification will be based on basin size, but landowners may delist streams or stream segments verified as nonperennial. 2) Small Type N (torrent) streams with drainage basins greater than 30 acres, in which more than 75% of the basin has been mapped as “high” or 50% “extreme” debris flow hazard (by the State Forester) and which have a high probability of wood delivery to Type F streams.
   b. **Small NT stream protection:** 1) Up to the first 500 feet of Type NT (temperature) stream above the confluence with a Type F stream will have a 50-foot search zone, each side. Within the search zone, retain 4 square feet of trees per each 100 feet of perennial flow (up to 500 feet) and all nonmerchantable conifer on each side of the stream. Trees left along these streams to satisfy the basal area requirement can be counted as in-unit leave trees. 2) “Torrent” type NT streams will be protected as follows - FPF, working with the landowner, has discretion to direct retention of in-unit trees to 50’ x 500’ search zone (each side).

5. **In-growth 25% Adjustment for Small Streams**
   The standard target will be recalculated for small Type F streams using the same per-acre basal area as large streams, minus 25 percent for in-growth. The standard target will also be recalculated for medium Type F streams, using the same per-acre basal area as large streams.
6. Riparian Specialist
   The Oregon Department of Forestry will designate a riparian specialist in each administrative area who will be available to inventory and prepare riparian prescriptions for landowners, at their request. These specialists will be new positions funded by funds other than the harvest tax.

7. Similar Prescriptions for All Large and Medium Streams
   Large and medium Type N stream prescriptions will be the same as the equivalent size Type F.

8. Monitoring
   The effectiveness of the small Type N stream prescription will be a monitoring priority.

9. Alternative Vegetation Retention Prescriptions
   The existing alternative vegetation retention prescriptions (e.g., hardwood conversions) may be applied to all riparian management areas (RMAs).

10. Preventing Sediment Delivery
    The purpose statement for harvesting rules will be modified to better describe the objective of preventing sediment delivery to channels. The current requirement not to locate skid trails within 35 feet of Type F or D streams will be extended to all streams. Skid trails will be defined as an excavated trail used to yard logs with more than one turn.

11. Measurement of Riparian Management Area/Channel Migration Zone
    The riparian management area (RMA) will be measured from the current points of measurement except for areas designated by the State Forester as a channel migration zone (CMZ). A CMZ is an unconstrained reach of stream that, in the judgment of the forester, is likely to have channel movement that can go outside the RMA widths within the period of a rotation (50-100 years). Within the CMZ, the no-touch area will be measured from the high-water mark of the channel (same as current rules). The outer edge of the CMZ will be based upon guidance to be developed by a technical committee. Retained trees in the CMZ shall be no less than the basal area standard target.

12. Type N and Small Type F Streams
    Landowners would get credit for in-unit leave trees.

13. Conceptual Agreement About the Use of “Stratification”
    In recognizing that riparian stands are not homogenous and that applying a single target for the RMA can prevent appropriate management in patches with conifer “over" stocking, agreement was reached on the concept of stratification. The details of how to do it in the field are to be developed. Stratification could allow an RMA to be divided into segments with a different management approach applied to each segment based on the specific conditions in the segment.

14. “Provide for Placement of Large Wood” is Supported as a Concept
    (See “Subcommittee” Riparian Option under Riparian Functions for more information.)
Note on Appendix D
Jason Miner requested an opportunity to include a letter in the ERFAC report that would articulate his views on the ERFAC process. That letter is included in this appendix to meet his request. The letter from Mary Scurlock was presented as public comment at an ERFAC meeting. Neither ERFAC nor the Oregon Department of Forestry have taken formal positions on these letters.

The material from the Department of Environmental Quality was presented at the June 25, 2002, ERFAC meeting.
June 10, 2002

Gregg Cline
Oregon Department of Forestry
2600 State Street
Salem, Oregon 97310

Dear Gregg:

I remain concerned about the imbalance of the Eastside Riparian Functions Advisory Committee (ERFAC). Since I last expressed my concern on March 19th, it appears that our committee has come to represent even less of the conservation and environmental community than it did at that time. Originally, Oregon Trout, The Friends of Greensprings, and The Nature Conservancy were represented on the committee. With the loss of The Nature Conservancy's representation, the list has shortened to two conservation groups.

Two problems hamstring ERFAC. First, the number of industry representatives dwarfs representation from conservation groups. Second, the diversity of the conservation and environmental movements is not represented. These are problems if the Department intends to present this committee's report as balanced.

The original FPAC process included Oregon Trout, Pacific Rivers Council, the Audubon Society of Portland, and the National Sportfishing Industry Association, among others. Surely, reflecting this diversity of organizations was an attempt to include the breadth of the environmental, conservation, and sportfishing communities. Why this number and diversity of representatives is less important to ERFAC's deliberations is unclear. As you know, Oregon Trout represents a very moderate conservationist approach to protecting wild fish and their habitats. Truly "environmentalist" approaches from either a national or state-wide perspective have been left out of ERFAC.

The number and diversity of representatives of the industry and regulated community appears similar to FPAC. Two members of the Oregon Forest Industries Council, two regulated forest landowners, and one member of the Associated Oregon Loggers hold voting seats on ERFAC.

This may be no fault of the committee or the Department, but it does call into question the ability of this committee to achieve recommendations that appear balanced. With no national conservation or environmental groups represented, one state conservation group, and one local watershed organization, we should expect at least skepticism if not outright opposition from the broader environmental community.

I am assuming the Department intends to present ERFAC's report as the product of a balanced committee. I may be incorrect in this assumption. If I am incorrect, then my continued participation may be unwarranted.

As you know, I have voiced these concerns at ERFAC meetings and in earlier correspondence. Adding committee members, as I recommended at that time, may no longer be possible. The situation requires me to restate my concerns.

Sincerely,

Jason Miner
Conservation Biologist

To Protect and Restore Native Fish and their Ecosystems
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Cc: Jim Brown, State Forester
    Charlie Stone, ODF
    Lanny Quackenbush, ODF
    Louise Sollday, GNRO
    Peter Green, GNRO
29 October 2002

Gregg Cline
Forest Practices Program Director
Oregon Department of Forestry
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Salem, Oregon 97310
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E-mail: gcline@odf.state.or.us

Re: Eastside Riparian Policies

Dear Gregg:

As you know, Pacific Rivers Council has been engaged in the development of forest practices policies for the past several years, starting with our participation on the Forest Practices Advisory Committee (FPAC). We have tracked the work of the ERFAC with interest, although regrettably we have lacked the staff to attend meetings this past year.

It has come to our attention that the Eastside Riparian Functions Advisory Committee is nearing completion of its work. Based on my review of meeting materials and conversations with committee members and involved state agency staff, Pacific Rivers Council would like to take this opportunity to express a few concerns. I am requesting that you share my input with the Committee at their meeting tomorrow in Prineville.

In sum, we are concerned that the proposals under consideration do not meet the committee’s charter to determine what changes are necessary to existing forest practices policies to meet water quality standards and the needs of fish. The FPAC committee correctly determined as a general matter that changes are needed to strengthen forest practices rules to protect aquatic resources. In our view, it would have been logical for the ERFAC to have approached its task based on the assumption that more protection, not less or status quo, is needed on eastside streams. This would have narrowed the Committee’s task to refining the exact configuration of such increased protections. Key changes recommended included: increased no-harvest areas within existing buffers, increased retention standards in the managed portions of buffers, buffer areas for large and medium non-fish streams commensurate with fish streams of the same size, and protection of Channel Migration Zones and floodplains. A portion of the previously unbuffered small nonfish network is also protected under the FPAC recommendations based on mass wasting risks. We are disappointed to note that some of these changes were not also carried forward by the ERFAC.

Specifically:
There is no ecological justification for eliminating the current no-harvest zone given the high significance of the first 20 feet of riparian vegetation to bank stability, and to the provision of shade, large wood and sediment regulation. I am aware of no compelling evidence in the literature or in the ERFAC record that indicates more intensive silviculture in the near stream area is necessary to protect aquatic values. On the contrary, our review of the literature finds a wealth of opinion regarding the need to use caution when presuming to actively manage this area. See e.g. Lee et. al. 1997; Beschta et. al. 1996. We see no reason why exceptions to harvest in this zone can’t be developed to deal with site-specific needs related to in-channel or riparian restoration projects – but the need for exceptions does not obviate the need for the general rule. We also strongly support the need to create larger no-harvest zones from 50-100 feet in size. See e.g. Forest and Fish Report, 2000; NMFS 1998; Spence et. al. 1996.

We are further concerned about any proposal that rejects the concept that riparian areas should be managed for the characteristics of mature forest conditions statewide. We are further concerned about the misuse of "growth basal area" as a relevant metric to apply in determining the desired conditions of riparian forest cover when the goal is provision of ecological functions. The relationship between rapid tree growth and riparian functionality is not adequately developed to support a wholesale abandonment of tying key metrics for riparian condition to indicators based on mature forests – including but not limited to conifer basal area. We would also include stand composition and age class distribution and density of larger trees as metrics.

It is my understanding that the statewide sufficiency analysis does not present any information that would justify relaxing current management restrictions on any size stream on the basis that such restrictions are not needed to meet temperature objectives. On the contrary, there is evidence that current levels of riparian harvest are adequate to maintain water temperatures on small and medium streams. In fact, the small stream sites in the study showed significant reductions in shading (and presumably increases in stream temperature) even though they were harvested less aggressively than allowed by current rules. It also suggests that increasing the leave-tree requirement along these streams by a factor greater than 2.5 would be needed to protect small fish-bearing streams against significant shade reductions (and, presumably, increases in stream temperatures). It is important to remember that a core goal of water quality standards is to maintain as well as restore water quality, the basis for the antidegradation component of these standards. Measures that reduce current shade are likely to run afoul of this requirement.

It is well-accepted that eastside aquatic ecosystems are suffering from the lack of large wood in riparian areas and in stream systems. Lee et. al. 1997; McIntosh et. al. 1994. Given this situation, retention of large trees in riparian areas should be a top priority for this committee. At the very least, some rule metric that retains some minimum number of the largest trees per unit of stream length is needed to prevent continued depletion of current and future sources of large wood. The FPAC recommendation for a new harvest limitation on the proportion of existing riparian basal could also better protect higher
quality riparian conditions. The harvest cap approach that reduces allowable degradation of currently robust riparian forests and could, over time, reduce the importance of minimum "conifer basal area" measures. Under the current rules, uniform harvest down to a minimum floor is allowed on all sites.

- Some of the most productive stream reaches for fish are those with lower-gradients and wider valley bottoms, areas characterized by migrating channels. In these places, the active channel should be considered the extent of the channel migration zone where one exists, not simply bankfull width. Riparian delineations should start at the edge of the CMZ. The FPAC recommendations would take the more limited step of increasing the size of the protected riparian area in unconstrained reaches.

- Domestic livestock grazing co-exists with timber harvest on almost every acre of private ground on the eastside. These impacts are additive to the background impact from wild ungulates. Landowners who manage livestock to minimize impacts on riparian ecosystems should be recognized, assisted financially and with technical assistance, and otherwise applauded. However, they should not receive a "basal area credit" to log more trees in riparian areas on this basis.

- Intensive harvesting of type N streams without buffers, including seasonal streams, destabilizes soils and hillslopes, generating accelerated sediment delivery and increased sedimentation. Sediment impacts increase as a greater proportion of a watershed is clearcut or roaded. Logging-generated sedimentation is compounded by roads, which generate additional sediment and serve as conduits for sediment to flow into streams. The removal of large wood sources diminishes the stream's capacity to trap, store and regulate the transport of sediment downstream. In these ways, the removal of riparian and upslope vegetation and disturbance of soils elevates sediment loads. It is our view that current rules do not consider multiple sources of accelerated sediment delivery, their full local effects, their downstream effects on fish habitat, or the biological effects on the fish themselves. We believe it is critical that eastside rules include additional buffering of nonfish streams to minimize and mitigate for these impacts and prevent harm to imperiled fish.

Under the current scheme, riparian area protections are expected to mitigate for intensive management on the rest of the landscape. As noted by the IMST, this is not only a tall order, it is probably an impossible order. However, given that no landscape-level strategy for dealing with the adverse effects of timber harvest has yet been developed for nonfederal lands, we must do what we can with this paradigm. Our objective must be to provide for some semblance of natural function in riparian areas – which means allowing forests to grow old in these places, and letting natural disturbances operate. If the science tells us anything it is that this is the only thing reasonably certain to protect aquatic resources.

We encourage the Department to press forward with its efforts to improve forest practices, policies and to move forward to the Board only such recommendations as are consistent with the Governor's Executive Order.
Thank you for your consideration.

Sincerely,

Mary Scurlock
Senior Policy Analyst

Cc: Jim Brown, State Forester
Louise Solilday and Peter Green, Office of Governor Kitzhaber
Oregon Department of Environmental Quality (DEQ)

The following material was presented to ERFAC by Tom Rosetta of the Oregon Department of Environmental Quality on June 25, 2002.

Meeting State Water Quality Standards

Please consider the following information in designing best management practices (BMPs) that will protect water quality. The focus is primarily on avoiding negative impacts from insufficient BMPs, and not on prescribing an 'ideal' set of BMPs. It is brief, and addresses specific issues that merit continued discussion in order to meet the objectives of the committee. The Attachment contains more extensive information related to the recent FPA sufficiency analysis conducted by the ODF and DEQ.

Temperature

Meeting water quality standards and the TMDL process: The narrative temperature standard of 'no measurable temperature increase' to fish bearing streams applies to all basins in Eastern Oregon. This is due to 303(d) temperature listings (64°F criterion) in basins with anadromous fish use; one of eight sets of conditions that 'triggers' the narrative temperature standard [see OAR 340-041-(Basin)-(2)(b), or Attachment p.6, 8 and Appendix B].

Where Total Maximum Daily Loads (TMDLs) for water temperature have been established in Eastern Oregon, no additional anthropogenic heat loadings have been allocated (see Upper Grande Ronde or Umatilla TMDLs). Rather, additional shade has been targeted for most streams based on current conditions and 'system potential shade'. Even with 'system potential shade' in place, estimated to take decades to achieve under optimal conditions, the 64°F numeric temperature criteria may still not be met on all streams.

General Applicability of water temperature standards to harvesting activities:

In many cases, the application of the FPA may be sufficient in achieving the temperature standard. 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. In order for the recommendations from the Sufficiency Analysis to be acted upon, there will also need to be consideration given to the legal, economic, and policy setting 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.

DEQ also recognizes that forests are dynamic, not static, and that standards are to be met over time. This means that short-term losses of shade (or other water quality functions) are justifiable if they are outweighed by longer term gains in shade producing vegetation (or large wood, etc.). Since riparian areas and their vegetation provide several important and inter-related water quality functions, other elements such as sediment control (sedimentation and turbidity standard) and large wood recruitment (habitat modification standard) must always be considered during
decision making processes (see Attachment p.15-20 for more information regarding inter-related water quality functions).

**Applicability to buffer width, no-touch zones, and basal area options discussed by the ERFAC:**

Potential buffer scenarios which may increase heat loading to streams:

- **Reductions of buffer width from the outside, leaving only a narrow strip of protection:**

  In many cases a large proportion of the shade to a stream may be obtained within the first 20 to 50 feet. However, over time, the opportunity for disturbance to these buffers may be great, either from high water events, or from windthrow. When that occurs, the stream may experience increased solar radiation and heat loading. Wider buffers help prevent this for two reasons:

  1. In the case of streamside vegetation loss (either shrubbery or trees), for example due to torrential flows, the remaining tree buffer (out to approximately 100 feet*) may shift from providing redundant shade to providing real shade.

  2. Exterior buffer trees may inhibit windthrow of their interior, thus preserving streamside shade producing vegetation.

Channels that migrate also need buffers that remain wide enough to continue to provide shade and other water quality functions.

Thermal micro-climate air temperatures tend to increase in the summer as buffer widths decrease. This may result in water temperature changes dependent on site-specific heat exchange processes. (see Attachment p.20 for more information)

*75-90% shade to streams can be produced by trees from 30-145 feet away from the stream (Sufficiency Analysis Draft, 2002; or Issue 2: State of the Science); can be less, or more, depending on channel migration zone width, stream aspect, and buffer aspect/position to the stream.

Large reductions of basal area from the RMA or no-cut zone:

- **Removal of shade producing trees from the riparian corridors may reduce shade over time and increase heat loading to streams.** Tree removal represents immediate and future shade loss (and potential reductions of LW and erosion control). As vegetation/trees approach the channel edge, shade increases per unit of vegetation/trees. In other words, a tree 50 feet from the channel will normally produce less shade to the stream than the same tree located 20 feet from the channel edge. For stream temperature protection, retaining shade producing tree stands in the RMA is important, and even more so within the first 20 feet.

- **Where all of the shade producing trees are removed, such as with small non-fish bearing streams, there exists potential temperature increases to downstream fish-bearing streams, and also the loss of cold water refugia (see Attachment p. 11).** 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. (ODF/DEQ, draft 2002).

- As the degree of basal area removal increases, the potential for shade loss and stream heat loading also increases. If a stand is greatly reduced in basal area, for example from 80% GBA (or above) to 40% GBA (or above), or to regeneration levels, there is the potential for substantial shade loss from the overstory and stream heat loading [(see Figure 1: Fred Hall's chart and text)]. Also, reducing stands to 40% GBA and below may result in very large trees, widely spaced providing relatively little shade from the overstory, and with little attrition (requiring managed placement of large wood). The magnitude of temperature increases in relation to reductions of shade vary, depending on site-specific conditions such as flow and channel width. Modeling estimates a temperature increase of 3° to 8° F due to 'effective shade' reductions of between 30% and 50% along most of Upper Grande Ronde (bankful width: 25-100 feet on upper reaches; Upper Grande Ronde TMDL).

- Over-thinning may promote windthrow. Windthrow may either increase or decrease shade over the stream, depending on where the trees fall relative to the stream.

To avoid measurable temperature increases:

1. General prescriptions could employ caps, similar to those recommended for Western Oregon (see FPAC Recommendation V.1.). This would address site variability in stocking capability and prevent substantial shade losses and temperature increases to streams (see Figure 2.)

2. Method/Approaches 1) and 2) suggested by ODF (see "ERFAC Option 'R': Regeneration in RMAs") could be used as general prescriptions if the removal of trees with high shade (or large wood/bank stabilization) potential from RMAs, and particularly no-touch zones, is greatly limited. This might essentially translate into caps as suggested above.

3. Use site-specific prescriptions for stands in poor health in order to allow healthy regeneration to take place; currently available in rule, and as suggested by ODF. (see below for additional considerations)

4. Retain trees along non-fish bearing streams, especially near confluences with fish-bearing streams (50 X 500 feet buffer recommended by FPAC; see Recommendations V.4.a. and b.) in order to provide shade (and also large wood recruitment, and soil stability).
Additional considerations for regeneration (clearcut) harvest units regarding long-term gains versus short-term losses in shade to streams:

1. The area is conducive to tree regeneration: soils and hydrology are adequate to support the selected seedlings.
2. Other opportunities have already been exhausted for growing conifer stands without removing shade producing trees.
3. The short term shade loss impact is limited: 'Conversion blocks' are limited to a set distance, and are separated by areas of retained vegetation (with 150-200 year rotations). Rule of thumb: short term impacts should be limited and buffered within the local area of activity.
4. "All trees and vegetation within 10 feet of the high water level, and all trees leaning over the channel within 20 feet of the high water level must be retained for bank stability, shade, and habitat values" (Currently an FPA BMP: OAR 629-640-0300).
5. Pesticide use within RMAs should be carefully limited using integrated pest management (IPM) methodologies, especially important for near stream areas such as the ones we are talking about.
6. Participants in conifer regeneration efforts must make a long-term commitment to assure success. A record of good stewardship performance is recommended. Regenerating streamside stands can be extremely difficult, expensive, and unpredictable in many areas. Long range management plans should include details on low impact vegetation removal, planting, maintenance, and monitoring, in order to achieve stand regeneration, and overall water quality goals.

**Sedimentation and Turbidity**

The sedimentation standard is most applicable to forestry activities at the reach or watershed level, while the turbidity standard (see below) is a better measure of potential sedimentation problems caused by a harvesting activity at specific sites (for more information see Attachment p.11).

The sedimentation standard, which is narrative, does not assign a threshold level for anthropogenic activities. Watershed analysis [as required for 303(d) listing] has been utilized as an assessment tool for understanding and controlling sediment inputs and effects on specific drainage areas. The Antidegradation Policy and High Quality Waters Policy essentially require that water quality with respect to any state water quality standard, including sedimentation, be protected, maintained and enhanced in order to protect existing beneficial uses (see Attachment p.5).

The turbidity standard is most applicable to forestry operations with respect to on-site monitoring of BMPs used in vegetation removal, road construction and use, skid trails, and removal/fill activities (such as culvert replacement):

In order to achieve compliance of the turbidity standard, on-site monitoring is required, both during and after initial work (following rain events) for activities which may cause erosion or the input of sediments into state waterways (see attachment p. 12) [Note that a visually perceptible plume (i.e. you can see it) 100 feet downstream from an activity is considered a violation]
Applicability of sedimentation/turbidity standards to buffer width, no-touch zones, and basal area options discussed by the ERFAC:

- With respect to buffer width: dependent on site-specific characteristics, including slope, soil components, hydrology and vegetation. Approximately 100 foot buffers adjacent to logging operations reduced sedimentation to streams compared to non-buffered operations (Erman et al., 1977; and Morin, 1982). These studies did not quantify a range of sedimentation versus buffer width. Windthrow can potentially introduce sediments to waterways (Greenway, 1987). Narrowing or over thinning buffers may potentially expose trees that are not 'windfirm' to blowdown.

- With respect to bank stabilizing trees: The root tensile strength is important in stabilizing slopes, including stream banks. Highest root strengths have been associated with 'natural forest settings', while lowest root strengths have been associated with clearcuts (Schmidt, 1999). Dead roots may decompose and create holes and opportunities for erosion. FEMAT (1993) concluded trees within 0.5 potential tree heights from stream channel are important for bank stabilization.

- Modeling in the Umatilla Basin estimated that approximately 50 to 80% of sediment loading to streams originated from streambanks, mostly coming from non-forested and poorly buffered channels. Streambank and upland erosion on private forestlands are currently not considered to be a major contributor to sediment loading in the Umatilla Basin (Umatilla TMDL).

- With respect to retained basal area and fallen wood: Wood in and out of the channel (in the RMA and no-cut zone) trap sediments and prevent erosion which leads to additional sedimentation/turbidity in streams. The minimum quantity of wood needed for this function has not been determined. However, as LW in and out of the channel increases, sedimentation and erosion control are also likely to increase.

- With respect to vegetation type: established deciduous/mixed/conifer - woody vegetation in the riparian zone resulted in the lowest median stream bed percent fines, followed closely by young deciduous/mixed/conifer - woody vegetation and Shrubs - woody vegetation (see Figure 3: ODFW data, 1996).

Habitat Modification (Large Wood)

Habitat modification 303(d) listings require a watershed analysis that also takes into account the biological criteria (or some indexing measurement of the biotic condition) as well as benchmark comparisons to the channel morphology or in-stream habitat conditions represented by such elements as large wood, pool frequency, or channel width to depth ratios. Since the recruitment and cycling of large wood through the watershed system plays a key role in shaping and contouring of channels, not to mention the substrate it provides for habitat complexity, this parameter is critical in the evaluation of the FPA BMPs that retain or provide for the placement of large wood in streams (see Attachment p. 13 and Appendix A).
Applicability of the habitat modification standard to buffer width, no-touch zones, and basal area options discussed by the ERFAC:

- Most of the information regarding shade is also applicable to Large Wood: trees closest to the channel provide the most potential for LW recruitment (and shade); but may still be important out past 100 feet from the channel (Sufficiency Analysis Draft, 2002; or Issue 2: State of the Science).

- Pushing shade-producing trees into the channel for large wood placement must be considered very carefully. In some settings this may be the best approach. However, trees in many cases may provide shade for decades into the future and then also provide LW in channels.

- If trees are designated for retention in the RMA (for example, 7 of the largest 10 trees as proposed) there must be an assurance that those trees will be retained over time; either through a written plan or some other record which clearly identifies those trees for future consideration.

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**Biological Criteria**

In order to directly evaluate BMP effectiveness in protecting aquatic biota, the ‘biocriteria’ standard is used. However, inventories of biological communities, particularly macro-invertebrates, and comparisons to reference site conditions have not been done with respect to current (or past) forest practices. Since the influences of temperature, sedimentation/turbidity, and large wood (habitat modification) and other anthropogenic effects could affect biocriteria measurements, the importance of achieving these ‘contributing’ standards is re-emphasized. (see Attachment p. 15 for more information on Biocriteria)

The IMST has recommended that “the goal of management and policy should be to emulate (not duplicate) natural process within their historic range”.

**References**


Schmidt. 1999. (Check with J. Paul; cited but not referenced in the Sufficiency Analysis)

Upper Grande Ronde or Umatilla TMDL. [Final reports available on the DEQ website at http://www.deq.state.or.us/wq/TMDLs/TMDLs.htm]
Effect of stand treatment as it influences shade and growing large trees. A stand depicted at (X) is thinned to four densities represented by four percentages of GBA (growth basal area). Light thinning, to 80 percent GBA, results in minimum reduction in shade and minimum increase in rate of diameter growth to grow large trees. Thinning to 60 percent reduces shade by about 40 percent and provides reasonable increase in tree diameter growth. A reduction to 40 percent of GBA significantly reduces shade yet stimulates diameter growth towards large trees. Cutting to 30 percent of GBA affords maximum growth toward large trees, results in minimum shade, and reduces stand occupancy of the site. Stand occupancy less than 30 percent of GBA permits tree regeneration and growth. One cannot provide for maximum shade and growing large trees at the same time.

Frederick C. Hall
Figure 2. Potential use of Caps to minimize harvesting effects on stream temperature and large wood recruitment.
Figure 3: Stream Bed Percent Fines Related to Various Riparian Vegetation Types
(ODFW data, 1996)

Overview

The Department of Environmental Quality (DEQ) is the state agency with primary responsibility for protecting, restoring, and enhancing Oregon’s public waters. DEQ and the Environmental Quality Commission (EQC) set water quality standards to protect “beneficial uses” such as salmonid habitat, drinking water supplies, and recreational activities. DEQ works with other agencies that oversee forestry, agriculture, and urban activities to protect watersheds. Examples of this include coordinated watershed enhancement and protection projects, education to land managers and the general public, projects that demonstrate good land management practices, and the enforcement of standards and regulations. DEQ’s involvement with protection and restoration of riparian and aquatic habitat includes: water quality monitoring and assessment; biological assessments of fish and aquatic invertebrate communities; stream habitat evaluations; the development of total maximum daily loads (TMDLs) and water quality management plans that restore water quality; certifying removal/fill projects under Section 401 of the Clean Water Act (CWA); and providing technical and financial assistance to restoration activities which improve riparian vegetation and their functions that protect water quality.

Achievement of State Water Quality Standards and TMDLs

Under requirements of the Clean Water Act, DEQ identifies streams that do not meet water quality standards and lists them as water quality limited on the state’s 303 (d) list. The Clean Water Act then requires that DEQ establish total maximum daily loads, or TMDLs, for these listed waterbodies. In developing TMDLs, DEQ coordinates with designated management agencies (DMAs) that are responsible for developing management plans that will achieve the TMDL targets. Management plans and DMAs include: the Forest Practices Act best management practices (BMPs) for state and private forest lands, administered by the Oregon Department of Forestry (ODF); Agricultural Water Quality Management Plans for agricultural land administered by the Oregon Department of Agriculture (ODA); urban non-point source management plans developed by local governments; water quality management plans for federal lands, administered by federal agencies (e.g., USFS and BLM); and discharge permit modifications for industries and cities.

TMDLs are being established for the 91 sub-basins in Oregon on a 10-year schedule. TMDLs allocate acceptable “loads” of pollutants such as temperature, sedimentation, turbidity, toxics, and others on the 303(d) list. Protecting and restoring riparian vegetation is often the best method for controlling and reducing pollution, and thus for protecting water quality. DEQ is using ‘shade’ as a surrogate for temperature, thus recognizing that certain levels of shade-producing vegetation are necessary in order to meet TMDL targets and achieve water quality standards.
Cooperative efforts with ODF

DEQ and ODF work cooperatively to insure the protection of water quality at or above levels provided for under the FPA in cases where forest land is to be converted to non-forest uses such as agricultural or urban development. This normally results in land use conversion projects being completed under FPA Water Protection Rules (OAR Chapter 629, Divisions 630 660), their equivalent, or greater water quality protection.

BMP Sufficiency Analysis

The Oregon Department of Forestry and the Oregon Department of Environmental Quality are involved an ongoing cooperative effort to evaluate the sufficiency of current best management practices (BMPs) of the FPA in meeting state water quality standards, as described in the interagency MOU signed in 1998. This is a statewide evaluation, with regional considerations, and is currently looking at several water quality parameters: Temperature; Sedimentation/Turbidity; Habitat Modification; and Biological Criteria. When completed (target date: 2002) this phase of the evaluation will result in potential rule and policy recommendations to the Board of Forestry (BOF). The draft report, “ODF/DEQ Sufficiency Analysis: A Statewide Evaluation of FPA Effectiveness in Protecting Water Quality.” is available on the ODF website at http://www.odf.state.or.us/FP/fpmp/TechReport.htm and on the DEQ website at http://www.deq.state.or.us/wq/nonpoint/nonpoint.htm.

These recommendations will be considered in conjunction with rule and policy recommendations of the FPAC (Forest Practices Advisory Committee) regarding statewide and some Western Oregon-specific BMPs, as well as recommendations of the ERFAC (Eastside Riparian Functions Advisory Committee) regarding specific Eastern Oregon BMPs that influence riparian functions related to eastside conditions.

A question that arose during the FPAC process was, “What is the purpose of this committee if the responsible state agencies are already carrying out their own analysis of the same BMPs that we are considering?” It is true that the sufficiency analysis relies on the same data and information that is used to inform the committee processes. However, the potential recommendations coming out of the sufficiency analysis are limited to the achievement of water quality standards. The recommendations coming out of the committees may be based on monitoring data and information as well as considerations regarding environmental, social, and economic values. Therefore, the nature of the recommendations coming out of these two processes may differ, and it will be up to the BOF to weigh all of the information collectively in order to meet their many statutory obligations.

In many cases, when evaluating best management practices, there may be enough data to indicate that BMPs are not adequate. However, there may not be the resolution of data necessary to determine the exact degree of improvement the BMPs would require in order to meet water quality standards. In part this is due to the difficulty of specifying BMPs that provide enough water quality protection but no more, and is compounded by a
highly variable landscape (spatially as well as temporally) in which prescriptions tailored for one site may not provide BMPs adequate for other locations. For this reason, general prescriptions are typically designed to be conservative enough to provide protections across the landscape (or a part of it) and why water quality standards include a margin of safety as described in the Clean Water Act (CWA).

In considering the environmental, social, and economic values regarding the management of riparian resources, the committee recommendations can promote appropriate action even when the potential degree of improvement on water quality cannot be immediately determined.

Once recommendations are accepted and put place as new into forest practices, then monitoring will be carried out by the agencies as it has been done in the past, and the new BMPs will be assessed in order to see if they meet water quality standards. Through this iterative (or adaptive) process should come a greater understanding of the effect and control of forest practices on water quality.

The following information is provided to the committee regarding the overarching water quality protective mechanisms that are in place regarding forestry activities, state water quality standards and policies relating to non-point source pollution, and further details with respect to the sufficiency analysis approach to evaluating the FPA.

**State Water Quality Protection Policies Regarding Forestry Activities**

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
practice rules adopted to prevent or reduce pollution of waters of the state.” [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]

Current 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 context that applicable water quality standards and the FPA are implemented to address water quality protection for waters of the state.

**Water Quality Standards, Policies, 303(d) listings, and Total Maximum Daily Loads (TMDLs)**

This section provides general definitions of state water quality standards, the state anti-degradation policy, 303(d) listings, and TMDLs. At the end of this section can be found more specific descriptions of each of the water quality parameters currently under joint evaluation by ODF and DEQ, including temperature, sedimentation/turbidity, habitat modification, and biological criteria. Table 2 connects state water quality standards to the FPA rule objectives established to protect water quality and fish. Table 3 provides summary information on the state’s 303(d) list with respect to state and private forestlands with additional information located in Appendix B. Appendix A provides 303(d) listing criterion.

**Water Quality Standards (General)**

Water quality standards are benchmarks established to assess whether the quality of Oregon’s streams, rivers, and lakes is adequate for fish and other aquatic life, recreation, drinking, agriculture, industry and other beneficial uses. Water quality standards are also regulatory tools used by the State Department of Environmental Quality (DEQ) and the federal Environmental Protection Agency (EPA) to prevent pollution of our waters. States are required to adopt water quality standards by the federal Clean Water Act. States submit their standards to EPA for approval.

Water quality standards are comprised of two elements. The first element is the existing or potential uses (beneficial uses). The second element identifies specific benchmarks that describe the level of water quality needed to achieve those uses. When a waterbody supports several uses, such as industrial water supply, recreation, salmonid fish rearing, and livestock watering, federal law requires the DEQ to protect the most sensitive of those uses.

Narrative guidelines describe what Oregon waters will be "free from", like oil and scum or color and odor. Numeric guidelines assign numbers that represent limits and/or ranges
of chemical concentrations, like pH or dissolved oxygen, or physical conditions like water temperature.

The “Antidegradation Policy” is designed to help protect beneficial uses in the state's 19 watershed basins with regard to all of the water quality standards discussed below, and is also applicable to 'high quality waters':

OAR 340-041-0026
Policy and Guidelines Generally Applicable to All Basins

(1) In order to maintain the quality of waters in the State of Oregon, the following is the general policy of the EQC:

(a) Antidegradation Policy for Surface Waters. The purpose of the Antidegradation Policy is to guide decisions that affect water quality such that unnecessary degradation from point and nonpoint sources of pollution is prevented, and to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses. The standards and policies set forth in OAR 340-041-0120 through 340-041-0962 are intended to implement the Antidegradation Policy;

(A) High Quality Waters Policy: Where existing water quality meets or exceeds those levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, and other designated beneficial uses, that level of water quality shall be maintained and protected. The Environmental Quality Commission, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, and with full consideration of sections (2), (3) and (5) of this rule, however, may allow a lowering of water quality in these high quality waters if they find:

(i) No other reasonable alternatives exist except to lower water quality; and

(ii) The action is necessary and justifiable for economic or social development benefits and outweighs the environmental costs of lowered water quality; and

(iii) All water quality standards will be met and beneficial uses protected.

303(d) listing information

The 1972 Federal Clean Water Act (CWA) in Section 303(d) requires each state to identify those waters for which existing required pollution controls are not adequate to achieve that state’s water quality standards. For these waters, states are required to establish total maximum daily loads (TMDLs) in accordance with a priority ranking.

The State must use all existing and readily available water quality data to prepare the Section 303(d) list. At a minimum, the following sources of data should be considered: waters identified as partially or not meeting water quality standards in the 305(b) report; waters for which dilution calculations or predictive models indicate nonattainment of standards; waters for which problems have been reported by other agencies, institutions and the public; and waters identified as impaired or threatened in the State’s nonpoint assessments submitted to EPA under Section 319 of the CWA.
Standards are typically designed to protect the most sensitive beneficial use within a water body. Listings can be based on: evidence of a numeric standard exceedence; evidence of a narrative standard exceedence; evidence of a beneficial use impairment; or antidegradation (i.e. a declining trend in water quality such that it would exceed a standard prior to the next listing period).

In general, rivers and streams were listed for their entire length (mouth to headwaters) unless there was information available to divide them into segments. Larger rivers were segmented based on factors such as changes in land use or slope, presence of a dam or other major structure such as a major irrigation diversion or major tributary. Rivers and streams were also segmented based on water quality data indicating different water quality status. Segments identified in the Nonpoint Source Assessment (DEQ, 1988) were utilized as a starting point. These segments were reviewed as part of the public review process of the Nonpoint Source Assessment. The DEQ is interested in gaining data that will aid in further refining the segments listed and in developing the list more on a watershed basis. This would include the acquisition of data that might lead to both additional listings and/or the removal of segments currently on the list. Headwaters can be defined as the natural perennial/intermittent stream interface of the named stream. Segments are based on professional judgment and the DEQ will review its approach in future listing updates.

303(d) listings of the 1998 MOU water quality parameters.

Summary statistics for the 303(d) listed parameters with respect to state and private forestlands of Oregon are presented in Table 3. Temperature concerns on state or private forestland are indicated throughout the state in all 18 basins, and in 70 of the 92 sub-basins; with more than 3000 miles listed on private forestland. Slightly more than 25% of the total listed waters of the state for each of the following parameters occur on private forestland: temperature, sedimentation, habitat modification, and biological criteria.

It should be noted that monitoring data is lacking in many areas of the state for many of the study parameters, preventing the 303(d) list at this time from being a comprehensive characterization of state water quality. Acquiring temperature data has been relatively simple and inexpensive when compared to the other parameters of this study, particularly toxics; but is lacking in many areas, especially for streams adjacent to private lands where access to appropriate monitoring sites has often been difficult to obtain. The 303(d) list does estimate a minimum range of temperature and other water quality problems, and reveals overlaps in basins and sub-basins where more than one parameter is identified as a concern. Additional sub-basin statistics are provided in Appendix B. 303(d) listing criterion are found in Appendix A.

Total Maximum Daily Load (TMDL) Targets

Under requirements of the Clean Water Act, the DEQ establishes basin or sub-basin TMDLs for 303(d) listed waterbodies, and coordinates with ODF, the DMA for state and private forestlands, in achieving water quality standards.
The comprehensive watershed approach for developing TMDLs takes into account pollution from all sources, including point source industrial and municipal discharges, as well as non-point source discharges from farms, forests, and urban areas.

The TMDL process identifies the maximum permissible loading capacities for the waterbody in question. A load allocation (LA) is the predicted amount of pollutant that point and/or non-point sources (such as forest operations) can contribute to a stream without exceeding the water quality standards for which that LA was developed. LA's include a margin of safety based on uncertainties in watershed measurements and predictions.

The key elements of a TMDL are:
1. A determination of the loading capacity of the receiving waterbody, i.e. the quantity of pollutants that can be assimilated and have water quality standards met;
2. Waste load allocations for point source dischargers (WLAs). These will be incorporated into NPDES permits at the time of renewal or reissue;
3. Load allocations for nonpoint sources (LAs). These shall be aggregate allocations to each sector, as applicable, including but not limited to agriculture, forestry, and urban within the geographic area of the TMDL;
4. An allocation for background, or natural levels of pollutants; and
5. A margin of safety based on the rigor of the available data and modeling.

DEQ works with watershed councils and the public to allocate this maximum load among the various pollutant contributors, such that once these allocations are met, water quality standards will no longer be violated. TMDLs are submitted to the U.S. EPA for approval. The TMDL must include information that defends the total allocation, and must be accompanied by an implementation plan (WQMP) that outlines how the TMDL allocations will be met and provides reasonable assurance that the TMDL will be implemented.

TMDL development includes the following steps for completion:
1. Perform preliminary analysis/determine data needs.
2. Establish public involvement strategy.
3. Develop overall plan for monitoring and analysis.
4. Perform data collection.
5. Perform watershed analysis/develop load allocations.
6. Submit TMDL to EPA.
7. Track TMDL implementation.

**Water Quality Standards/Criterion**

**Temperature**

Oregon’s water temperature standards include specific numeric criteria, as well as the narrative water quality standard. The numeric criteria are “seven-day moving averages”
of daily maximum temperature based on general and special habitat considerations, along with development requirements of the most sensitive species (salmonids). The narrative standard of ‘no measurable temperature increase’ is triggered by any one of the numeric criteria, depending on water quality and/or aquatic habitat conditions (see below).

Table 1. State water quality temperature numeric criteria.

<table>
<thead>
<tr>
<th>Bull Trout Habitat Criteria</th>
<th>Cold Water Spawning, Egg Incubation, and Fry Emergence Habitat Criteria</th>
<th>Standard Criteria</th>
<th>Willamette &amp; Columbia Rivers Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F 50</td>
<td>64</td>
<td>68*</td>
<td></td>
</tr>
<tr>
<td>°C 10.0</td>
<td>17.8</td>
<td>20.0</td>
<td></td>
</tr>
</tbody>
</table>

* With the exception of the 68°C temperature standard for the Willamette River, EPA has reviewed and approved these standards as of July 1999.


Narrative standard: No measurable surface water temperature increases resulting from anthropogenic activities are allowed under specified water quality conditions or at specified locations as described in the following rule [A measurable temperature increase means an increase in stream temperature of more than 0.25°F [OAR 340-041-0006(55)]]:

OAR 340-041-(Basin)-
Water Quality Standards Not to be Exceeded (To be Adopted Pursuant to ORS 468.735 and Enforceable Pursuant to ORS 468.720, 468.990, and 468.992)

(2)(b) Temperature: 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. The method for measuring the numeric temperature criteria specified in this rule is defined in OAR 340-041-0006(54):

To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

(i) In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C);
(ii) In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0°F (20.0°C);
(iii) In waters and periods of the year determined by the department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55.0°F (12.8°C);
(iv) In waters determined by the department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0°F (10.0°C);
(v) In waters determined by the department to be ecologically significant cold-water refugia;
(vi) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population;
(vii) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/l or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin;
(viii) In natural lakes.

**Applicability of the rule:** The DEQ developed the narrative standard to be interpreted in the following way with respect to OAR 340-041-(Basin)(2)(b)(A): the standard will not be met if there is a measurable temperature increase caused by an anthropogenic activity where one of the conditions listed above exist (OAR 340-041-(Basin)-2(b)(A)(i-viii)). Because all of the basins (and 79 of 92 of the sub-basins) in the state of Oregon are listed for temperature impairment [64°F threshold: 303(d) list], and salmonid rearing occurs to a greater or lesser degree in all of the basins, the anti-degradation numeric criteria is currently applicable to all fish bearing waters of the state, as well as activities which cause measurable temperature increases to fish bearing waters.

The corresponding rule OAR 629-635-0100 (7) describes in general terms the achievement and maintenance of water quality standards with respect to forestry operations:

OAR 629-635-0100 (7) The overall goal of the water protection rules 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 resulting from forest operations do not impair the achievement and maintenance of the water quality standards.

(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.

**Exceptions to the anti-degradation numeric criteria rule [OAR 340-041-(Basin)(2)(A)]** may occur under different scenarios. One scenario: if the department approves a surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D):

OAR 340-041-0026(3)(a)(D) Effective July 1, 1996, in any waterbody identified by the department as exceeding the relevant numeric temperature criteria specified for each individual water quality management basin identified in OAR 340-041-0205, OAR-340-041-0245, OAR-340-041-0285, OAR-340-041-0325, OAR-340-041-0365, OAR-340-041-0445, OAR-340-041-0485, OAR-340-041-0525, OAR-340-041-0565, OAR-340-041-0605, OAR-340-041-0645, OAR-340-041-0685, OAR-340-041-0725, OAR-340-041-0765, OAR-340-041-0805, OAR-340-041-0845, OAR-340-041-0885, OAR-340-041-0925, OAR-340-041-0965, and designated as water quality limited under Section 303(d) of the Clean Water Act, the following requirements shall apply to appropriate watersheds or stream segments in accordance with priorities established by the department. The department may determine that a plan is not necessary for a particular stream segment or segments within a water-quality limited basin based on the contribution of the segment(s) to the temperature problem:
(i) Anthropogenic sources are required to develop and implement a surface water temperature management plan which describes the best management practices, measures, and/or control technologies which will be used to reverse the warming trend of the basin, watershed, or stream segment identified as water quality limited for temperature;

(iii) Sources shall continue to maintain and improve, if necessary, the surface water temperature management plan in order to maintain the cooling trend until the numeric criterion is achieved or until the department, in consultation with the Designated Management Agencies (DMAs), has determined that all feasible steps have been taken to meet the criterion and that the designated beneficial uses are not being adversely impacted. In this latter situation, the temperature achieved after all feasible steps have been taken will be the temperature criterion for the surface waters covered by the applicable management plan. The determination that all feasible steps have been taken will be based on, but not limited to, a site-specific balance of the following criteria: protection of beneficial uses; appropriateness to local conditions; use of best treatment technologies or management practices or measures; and cost of compliance;

(iii) Once the numeric criterion is achieved or the department has determined that all feasible steps have been taken, sources shall continue to implement the practices or measures described in the surface water temperature management plan in order to continually achieve the temperature criterion;

(iv) For point sources, the surface water temperature management plan will be part of their National Pollutant Discharge Elimination System Permit (NPDES);

(v) For nonpoint sources, the surface water temperature management plan will be developed by designated management agencies (DMAs) which will identify the appropriate BMPs or measures;

(vi) A source (including but not limited to permitted point sources, individual landowners and land managers) in compliance with the department or DMA (as appropriate) approved surface water temperature management plan shall not be deemed to be causing or contributing to a violation of the numeric criterion if the surface water temperature exceeds the criterion;

(vii) In waters the department determines to be critical for bull trout recovery, the goal of a bull trout surface water temperature management plan is to specifically protect those habitat ranges necessary to maintain the viability of existing stocks by restoring stream and riparian conditions or allowing them to revert to conditions attaining the coolest surface water temperatures possible under natural background conditions;

The process for developing watershed specific practices for water quality limited watersheds under the Forest Practices Act, which could serve as a surface water temperature management plan, is described in OAR 629-635-0120.

629-635-0120

Watershed Specific Practices for Water Quality Limited Watersheds and Threatened or Endangered Aquatic Species:

(1) The objective of this rule is to describe a process for determining whether additional watershed specific protection rules are needed for watersheds that have been designated as water quality limited or for watersheds containing threatened or endangered aquatic species.

(2) The Board of Forestry shall appoint an interdisciplinary task force, including representatives of forest landowners within the watershed and appropriate state agencies, to evaluate a watershed, if the board has determined based on evidence presented to it that forest practices in a watershed are measurably limiting to water quality achievement or species maintenance, and either:
(a) The watershed is designated by the Environmental Quality Commission as water quality limited; or

(b) The watershed contains threatened or endangered aquatic species identified on lists that are adopted by rule by the State Fish and Wildlife Commission, or are federally listed under the Endangered Species Act of 1973 as amended.

(3) The board shall direct the task force to analyze conditions within the watershed and recommend watershed-specific practices to ensure water quality achievement or species maintenance.

(4) The board shall consider the report of the task force and take appropriate action.

(5) Nothing in this rule shall be interpreted to limit the Board's ability to study and address concerns for other species on a watershed basis.

Stat. Auth.: ORS 527.710 & ORS 527.765

Stats. Implemented: ORS 527.710


Another scenario for obtaining an exception to anti-degradation numeric criteria rule is stated in OAR 340-041-(Basin)-(2)(b) (C):

OAR 340-041-(Basin)-(2)(b) (C) Any source may petition the Commission for an exception to subparagraphs (A)(i) through (vii) of this subsection for discharge above the identified criteria if:

(i) The source provides the necessary scientific information to describe how the designated beneficial uses would not be adversely impacted; or

(ii) A source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource.

A brief summary of information regarding these standards is provided below. Appendix A lays out more detailed descriptions of these parameters (including temperature) with respect to 303(d) listing criteria.

**Cold-water Refugia**

Oregon forested watersheds exhibit a high degree of variability in water temperature. The existence of 'cold water refugia' is an important component of salmonid habitat because they provide holding (resting) and rearing habitat for juveniles and adult fish. Types of cold water refugia include, but are not limited to: tributary mouths; lateral seeps; pool bottom seeps; and groundwater-to-surface interaction zones (Bilby, 1984).

Bilby (1984) determined that the mouths of tributaries in a Western Washington stream (Thrash Creek) averaged 8.5°F lower than the average stream temperatures of the receiving waters fed by the tributaries. Cool water pockets located at tributary mouths of Western Washington streams constituted less than 1.5% of the overall flow volume of the
watershed, while cool water areas of all types accounted for approximately 2.9% of the total water volume (Bilby, 1984).

The determinations presented above indicates that harvesting up to the edge of the stream bank on small Type-N (non-fish-bearing) streams, as allowed under current FPA BMPs, presents a “low to moderate” risk (Table 9) that stream temperature standards are not being met. This can occur where Type-N tributary mouths enter Type-F streams, potentially influencing this type of cold-water refugia.

Cold water refugia are addressed in water protection rule OAR 340-041-0205 (2)(b)(A) “...no measurable surface water temperature increase resulting from anthropogenic activities is allowed: (v) In waters determined by the department to be ecologically significant cold-water refugia;”

By definition [OAR 340-041-0006 (57)] "Ecologically Significant Cold-Water Refuge" exists when all or a portion of a waterbody supports stenotypic cold-water species (flora or fauna) not otherwise widely supported within the subbasin, and either: (a) Maintains cold-water temperatures throughout the year relative to other segments in the subbasin, providing summertime cold-water holding or rearing habitat that is limited in supply, or; (b) Supplies cold water to a receiving stream or downstream reach that supports cold-water biota.

A specific delineation of what constitutes cold-water refugia (i.e. spatial extent and operational definition) and guidance on how to identify these areas has not been completed by DEQ. Until this is done, evaluating the FPA in terms of protecting cold-water refugia will be problematic. There are many potential areas that might be considered in the evaluation cold-water refugia and the adequacy of the FPA. Given all of these factors, rule adequacy as it pertains to this issue may still need to be addressed at some point in the future.

**Sedimentation Standard**

OAR 340-41-(basin)(2) (applicable to all basins) No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the (applicable) Basin:

(j) 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 shall not be allowed;

The sedimentation standard is most applicable to forestry activities at the reach or watershed level, while the turbidity standard (see below) is a better measure of potential sedimentation problems caused by a harvesting activity at specific sites.

The sedimentation standard, which is narrative, does not assign a threshold level for anthropogenic activities. Watershed analysis [as required for 303(d) listing] has been utilized as an assessment tool for understanding and controlling sediment inputs and effects on specific drainage areas. In basins where sedimentation or turbidity listings
occur, loads are in mg/L of total suspended solids (TSS). Nephelometric Turbidity Units (NTUs) which correlate strongly with basin suspended sediment loads, have been used to calculate loads of TSS determined to be at levels protective of aquatic species and not detrimental to residential biological communities.

**Turbidity Standard**

The turbidity standard is most applicable to forestry operations with respect to on-site monitoring of BMPs used in vegetation removal, road construction and use, skid trails, and removal/fill activities (such as culvert replacement):

OAR 340-41-(basin)(2) (applicable to all basins)  No wastes shall be discharged and no activities shall be conducted which either alone or in combination with other wastes or activities will cause violation of the following standards in the waters of the (applicable) Basin:

(c) Turbidity (Nephelometric Turbidity Units, NTU): No more than a ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied and one of the following has been granted:

(A) Emergency activities: Approval coordinated by DEQ with the department of Fish and Wildlife under conditions they may prescribe to accommodate response to emergencies or to protect public health and welfare;

(B) Dredging, Construction or other Legitimate Activities: Permit or certification authorized under terms of Section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 14l-085-0100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

In order to achieve compliance of the turbidity standard, on-site monitoring is required, both during and after initial work (following rain events) for activities which may cause erosion or the input of sediments into state waterways. For most forestry type activities the protection of water quality can be achieved by applying the rule in the following manner. For work done in dry weather and away from flowing waters, monitoring should occur with the first or major rain events. [Note that a visually perceptible plume (i.e. you can see it) 100 feet downstream from an activity is considered a violation and requires immediate correction]:

The authorized work shall not cause turbidity of affected waters to exceed 10% over natural background turbidity 100 feet downstream of the fill point. For projects proposed in areas with no discernible gradient break (gradient of 2% or less), monitoring shall take place at 4 hour intervals and the turbidity standard may be exceeded for a maximum of one monitoring interval per 24 hour work period provided all practicable control measures have been implemented. This turbidity standard exceedance interval applies only to coastal lowlands and floodplains, valley bottoms and other low-lying and/or relatively flat land.

For projects in all other areas, the turbidity standard can be exceeded for a maximum of 2 hours (limited duration) provided all practicable erosion control measures have been implemented. These projects may also be subject to additional reporting requirements.
Turbidity shall be monitored during active in-water work periods. Monitoring points shall be at an undisturbed site (representative background) 100 feet upstream from the turbidity causing activity (i.e., fill or discharge point), 100 feet downstream from the fill point, and at the point of fill. A turbidimeter is recommended, however, visual gauging is acceptable. Turbidity that is visible over background is considered an exceedance of the standard.

Practicable erosion control measures which shall be implemented, as appropriate, include but are not limited to the following:

• Place fill in the water using methods that avoid disturbance to the maximum practicable extent (e.g. placing fill with a machine rather than end-dumping from a truck).
• Prevent all construction materials and debris from entering waterway;
• Use filter bags, sediment fences, sediment traps or catch basins, silt curtains, leave strips or berms, Jersey barriers, sand bags, or other measures sufficient to prevent movement of soil;
• Use impervious materials to cover stockpiles when unattended or during rain event;
• Erosion control measures shall be inspected and maintained daily to ensure their continued effectiveness;
• No heavy machinery in a wetland or other waterway;
• Use a gravel staging area and construction access;
• Fence off planted areas to protect from disturbance and/or erosion; and
• Flag or fence off wetlands adjacent to the construction area.

Habitat Modification Standard

OAR 340-41-(basin)(2) (applicable to all basins): 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 shall not be allowed.

-or-

OAR 340-41-027 (applicable to all basins): Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

Biological Criteria Standard

OAR 340-41-027 (Standards applicable to all basins) Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

"Aquatic species" means any plants or animals which live at least part of their life cycle in waters of the State.
"Biological Criteria": means numerical values or narrative expressions that describe the biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use.
"Resident Biological Community" means aquatic life expected to exist in a particular habitat where water quality standards for a specific ecoregion, basin, or water body are met. This shall be established by accepted biomonitoring techniques.
"Without Detrimental Changes in the Resident Biological Community" means no loss of ecological integrity when compared to natural conditions at an appropriate reference site or region.
"Ecological Integrity" means the summation of chemical, physical and biological integrity capable of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region.
"Appropriate Reference Site or Region" means a site on the same water body, or within the same basin or ecoregion that has similar habitat conditions, and represents the water quality and biological community attainable within the areas of concern.
Both the habitat modification and biological criteria standards are most applicable to forestry activities at the reach or watershed levels since they require detailed analysis often encompassing extensive drainage areas. TMDLs are not currently being developed for the habitat modification or biological criteria since these parameters are not considered by EPA to be discrete 'pollutants'; but are rather categorized as 'pollution'.

Habitat modification and biological criteria are important parameters for consideration for this evaluation because they focus directly on the presence of aquatic life, a 'beneficial use' of state waterways. Habitat modification 303(d) listings require a watershed analysis that also takes into account the biological criteria (or some indexing measurement of the biotic condition), as well as benchmark comparisons to the channel morphology or in-stream habitat conditions represented by such elements as large wood, pool frequency, or channel width to depth ratios. Since the recruitment and cycling of large wood through the watershed system plays a key role in shaping and contouring of channels, not to mention the substrate it provides for habitat complexity, this parameter is critical in the evaluation of the FPA BMPs that retain or provide for the placement of large wood in streams.

Evaluating Best Management Practices (BMPs)

Riparian forest buffers provide many key functions in water quality protection: shade, large wood, bank stability, sediment filtration, dust and chemical drift filtration, etc. Most of the water quality parameters addressed in the sufficiency analysis are inter-related, and forest management activities often have the potential to affect more than one of these parameters at the same time. For example, shade-producing trees affecting water temperature can provide large wood in and out of the channel that can reduce levels of sedimentation and turbidity. Sedimentation is also a parameter that can influence stream temperature where changes in sedimentation alter 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 together rather than just isolating individual parameters and attempting to consider them independently. Figure 1 below shows the various BMPs, and their function pathways to protecting the MOU water quality parameters of this analysis. Table 4 provides a brief description of the function pathways that provide a link between the water quality parameters and specific forest practices.

Table 2 illustrates the parity between state water quality standards and the FPA goals and objectives for achieving water quality. With the exception of temperature and turbidity, the water quality standards and criteria for all parameters in Table 2 are to protect against those conditions that are “detrimental” or “deleterious” to fish or aquatic communities. This level of protection is comparable to the “fishable/swimmable” standard derived from the Federal Clean Water Act, as well as the water quality goals described in ORS 468B.015(2) and 468B.110 (2). The FPA has specific goals to address resource protection that are designed to be consistent with the federal and state water quality goals. Specifically, the regulation of forest practices in the State of Oregon must be “consistent with sound management of soil, air, water, fish and wildlife resources . . . that assures the
continuous benefit of those resources for future generations of Oregonians” (ORS 527.630(1)).
Table 2: Water quality parameters, applicable standards and/or criteria, and applicable FPA rule objectives.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Paraphrase of State Standards and/or Criteria</th>
<th>FPA Goals and Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Various numeric and narrative standards to protect beneficial uses.</td>
<td>“The desired future condition for streamside areas along fish use streams is to grow and retain vegetation so that, over time, average conditions across the landscape become similar to those of mature streamside stands.” OAR 629-640-0000(2)</td>
</tr>
<tr>
<td></td>
<td>OAR 340-41-(basin)(2)(b)</td>
<td>“The desired future condition for streamside areas that do not have fish use is to have sufficient streamside vegetation to support functions and processes that are important to downstream fish use waters and domestic water use . . .” OAR 629-640-0000(4)</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>The formation of [any] deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed. Documentation should indicate that there are conditions that are deleterious to fish or other aquatic life. OAR 340-41-(basin)(2)(i)</td>
<td>“The purpose of the road construction and maintenance rules is to . . . provide the maximum practical protection to maintain forest productivity, water quality, and fish and wildlife habitat.” OAR 629-625-0000(3)</td>
</tr>
<tr>
<td></td>
<td>A systematic or persistent increase (of greater than 10%) in turbidity due to an operational activity that occurs on a persistent basis (e.g. dam release or irrigation return, etc). OAR 340-41-(basin)(2)(c)</td>
<td>“The purpose of the harvesting rules is to establish standards for forest practices that will maintain the productivity of forestland, minimize soil and debris entering waters of the state, and protect wildlife and fish habitat.” OAR 629-630-0000(3)</td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td>“The desired future condition for streamside areas along fish use streams is to grow and retain vegetation so that, over time, average conditions across the landscape become similar to those of mature streamside stands.” OAR 629-640-0000(2)</td>
</tr>
<tr>
<td></td>
<td>The creation of . . . conditions that are deleterious to fish or other aquatic life . . . shall not be allowed. Documentation that habitat conditions are a significant limitation to fish or other aquatic life. OAR 340-41-(basin)(2)(i)</td>
<td>“The desired future condition for streamside areas that do not have fish use is to have sufficient streamside vegetation to support functions and processes that are important to downstream fish use waters and domestic water use . . .” OAR 629-640-0000(4)</td>
</tr>
<tr>
<td>Habitat Modification</td>
<td></td>
<td>“The purpose of the road construction and maintenance rules is to . . . provide the maximum practical protection to maintain forest productivity, water quality, and fish and wildlife habitat.” OAR 629-625-0000(3)</td>
</tr>
<tr>
<td></td>
<td>Waters of the state shall be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities. OAR 340-41-027</td>
<td>“The purpose of the harvesting rules is to establish standards for forest practices that will maintain the productivity of forestland, minimize soil and debris entering waters of the state, and protect wildlife and fish habitat.” OAR 629-630-0000(3)</td>
</tr>
</tbody>
</table>
Table 3  Summary statistics for 303(d) listed parameters regarding state and private forestlands of Oregon [1998 303(d) List].
For the 18 Basins and 92 Sub-Basins of Oregon; non-listings may signify a lack of data or incomplete studies.

<table>
<thead>
<tr>
<th>BASIN</th>
<th>TEMPERATURE</th>
<th>SEDIMENTATION</th>
<th>HABITAT MODIFICATION</th>
<th>BIOLOGICAL CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Listed Waters Forestland</td>
<td>Listed Waters Total</td>
<td>Listed Waters Forestland</td>
<td>Listed Waters Total</td>
</tr>
<tr>
<td>Deschutes</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Goose and Summer Lakes</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grande Ronde</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Hood</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>John Day</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Klamath</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Malheur Lake</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malheur River</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mid Coast</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>North Coast</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Owyhee</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Rogue</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sandy</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Coast</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Umatilla</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Umpqua</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Willamette</td>
<td>12</td>
<td>12</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total # of Sub-basins with 303(d) listings</td>
<td>70</td>
<td>79</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Total 303(d) listed miles</td>
<td>3,284</td>
<td>12,285</td>
<td>456</td>
<td>1,426</td>
</tr>
<tr>
<td>Private forestlands % of total listed miles</td>
<td>26</td>
<td>31</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>State forestlands % of total listed miles</td>
<td>0.69</td>
<td>0.47</td>
<td>0.50</td>
<td>0.12</td>
</tr>
</tbody>
</table>
Figure 1: Water quality function pathways between the FPA and water quality criteria and standards.

Table 4. Overview of potential water-quality-protective functions related to forest practices (see Figure ABC).

<table>
<thead>
<tr>
<th>Flowchart Pathway</th>
<th>Function/Provision Description for Specified Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Temperature</strong></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>Retained trees and understory vegetation in riparian areas adjacent to streams provide shade to streams. Shade reduces heat loading from solar radiation at levels corresponding to the percent effective shade on the stream, and can attenuate diurnal maximum and minimum stream temperatures.</td>
</tr>
<tr>
<td>B2</td>
<td>Large wood, placed or fallen into streams from retained riparian vegetation and positioned in the stream channel, may increase the complexity of in-channel habitat, creating pools and riffles. Deep-water areas of cooler temperatures, or cold water refugia, can also result from large wood in streams.</td>
</tr>
<tr>
<td>C4</td>
<td>Vegetation retention on banks can decrease channel bank erosion and prevent channel widening. Narrow channels receive less solar radiation and stream heating relative to wider channels (all else being equal).</td>
</tr>
<tr>
<td>D4, E4</td>
<td>Road construction and maintenance practices that minimize sediment inputs to streams, such as location, drainage control, hard surfacing, and choice of hauling time, may prevent channel widening and temperature increases as described in C4.</td>
</tr>
</tbody>
</table>
Sedimentation and Turbidity

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Vegetation retention on banks can decrease channel bank erosion, decreasing sediment inputs.</td>
</tr>
<tr>
<td>D5, E5</td>
<td>Road construction and maintenance practices that minimize sediment inputs to streams, such as location, drainage control, hard surfacing, and choice of hauling time, reduce undesirable levels of sediment and turbidity inputs.</td>
</tr>
</tbody>
</table>

Habitat Modification

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B3</td>
<td>Tree retention in riparian areas may provide future recruitment of large wood to streams. Historically, large wood in channels recruited from fallen trees has been a valuable component of aquatic habitat. Managed placement of large wood can be an effective means to accelerate inputs.</td>
</tr>
<tr>
<td>C6, D6</td>
<td>Large Wood, placed or fallen into or near streams from retained riparian vegetation may serve to trap sediments in place, influencing habitat quality.</td>
</tr>
<tr>
<td>E6</td>
<td>The movement of large wood and sediment downstream is an important function that provides for, and maintains, fish habitat. Stream crossings that are designed to accommodate this function can have a positive influence on habitat quality.</td>
</tr>
<tr>
<td>F7</td>
<td>Culverts that block fish passage reduce the amount of fish habitat available.</td>
</tr>
</tbody>
</table>

Biological Criteria

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrelated</td>
<td>Forest practices that influence water quality with respect to temperature, sedimentation, turbidity, and habitat modification may also affect biotic populations with respect to the biological criteria standard.</td>
</tr>
</tbody>
</table>

Thermal Microclimate

The thermal microclimate refers to localized air temperatures, relative humidity and wind speeds affecting the stream that result from riparian and forest vegetation. While direct solar loading to a stream is the primary contributor to the diurnal fluctuations in stream temperature, the exchange of heat between water and air is also a factor in stream temperature.

Dong et al. (1998) confirmed that harvesting adjacent to riparian forests can affect air temperatures above the stream. This study looked at Western Washington pre- and post-harvesting comparisons in 1993 and 1994 and found air temperature increases above streams of 2-4°C. This study also suggested that temperature increases caused by the ‘edge effect’ would likely be seen even with buffers wider than 70m, which was the limit of this study. Chen et al. (1995) found that in upslope areas not associated with riparian vegetation, edge effects on temperature might be detected at more than 180m inside the forested canopy. Dong et al. (1998) also found that relative humidities were 2.5 to 13.8 % lower after harvesting, suggesting a potential evaporative water loss in streams due to lost riparian vegetation. Energy lost through evaporative heat transfer can result in a decrease in stream temperatures if heat losses are greater than heat gains (Benner & Beschta 2000).

References


Note: The DEQ material presented to ERFAC included “Appendix F: Selected Water Quality Standards Criteria,” of the ODF/DEQ Sufficiency Analysis. That appendix is not reproduced here but is available in the following:

What is the applicability of the narrative temperature standard “of no measurable temperature increases” to the FPA with respect to fish and non-fish bearing streams?

The following information describes the applicability of the state temperature standard to forestry activities, including the narrative standard of 'no measurable temperature increases'. A technical explanation of the standard is included, citing the OAR rules that the standard is based on. Research and monitoring information summarized in the draft ODF/DEQ sufficiency analysis (currently under external peer review) relevant to forest practices and water quality is also included below. Information on the physics (or mass balance) of temperature increase contributions from small tributaries to downstream fish bearing streams is also included which may help predict potential temperature increases where little other monitoring data is available. This information is provided to the committee in order to aid in the discussion and consideration of BMPs that will be protective of state water quality standards.

**Temperature Standards/Criterion**

Oregon’s water temperature standards include a narrative standard and numeric criteria which may trigger the narrative standard. The numeric criteria (or triggers) are thresholds for “seven-day moving averages” of daily maximum temperature based on general and special habitat considerations, along with development requirements of the most sensitive species (salmonids):

**Table 1.** State water quality temperature numeric criteria.

<table>
<thead>
<tr>
<th>Bull Trout Habitat Criteria</th>
<th>Cold Water Spawning, Egg Incubation, and Fry Emergence Habitat Criteria</th>
<th>Standard Criteria</th>
<th>Willamette &amp; Columbia Rivers Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
<td>50</td>
<td>55</td>
<td>64</td>
</tr>
<tr>
<td>°C</td>
<td>10.0</td>
<td>12.8</td>
<td>17.8</td>
</tr>
</tbody>
</table>

* With the exception of the 68° C temperature numeric criteria for the Willamette River, EPA has reviewed and approved these numeric criterion as of July 1999.

**Narrative standard:** No measurable surface water temperature increases resulting from anthropogenic activities are allowed under specified water quality conditions or at specified locations as described in the following rule [A measurable temperature increase means an increase in stream temperature of more than 0.25°F [OAR 340-041-0006(55)]]:

OAR 340-041-(Basin)-
Water Quality Standards Not to be Exceeded (To be Adopted Pursuant to [ORS 468.735 and Enforceable Pursuant to ORS 468.720, 468.990, and 468.992])

(2)(b) Temperature: 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. The method for measuring the numeric temperature criteria specified in this rule is defined in OAR 340-041-0006(54):
To accomplish the goals identified in OAR 340-041-0120(11), unless specifically allowed under a department-approved surface water temperature management plan as required under OAR 340-041-0026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed:

(i) In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64.0°F (17.8°C);
(ii) In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68.0°F (20.0°C);
(iii) In waters and periods of the year determined by the department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55.0°F (12.8°C);
(iv) In waters determined by the department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50.0°F (10.0°C);
(v) In waters determined by the department to be ecologically significant cold-water refugia;
(vi) In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened and Endangered population;
(vii) In Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/l or 10 percent saturation of the water column or intergravel DO criterion for a given stream reach or subbasin;
(viii) In natural lakes.

The narrative standard of no measurable increase to stream temperature is applicable to basins which are 303(d) listed for temperature and for which salmonid fish rearing is a designated beneficial use. Other stream conditions, as listed above, may also apply, although condition ‘i’ encompasses all of the basins of the state.

Since salmonids are considered the most sensitive beneficial use in the establishment of the numeric temperature criteria, as well as in the application of the narrative standard, the ‘no measurable temperature increase’ rule should be applied only to activities that cause measurable temperature increases to fish bearing streams. See DEQ 'Attachment' regarding standards and policies for additional information.

**Water temperature data:** *A nationwide review* (five studies excluding Oregon) showed summer water temperature average maximum increases through clearcuts of from 5 to 19°F, and minimum temperature increases of from 0 to 3°F. These studies were done on the East Coast in the 1970s and early 80’s on areas harvested adjacent to larger streams. (Beschta et al., 1987)

*Oregon Stream temperature increases through clearcuts, and downstream from clearcuts:* An Oregon review of average summer maximum water temperature increases through Coast Range and Cascades clearcuts of from 5 to 18°F. Increases of temperature through mixed clearcut and forested reaches: 0 to 3.8 °F/1000 ft. These studies were done on areas harvested adjacent to larger streams before there was a Forest Practices Act (published between 1967 and 1971) (Beschta et al., 1987)

**What about small Type N streams** that receive little or no canopy cover retention under the current rules following an adjacent harvest operation? Caldwell et al. (1991) and Robison et al. (1995) provide some information as to the performance of the current rules in terms of temperature effects from harvesting to the edge of small Type N streams. Caldwell et al. (1991)
examined the extent of temperature increases on “Type 4” streams (comparable to the category of small streams in Oregon) on downstream waters. In cases where a single stream channel changed from a Type 4 to a Type 3 water type, short response distances were seen, in response to changes in the riparian shading levels. Maximum equilibrium temperatures were quickly established dependent on the downstream conditions once the water entered the Type 3 (shaded) reach. The response distance was typically 150 meters or less with no effect on temperature from the harvested Type 4 stream downstream of the response distance.

The response of the Type 3 [the downstream receiving stream] never exceeded 0.5°C [1°F] change in temperature attributable to the incoming Type 4 stream. Reasons include the typical small size of the Type 4 tributaries in relation to the Type 3 receiving streams, and the relatively cool temperatures seen in some Type 4 reaches despite total removal of overstory canopy. (Caldwell et al., 1991)

This study also observed that several of the Type 4 stream reaches monitored for temperature exceeded the Washington water quality standards, and harvested streams were as much as 2-8°C higher than for streams at similar elevations with mature forest canopies. Despite these increases, the elevated temperatures in many of these streams still remained well below the water quality numeric criteria [Washington State criteria]. However, there were examples in both harvested and forested Type 4 streams where the temperature standard was exceeded [Washington State criteria].

Robison et al. (1995) conducted a similar study on stream temperature response on small Type N streams in the Oregon Coast Range and Interior Georegions. As with Caldwell et al. (1991), Robison et al. also observed stream temperatures that exceeded the water quality standard in forested stream reaches. There was a total of eight monitoring sites that evaluated stream temperature flowing through clearcut sites.

In general, maximum water temperatures for streams flowing out of clearcut units were below 60°F. Two clearcut unit streams had maximum water temperatures greater than 60°F [one of which exceeded 64°F]. For most of the clearcut units, there was significant cooling below the unit as the streams re-entered the forest canopy. This finding is consistent with previous temperature monitoring on small headwater streams. (Robison et al., 1995)

In the Robison et al (1995) study, Brush Creek, the only stream segment which had temperature data above and below the clearcut, had the following monitoring results: The 7-day average maximum temperature of Brush Creek (0.24 cfs) increased 6.9°F through 280 feet of a clearcut (from 68.5 to 75.4°F), or 25°F/1000 feet water temperature increase. Elevated temperatures continued but diminished through 834 feet.

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9 Since this study was published, surveys of Type 4 streams in Washington are showing that a substantial number of them are actually fish-bearing streams. Thus, they may, in fact, be more comparable to small Type F streams in Oregon.

10 Small to medium streams as defined under the FPA.
of riparian buffer (60, 90, and 89% canopy cover levels measured) to a level 0.6°F higher than the initial temperature above the clearcut (7.5°F/1000 feet recovery).

Temperature Monitoring Conclusions: Based on ODF monitoring results and other studies, the following general conclusion can be made regarding forest harvesting and stream temperature, as it pertains to the water protection rules:

For small, headwater streams, while stream temperatures can increase after harvest, there is the potential for temperature increases due to canopy removal to diminish within 500 feet downstream of the harvest activity (Caldwell et al. 1991). It should be noted, however, that magnitude of recovery of cooler temperatures in downstream shaded reaches is highly variable, and dependent on reach-specific heat exchange processes.

Projected Data Tables: Resulting temperature after mixing is derived using a simple formula 
\[\frac{(A*C)+(B*D)}{(A+B)}\], where:

A=Receiving Stream Flow  
B=Tributary Flow  
C=Receiving Stream Temperature  
D=Tributary Temperature

Predicted receiving water temperature changes (at the zone of mixing) caused by combining tributary waters are depicted in Figure 1, and Table 3.

If for example, the tributary is 16°F warmer than the receiving stream, the resulting receiving stream temperature changes would range from +1.5 to +5.3, with respect to a Tributary: Receiving Stream flow relationship ranging from 1:10 to 1:2. Note that a '1:2 tributary to receiving stream ratio' translates into an approximately 33% tributary contribution to the downstream flow [A measurable temperature increase is defined as 0.25°F [OAR 340-041-0006(55)]]

Or if, for example, the tributary is 10°F colder than the receiving stream, the resulting receiving stream temperature changes would range from –0.9 to –3.3, at a Tributary: Receiving Stream flow relationship ranging from 1:10 to 1:2. This shows a potential cooling effect that was observed by Bilby (1984) where mouths of tributaries averaged 8.5°F lower than receiving streams. Therefore, it is important to keep in mind that the tributary temperature (pre- and post-harvest) must also be considered with respect to the potential loss of a ‘cooling effect’ with mixing, or the potential loss of an un-mixed pocket or plume of cold water (refugia).

Where the difference between tributary and receiving stream temperatures fall between +16°F and -10°F, the ranges in temperature change also fall predictably between the ranges just given (see Figure 1 and Table 3).
**Conclusions:** 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.

**REFERENCES**


Figure 1. Tributary Effects on Receiving Stream Temperature
[Initial Receiving stream water temperature=60 degrees F]

Tributary Flow : Recieving Stream Flow

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Tributary Contribution: 9% 17% 23% 28% 33%

[To the combined downstream flow]


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Appendix D
Page 48
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Riparian Functions

Large wood, shade (stream temperature), microclimate, streambank stability, litterfall, sediment filtration, and floodplain processes are all riparian functions that are provided for by riparian forests (Naiman et al., 1998; Spence et al., 1996; FEMAT, 1993; Chamberlin et al., 1991; Sullivan et al., 1987; CH2MHill et al., 1999). It is assumed under the current rules that practices designed to provide desired levels of large wood and shade will also provide desired levels of the other functions provided by riparian forests (see Lorensen et al. 1994). The following is an overview of the current scientific findings and what is generally understood in terms of forest management effects upon large wood inputs and stream temperature. For additional information on other riparian functions, see the references cited above.

Large Wood

Large wood (a.k.a. large woody debris; coarse woody debris; large organic debris) is an important component of salmonid habitat (Bisson et al., 1987; Bilby and Bisson, 1998). Large wood (LW) is a key factor in the development of channel form, including off-channel rearing backwaters, side channels, and pools and riffles, that are important for salmon. The National Research Council (1996) states that "[p]erhaps no other structural component of the environment is as important to salmon habitat as large woody debris . . ."(p. 194)

Physical processes associated with [large woody] debris in streams include the formation of pools and other important rearing areas, control of sediment and organic matter storage, and modification of water quality. Biological properties of [woody] debris-created structures can include blockages to fish migration, provision of cover from predators and from high streamflow, and maintenance of organic matter . . . The locations and principle roles of woody debris change throughout the river system. In steep headwater streams where logs span the channel, debris creates a stepped longitudinal profile that governs the storage and release of sediment and detritus, a function that facilitates the biological processing of organic inputs from the surrounding forest. When the stream channel becomes too wide for spanning by large logs, debris is deposited along the channel margins, where it often forms the most productive fish habitat in main-stem rivers. (Bisson et al., 1987)

Large wood loading of streams has been correlated to winter survival of juvenile salmonids (Bisson et al., 1987; Murphy et al., 1986) and can increase fish numbers within a given watershed. Reeves et al. (1997) found that adding LW to Fish Creek resulted in a 27 percent increase in the mean number of fish in during the period following wood placement compared to the prior five-year period\footnote{This difference was not statistically significant, P>0.05. Due to the many different factors that influence fish populations and the variability from one year to the next, a 27% increase over five years was not statistically significant in this study.}. Steelhead age 1+ and smolts were also significantly larger (P<0.05),
12.5 percent and 4.1 percent, respectively, following wood placement compared to the period before.

Reductions in large wood will often result in habitat simplification which has been shown to reduce the diversity of fish species (Reeves et al., 1995). Habitat simplification, however, does not necessarily result in a decline in total fish populations. Certain species and age classes may increase in numbers to occupy space vacated by other species or age classes that found the habitat simplification undesirable (Schwartz, 1990). It is also possible for habitat simplification to favor no species or age classes and all groups experience a decline in productivity (House and Boehne, 1987).

Currently, there is no generally accepted minimum criteria for what LW levels (i.e., pieces per 1000 feet) are necessary for maintaining and recovering salmonids. Despite this lack of prescriptive information, it is widely believed that current levels of LW are significantly lower than what was supported by historic stream conditions. A number of different factors are responsible for the lower levels of LW:

- Extensive dam building and an acceleration of road building into forestland during most of the last century have reduced levels of LW in the system. As LW moved into reservoirs or backed up behind stream crossing structures, it would be removed either for safety reasons or to utilize the wood, thereby preventing that LW from continuing downstream and being utilized by the stream system.
- Stream cleaning also occurred in the 1970s and early 1980s because it was believed LW was a barrier to fish passage. During this period, there was an effort to remove large accumulations of LW from selected streams. A significant amount of this stream cleaning occurred immediately after large storm events such as the 1964 and 1977-78 floods.
- Previous to any forest practice rules that require the retention of trees along streams, harvesting operations were also removing the large trees that were potential future sources of key pieces of LW. Historical harvesting practices that did not retain riparian buffers have also resulted in fewer large conifers being grown in riparian forests and upslope areas (forestlands susceptible to landslides that result in LW being transported to fish-bearing streams), reducing the future supply of key pieces of LW.

There are essentially three ways in which LW can end up in streams. It can fall directly in from the riparian area, it can be delivered via a landslide or debris flow from upslope areas, or it can be manually placed in the stream. Considering riparian areas first, potential LW inputs can be expressed as a function of distance from the stream (Figure 1). A review of the literature shows that anywhere from 70 to 99 percent of the LW input potential from adjacent riparian stands originates from within the first 30 meters, or about 100 feet, of the riparian forest (Murphy and Koski, 1989; Van Sickle and Gregory, 1990; McDade et al., 1990; Bilby and Bisson, 1998). It is also possible, however, for 70 to 99 percent of the LW input potential from riparian stands to originate from within the first 50 feet of the riparian forest (Murphy and Koski, 1989).

LW input potential can also be expressed in terms of tree height. Reid & Hilton (1998) summarized the same studies in Figure 1 in terms of percent of total potential LW and distance from the channel expressed and a proportion of tree heights. About 80 to 90 percent of the total
potential LW from adjacent riparian stands originates from a distance equal to about one-half of one tree height from the channel. A distance equal to 70 percent of one tree height will provide about 95 percent of the total potential LW (Reid & Hilton 1998).

It should be emphasized that these studies did not intend to examine upslope source areas. They analyze potential LW inputs in terms of the total LW potential from riparian areas only. Large wood is defined in most of these studies as pieces with a minimum diameter of 10 centimeters (4 inches) and a minimum length of 1-1.5 meters (3.25-5 feet). The majority of larger pieces of LW, such as key pieces, originate from within a distance less than 100 feet (Robison and Beschta, 1990). The bulk of the potential riparian area inputs of LW comes from vegetation in close proximity to the channel, with diminishing amounts coming from distances farther from the stream (Figure 1).

Potential LW from adjacent riparian stands originates from a distance equal to about one-half of one tree height from the channel. A distance equal to 70 percent of one tree height will provide about 95 percent of the total potential LW (Reid & Hilton 1998).

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![LW Input Potential vs. Riparian Buffer Width](image)

**Figure 1:** Compilation of current studies relating buffer width to large wood input potential. Murphy and Koski (1989) conducted their study in Alaska, the McDade et al. (1990) data is from the Oregon Cascades, Van Sickle and Gregory “mixed old growth” data is from the Oregon Cascades, and the Van Sickle and Gregory “uniform old growth” is modeled data from a hypothetical (modeled) stand.

Debris flows can periodically move very large pieces of wood from a hillslope or hollow downslope to fish-bearing streams where the LW can interact with the channel and form fish habitat. In these cases, small stream channels can play a significant role in contributing key pieces of LW to downstream riparian functions. These sources of LW have been referred to as both “upslope” and “upstream” sources. For the sake of clarity, the following terminology will be used to define LW sources for this discussion.
Near-stream riparian:
Areas directly adjacent to the stream. LW is delivered simply by the tree falling directly into the stream from the adjacent streambank or hillslope.

Upstream riparian:
Near-stream riparian sources that are upstream of the reach of concern. High water and/or a debris flow transport the LW to its current location after initially falling into the stream from the riparian area.

Upslope:
Zero-order channels (small unbranched draws), hollows, or hillslopes. Areas outside of the riparian area. LW is delivered by a landslide or landslide-debris flow combination that moves the wood into the stream channel from these areas.

Currently, there is limited scientific information on the relative inputs from these three sources. McGarry (1994) is one of the few studies that have attempted to quantify the relative contribution from each LW source. He found that the LW inputs in Cummins Creek, Oregon were split about 50/50 between near-stream riparian and other source areas, or what was termed “transported” and “nontransported.” McGarry (1994) did not attempt to quantify what percent of the transported LW originated from upstream versus upslope areas. McDade et al. (1990) also identified about 50 percent of the LW as originating from near-stream areas, but did not attempt to classify the origin of the other 50 percent either. Unless the debris flow and/or landslide delivering the material is inventoried before high stream flows are able to transform the deposits and relocate the LW downstream, it is difficult to determine what pieces of transported LW originated from upslope versus upstream areas. Both of these studies (McGarry, 1994; McDade, 1990) utilized a single-season data collection method, representative of conditions for a snapshot in time. Both of these studies were also conducted in the Coast Range and their applicability east of the Cascades may be limited.

Despite the limitations of the data, some qualitative statements can be made in regards to LW sources. In terms of upslope sources, the relative importance of potential LW from zero-order channels and hillslopes to a given stream reach becomes less and less the larger the channel network is above that reach. The larger the channel is along a given reach, the greater the percentage of potential LW originates from near-stream and upstream riparian sources. This will vary, however, depending on the topographic characteristics and landslide/debris flow potential. An area where debris flows rarely occur and where the slopes are relatively mild will have virtually all of the LW originating from near-stream and upstream riparian sources. An area that has frequent landslide/debris flow activity and relatively steep slopes, on the other hand, may have a significant portion of the LW potential in upslope sources originating from the zero-order channels and hillslopes. Benda and Sias (1998) conducted a modeling exercise where they estimated that the overall contribution of LW by debris flows is limited to about 10 to 15 percent of the overall wood budget. While this may imply that mass wasting plays a relatively minor role in the long-term wood budget of a given watershed, “wood from debris flows can overwhelm all other sources to a channel or valley floor locally in time and space, and therefore dominate in the shorter-term (decadal – human lifespan).”(Benda and Sias, 1998).
Where shallow rapid landslides are rare or do not occur, the dominant available mechanism for transporting LW downstream is stream flow. For this population of streams, the hydrologic regime will determine what sizes of LW will be stable and hydrologically functional in the channel. Bilby (1985) found that length and diameter of stable large wood in a stream is, in part, a function of channel width, where smaller pieces of LW can be stable in smaller streams. Other research has found that the amount and distribution of LW will vary with channel size. Smaller channels contain more abundant amounts of randomly distributed LW, while larger streams more easily transport LW, resulting in fewer pieces and reduced aggregation of LW (Bilby and Bisson, 1998). On very large, main-stem channels, LW tends to form accumulations at the head of gravel bars and along the edge of the channels. These accumulations are important for maintaining spawning areas and creating off-channel habitats (Sedell et al., 1982).

The incidence of windthrow affects the frequency and distribution of LW inputs from riparian areas. An increase in windthrow can occur where riparian buffers are retained. It is generally believed that the potential for windthrow is higher for narrow buffers and decreases for wider buffers, however, there is a wide range of scientific opinion on how wide a buffer needs to be before the risk of windthrow is significantly reduced. Windthrow associated with riparian buffers is also highly variable depending on vegetation, local topographic relief, and an areas susceptibility to windstorms. It could be argued that an increase in the incidence of windthrow due to narrow buffers could have a positive short-term effect on salmonid habitat by delivering LW to the stream (Spence et al., 1996). Potential negative effects of windthrow include an increase in stream temperatures due to additional solar radiation reaching the stream, increased bank erosion due to the displacement of soil by root wads, upslope erosion of fine sediments where oversteepened slopes are exposed by displaced trees, and reduced LW input potential until a future stand of large trees becomes established.

There are many factors that must be considered in determining what types of buffers are effective or ideal in maintaining or enhancing salmonid production. Wildfire, floods and windstorms were all important disturbance events that had a significant effect on forest characteristics. These types of disturbance also tend to leave behind significant amounts of structure in the form of snags and large wood on the ground, as compared to timber harvesting where this is not always the case. While the notion of mature forest conditions everywhere is not consistent with what is known about historic disturbance patterns, the current disturbance pattern due to fire suppression and forest management is not consistent with historic disturbance patterns either.

Historically, most streams, wetlands, and lakes had some riparian overstory vegetation composed of conifer and/or hardwood trees. The processes for plant succession in riparian areas are debated and it is likely that succession follows a number of potential paths. Beavers and elk may have maintained some riparian areas, particularly along lower gradient reaches, in early (more open) seral stages. Vegetation succession paths are likely to vary for different streams. More frequent disturbance events, including beaver activity and floods, may create more diverse conditions and a greater hardwood component on larger and lower gradient streams. Small streams in steeper terrain, however, are more likely to be more dominated by conifer due to different types of disturbance and site conditions. Since large wood originates from many
different sources on the landscape, these patterns also likely influenced large wood inputs and habitat conditions.

Stream Temperature

Stream temperature is an important component of fish habitat and has a direct effect on the growth and survival of salmonids. The effect of changes in stream temperature on fish varies between species and within the life cycle of a given species (DEQ, 1995). Critical life stages that occur during the warmest months in the summer are of particular concern. For the chinook salmon, juvenile rearing, adult holding and adult migrations all occur during the summer months. Juvenile rearing also occurs in the summer for the coho salmon, and migration occurs in the late summer and early fall. Spawning and within-stream migration occurs in the summer and fall for the bull trout. Preferred temperature ranges for these species and particular life stages are shown in Table 1.

Table 1. Optimum and lethal limit temperature ranges for coho, chinook and bull trout (from DEQ 1995).

<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Coho</th>
<th>Chinook</th>
<th>Bull Trout&lt;sup&gt;12&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred juvenile temperature range</td>
<td>54-57°F</td>
<td>50-60°F</td>
<td>39-50°F</td>
</tr>
<tr>
<td>Adult migration, holding, or spawning</td>
<td>45-60°F</td>
<td>46-55°F</td>
<td>39-54°F</td>
</tr>
<tr>
<td>Lethal limit</td>
<td>77°F</td>
<td>77°F</td>
<td>NA</td>
</tr>
<tr>
<td>State water quality standard&lt;sup&gt;13&lt;/sup&gt;</td>
<td>64°F</td>
<td>64°F</td>
<td>50°F</td>
</tr>
</tbody>
</table>

<sup>12</sup> The optimal temperature for rearing and the lethal limit may actually be different from the values listed in Table 1. Preliminary results of on-going research by Dr. Bob Danehy concludes that the optimal rearing and lethal limit are closer to 54-58°F and 69°F, respectively (Bob Danehy, personal communication).

<sup>13</sup> See Appendix E for more information on state water quality standards and rules.
The various physiological and ecological processes of salmonids that are affected by temperature are well documented. Listed below are some of the more important processes (from Spence et al. 1996).

- Decomposition rate of organic materials
- Metabolism of aquatic organisms, including fishes
- Food requirements, appetite, and digestion rates of fish
- Growth rates of fish
- Developmental rates of embryos and alevins
- Timing of life-history events including migrations, fry emergence, and smoltification
- Competitor and predator-prey interactions
- Disease-host and parasite-host relationships
- Development rate and life history of aquatic invertebrates

Exposure to temperatures above optimum levels has the potential to negatively affect salmonid survival and recovery. As stream temperature increases, the ability of water to hold dissolved oxygen decreases (MacDonald et al., 1991). Increases in stream temperature also raise the metabolic rate of salmonids, which can enlarge demands on the available food supply. Primary productivity can be augmented as a result of increases in light reaching the stream where nutrients are limiting, which can add to the available food supply for salmonids (MacDonald et al., 1991; Murphy and Meehan, 1991). However, decreased levels of dissolved oxygen may also lead to appetite suppression in salmonids (Jobling, 1993; in Spence et al., 1996).

The presence of cool-water refugia can help salmonids avoid areas with adverse stream temperatures and help sustain a population of sensitive species (Bilby, 1984; Sedell et al., 1990). When ambient stream temperatures are too warm, sensitive aquatic species can inhabit these patches of cool water habitat. Deep pools, cool springs, hyporheic flow, and the junction of cooler tributary streams are all examples of cool-water refugia. Matthews et al. (1994) and Nielsen et al. (1994) found that stream temperatures are stratified in deep pools (3 to 9 feet), in pools with large gravel bars at the upstream end, and in shallow pools (1.5 feet) with subsurface seepage. Differences in temperature ranged from 7.0 to 8.0°F between the stream surface and stream bottom in these areas.

There are several factors that make up the heat balance of water, which determine how the temperature of a stream will change as it flows downstream. Net radiation, evaporation, convection, conduction, and advection all contribute to the net rate of gain or loss in stream temperature as it moves through a forest (Brown 1983). Stream temperatures also can fluctuate significantly over both space and time. Seasonal and daily cycles produce a high degree of variability in stream temperatures. Spatial variables such as latitude, proximity to the ocean, stream order, and distance from watershed divide can all affect differences in stream temperatures as well (Beschta et al., 1987; Sullivan et al., 1990). Heat inputs result from solar radiation, conserved solar radiation in the form of channel substrate heat loading (conduction), and air temperature that is greater than the water temperature (convection). Heat losses occur from evaporation, air temperature that is less than the water temperature (convection), channel bed conduction if the bed is cooler than the water column, and surface water/ground water interactions. Over any stream length, heat will be retained as it flows downstream in the water column only if the heat inputs are greater than the heat losses.
During the summer months, when stream temperatures are at their highest, the combination of direct solar radiation, a decrease in discharge, and the relative number of tributaries have the greatest effect on stream temperatures changes in the downstream direction (Beschta et al., 1987). Of these three factors, forest management can have the greatest effect on direct solar radiation. Solar energy is also the largest component of energy available to warm stream water (Chamberlin et al., 1991). The more forest canopy that is removed that reduces shade, the more energy reaches the stream translating into a potential increase in stream temperature. While shade cannot physically cool the stream down, it can prevent further heating of the stream. In the case where significant groundwater inputs or tributaries are contributing relatively cool water, shading can have the appearance of cooling. In fact, what is occurring is that shade is preventing further heating so that other processes (e.g., evaporation, groundwater mixing, convection) have a chance to cool the stream.

While shade is considered to be the factor that has the greatest influence of stream temperature, Benner and Beschta (2000) found that evaporation rates can also be an important factor. Stream evaporation rates were studied along the Middle Fork of the John Day river in northeastern Oregon during the summer of 1998. Conclusions from this study included the following:

“In northeastern Oregon, as well as in much of the arid west, relatively high daytime stream temperatures are common during the summer months due to the absorption of incoming solar radiation by exposed water surfaces. During these same periods, evaporation represents a potentially important mechanism of energy loss than enables streams and rivers to dissipate at least some of the absorbed solar energy. . . . [T]he evaporative process is an important mechanism for limiting the magnitude of maximum stream temperatures during clear-sky conditions when solar radiation inputs are relatively high. Without the occurrence of afternoon (typically up-valley) winds and associated low humidities that are normally experienced in northeastern Oregon during summer days, evaporative heat loss form streams and rivers would likely be much lower and daily maximum temperatures much higher than they are currently.”(Benner & Beschta 2000)

Many studies have documented increases in stream temperature due to timber harvesting. The degree of impact varies with particular practices and stream characteristics. Harvesting to the edge of the stream without leave trees or riparian buffer strips is consistently shown to increase mean, maximum, and diurnal fluctuation of stream temperature (Levno and Rothacher, 1967; Meehan, 1970; Feller, 1981; Hewlett and Fortson, 1982; Holtby, 1988). Maintaining riparian vegetation has been shown to be successful in minimizing or eliminating increases in stream temperature associated with harvesting (Brazier and Brown, 1973; Kappel and DeWalle, 1975; Lynch et al., 1985; Amaranthus et al., 1989). When examining the potential influence of harvesting near streams on stream temperatures, it is important to account for ‘natural’ heating in the downstream direction that is commonly observed (Sullivan et al., 1990; Zwieniecki and Newton, 1999). Increases in stream temperatures that might occur in the downstream direction, whether or not vegetation is removed, can be difficult to separate out from potential harvesting effects on stream temperatures (Dent and Walsh, 1997).
The width of the riparian vegetation alone, however, does not dictate the amount of shade provided to a given stream reach. Canopy density, canopy height, stream width, and stream discharge are all interrelated and determine the effectiveness of the riparian buffer width (Brazier and Brown, 1973). For example, a stand of dense vine maple and salmonberry over a small stream might provide close to 100 percent shading for that stream in the middle of summer. It would not matter how much riparian vegetation was retained beyond the width occupied by these two species in terms of increased shade. For a medium or large stream in eastern Oregon, on the other hand, that has a widely-spaced stand of Ponderosa Pine it may not be possible to obtain 100 percent shade no matter how wide of a buffer is retained. Because of the complex interactions between all of the factors that determine effective shade about a stream, buffer width alone is not always a reliable determinant of effective shade.

Angular canopy density (ACD) is an effective means of providing a direct estimate of the shading effects of riparian vegetation (NCASI, 1999). ACD is a measurement of the canopy density at an angle coincident with the sun when the most significant solar heating occurs. ACD is expressed as a percentage, where 100 percent represents no sunlight reaching the stream or forest floor. Considering small streams only, Figure 2 demonstrates the relatively high variability of buffer width as a determinant of effective shade. For example, 75 to 90 percent shading can be achieved with a buffer width of anywhere from 30 to 145 feet. Looking at it a different way, a 50-foot buffer width might provide anywhere from 18 to 80 percent shading.

Natural disturbance regimes historically played a significant role in the temporal and spatial distribution of forest-types across the landscape (Swanston, 1991). The historic distribution of forest-types is important in understanding the temporal and spatial distribution of effective shade along riparian areas across the landscape. While significant areas of older forests are likely to have occurred along riparian areas historically, variability in the intensity, timing, and location of disturbance events created a diverse mosaic of riparian vegetation characteristics. Wildfire, windthrow, debris torrents, and major floods periodically reset riparian forests and changed the characteristics of riparian vegetation. The result of the natural disturbance events in terms of effective shade is that while relatively high levels of shade may have been present in some areas or at one moment in time, lower shade levels are likely to have occurred in other areas or at another moment in time. Understanding the natural or climactic variability in stream temperatures brought about by natural disturbance regimes is an important first step in understanding how forest management may be altering stream temperatures and thus influencing salmonid populations. If harvesting near a stream results in temperature changes that are consistent with the range of natural variability, both spatially and temporally, of the temperature regime, then such effects may be unimportant (Beschta et al., 1987). However, where the opposite is true, harvesting effects on the maintenance and recovery salmonids may be significant.

Since riparian shade reduces or eliminates solar radiation inputs to the stream, retaining riparian buffers is a widely accepted method of minimizing or eliminating harvesting effects on stream temperature. Some studies, however, have demonstrated that increased sunlight in clearcut areas can increase salmonid production and/or growth in unbuffered streams in the short-term (Holtby, 1988; Tschaplinski, 1999). This is related to increases in primary production, and ultimately salmonid food sources, that can occur when a stream is exposed to increased levels of sunlight.
This response can only occur, however, where food production is a limiting factor in salmonid growth and survival. Increased stream temperature also increases the metabolic demands of salmonids. When this occurs, an increased food supply is needed to support the increased metabolic demands or else increases in growth and survival may not be realized. There must also be adequate physical habitat available to support the increased salmonid production and/or growth that may be stimulated by an increased food supply.

The complex interactions between primary production, salmonid metabolic demands, and stream temperature results in a highly variable response to increased levels of sunlight to the stream. Research has shown, however, that in some locations, a closed dense conifer stand typical of second-growth is not very productive for fish due to a substantial reduction in sunlight reaching channels as compared to either old-growth or clearcut streams (Sedell and Swanson, 1984). The various results have led some to argue that buffers designed to maintain physical habitat over the long-term, but that also increases the level of sunlight above that provided by closed-canopy forests, may be more productive overall than either mature forest or clearcut reaches (Koski et al., 1984; Murphy et al., 1986; Murphy and Meehan, 1991; Sedell and Swanson, 1984).

![Figure 2: Relation between angular canopy density (ACD) and buffer-strip width for small streams in western Oregon (from Beschta et al., 1987).](image)

**Figure 2:** Relation between angular canopy density (ACD) and buffer-strip width for small streams in western Oregon (from Beschta et al., 1987).

### Historic Disturbance and Variability

The historic condition of riparian forests in which salmonids evolved and thrived was significantly influenced by natural disturbance (fire, insects, disease, windthrow, landslides, and...
floods). A high degree of spatial and temporal variability was present at both small and large scales. Fire disturbance has received increased attention in recent years, perhaps because it is arguably the disturbance-type that has been most influenced by human activities across the landscape (Agee, 1998). More recently, increased attention has been given to the effects of landslides and flooding in how they influence the physical and biological characteristics of riparian areas and associated aquatic species.

The spruce and Douglas-fir forests of the Oregon Coastal Range and Cascade Range were historically subjected to infrequent (every 175-250 years), high-intensity fires, while the pine forests of eastern Oregon experience frequent (every 10-30 years) low-intensity fires. Portions of both eastern and western Oregon also experience a moderate-intensity fire regime, where semi-frequent (every 30-175 years) fires would result in a patchwork of stands of various ages (Agee 1998). High intensity fires tend to “reset” the landscape by killing all live vegetation resulting in even-aged forests. Low intensity fires tend to burn mostly understory vegetation leaving the larger trees unimpacted, resulting in a forest of widely spaced larger trees with a relatively open understory (Agee, 1998).

Decades of fire suppression has increased the frequency and intensity of insect and disease disturbance in eastern Oregon, where relatively dense stands of pine and mixed conifer forests have become stressed due to increased competition for limited resources. As a result, these forests can be more susceptible to high-severity fire and insect and disease outbreaks than was historically the case. For low-severity fire regimes, Agee (1998) suggests that a combination of underburning and thinning to modify the fuel loads in the system can result in a forest that more closely resembles a natural pattern. In areas where moderate-severity fire regimes were historically present, harvesting techniques that utilize partial cuts, small patch cuts with snag retention, and a system of reserves will result in a forest structure that more closely resembles the historic pattern than either even-aged management or a no-harvest reserve system that does not recognize natural disturbance processes (Agee, 1998). Management options that influence fire behavior in forests adapted to high-severity fire regimes are relatively limited. Severe weather appears to be the controlling factor in these forest-types, thus large stand-replacement fires are probably going to occur regardless of the fire suppression activities or harvesting methods that are employed (Agee, 1998).

Riparian functions and the maintenance of riparian forests have important implications in terms of disturbance regimes and watershed-scale effects. Riparian forests can provide important functions that include the delivery of large wood to streams, corridors for wildlife, and stream temperature protection for threatened and endangered fish. There is evidence, however, that riparian areas maintained as reserves where management is excluded can become corridors for severe wildfire (Segura and Snook, 1992, in Agee, 1998). However, there is limited data available to evaluate the susceptibility of different riparian community types to severe fire (Agee, 1998). Disturbance plays an important role in the ecology of both upland and riparian forests. Management prescriptions that do not consider the role of disturbance and historical patterns of forest succession may result in riparian forests that differ significantly from what occurred in the past.
IDENTIFICATION OF ERFAC FOREST
SITE CLASSES*

Frederick C Hall
Plantecol NW, LLC

*As presented by Fred Hall to ERFAC.

The Eastside Riparian Functions Advisory Committee, Oregon Department of Forestry, has established three site productivity classes for riparian forested communities. These are shown in “Revised forest productivity classes and site data” of 27 Feb 02. Identification of these site classes in the field may be facilitated by the following criteria.

Ponderosa pine is the only tree present (or the only stumps); basal area as trees or old stumps is less than 130 sq. ft. per acre. [From Fred Hall presentation: This describes a forest that grew into range lands or meadow lands after fire exclusion.]

Ponderosa pine is the dominant tree: more than 60 percent of present or past basal area; other trees may be Douglas-fir or juniper. Around the Fremont N.F., dry site white fir may be present. Basal area as trees or old stumps is less than 130 sq. ft. per acre. [From Fred Hall presentation: This describes a ponderosa pine forest that was historically maintained by periodic fire before fire suppression.]

Lodgepole pine is clearly dominant. Basal areas are between 100 and 200 sq. ft. per acre (either live trees or stumps)

Quaking aspen or cottonwood are dominant; other trees may be present such as juniper, ponderosa pine, or Douglas-fir. [From Fred Hall presentation: White fir takes the place of Douglas-fir on the Fremont.]

Ponderosa pine may be present but is less than 60 percent of present or past basal area; other trees present are Douglas-fir, white or grand fir, or larch. Some Engelmann spruce or sub-alpine fir may be present but not dominant. Basal area of trees or old stumps (not counted together) is between 130 and 190 sq. ft. per acre.

Ponderosa pine is absent; it was part of the old growth basal area. Dominant trees are Douglas-fir and/or grand or white fir. Larch may be dominant in some cases. Some Engelmann spruce or sub-alpine fir may be common. Basal area of trees or old stumps (not counted together) is between 130 and 190 sq. ft. per acre.

Grand or white fir and Douglas-fir [italic font indicates revised text] dominate the stand or old growth basal area. Engelmann spruce or sub-alpine fir may dominate some stands. Larch may dominate but usually has a grand or white fir or Engelmann spruce understory. Basal area per acre is between 180 and 250 sq. ft. per acre.
### Revised forest productivity classes and site data.

<table>
<thead>
<tr>
<th>Prod Class</th>
<th>Cubic feet/acre/yr(^{14})</th>
<th>Cu. Ft Ave(^{15})</th>
<th>Si(^{16}) Ft</th>
<th>GBA(^{17}) Sq. Ft.</th>
<th>GBA(^{18}) 80%</th>
<th>GBA(^{18}) 40%</th>
<th>30%</th>
<th>Refor.(^{19}) BA/A</th>
<th>BA per 1000 by 100(^{20})</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>&gt;225</td>
<td>330</td>
<td>152</td>
<td>565</td>
<td>452</td>
<td>226</td>
<td>170</td>
<td>80</td>
<td>1040</td>
<td>520 391 185</td>
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<td>125</td>
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<td>84</td>
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<td>88</td>
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<td>74</td>
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<td>170 129 115</td>
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<td>73</td>
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<td>99</td>
<td>50</td>
<td>37</td>
<td>228</td>
<td>115 86 90</td>
</tr>
</tbody>
</table>

- **Best west side site.**
- **Good west side site.**
- **Fair west side site.**
- **Poor west side site; best east side site:** Moist Mixed conifer – ponderosa pine absent or less than 40 percent of existing or past basal area, Douglas-fir, grand or white fir, larch, Engelmann spruce, sub-alpine fir.
- **Mixed conifer** – ponderosa pine absent or less than 40 percent or present or former basal area, Douglas-fir, grand or white fir, larch, Engelmann spruce, sub-alpine fir.
- **Cold air basins:** lodgepole pine; quaking aspen and/or cottonwood, either existing or to be planted.
- **Open ponderosa pine more than 60 percent or past basal area, dry mixed conifer, west juniper.**

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\(^{15}\) Average cubic feet per acre per year productivity for those plant associations in the productivity class from Hall, Frederick C. 1998. Pacific Northwest Ecoclass Codes for Seral and Potential Natural Communities. PNW-GTR-418. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. Appendix 3, pp 89-121.

\(^{16}\) Site Index in feet at age 100 for those plant association in the productivity class from Hall, Frederick C. 1998. Pacific Northwest Ecoclass Codes for Seral and Potential Natural Communities. PNW-GTR-418. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. Appendix 3, pp 89-121.


\(^{18}\) Growth basal area was adjusted by 80% to represent 1.4 inches per decade (in/dec) diameter growth, by 40% representing 3.0 in/dec, and 30% representing 3.5 in/dec.

\(^{19}\) Refor. basal area is reforestation BA/A contained in the Oregon Forest Practices Rules and Statutes, January 2000: Reforestation Rules, pages 37-38. It permits acceptable height and diameter growth of regeneration.

\(^{20}\) Basal area per 1000 feet of stream at 100 feet wide. All data are multiplied by 2.3 (the acres in an area 1000 ft by 100 feet).
Aquatic Habitat Assessment in Eastern Oregon: The Influence of Riparian Vegetation and Large Wood on Fish Distribution and Abundance

As presented to ERFAC by Kim Jones, Oregon Department of Fish and Wildlife

This information was presented to ERFAC in an electronic slide-show format. The information is available by calling the Oregon Department of Forestry at 503-945-7470.
Oregon Forest Practices Act Water Protection Rules (OAR 629-635 through 660)

The Water Protection Rules identify seven geographic regions and distinguish among streams, lakes, and wetlands. The rules further distinguish each by size and type. Stream size is distinguished as small, medium, or large, based on average annual flow. Stream type is distinguished as fish use, domestic use, or neither. Table 1 lists the required RMA widths based on stream size and type.

Table 1. Riparian Management Area widths for streams of various sizes and beneficial uses (OAR 629-635-310).

<table>
<thead>
<tr>
<th></th>
<th>Type F</th>
<th>Type D</th>
<th>Type N</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE</td>
<td>100 feet</td>
<td>70 feet</td>
<td>70 feet</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>70 feet</td>
<td>50 feet</td>
<td>50 feet</td>
</tr>
<tr>
<td>SMALL</td>
<td>50 feet</td>
<td>20 feet</td>
<td>Apply specified water quality protection measures, and see OAR 629-640-200</td>
</tr>
</tbody>
</table>

Generally, no tree harvesting is allowed within 20 feet of fish bearing, domestic use, and all other medium and large streams unless stand restoration is needed. In addition, all snags and downed wood must be retained in every riparian management area. Provisions governing vegetation retention are designed to encourage conifer restoration on riparian forestland that is not currently in the desired conifer condition. Future supplies of conifer on these sites are deemed desirable to support stream functions and to provide fish and wildlife habitat. The rules provide incentives for landowners to place large wood in streams to immediately enhance fish habitat. Other alternatives are provided to address site-specific conditions and large-scale catastrophic events.

The goal for managing riparian forests along fish use streams is to grow and retain vegetation so that, over time, average conditions across the riparian landscape become similar to those of mature, unmanaged riparian stands. This goal is based on the following considerations (Lorensen et al., 1994):

1. Mature riparian stands can supply large, persistent woody debris necessary to maintain adequate fish habitat. A shortage of large wood currently exists in streams on nonfederal forestlands due to historic practices and a wide distribution of young, second-growth forests. For most streams, mature riparian stands are able to provide more of the functions and inputs of large wood than are provided by young second-growth trees.

2. Historically, riparian forests were periodically disturbed by wildfire, windstorms, floods, and disease. These forests were also impacted by wildlife such as beaver, deer, and elk. These disturbances maintained a forest landscape comprised of riparian stands of all ages ranging from early successional to old growth. At any given time, however, it is likely that a significant proportion of the riparian areas supported forests of mature age classes. This distribution of mature riparian forests supported a supply of large, persistent woody debris that was important in maintaining quality fish habitat.
The overall goals of the riparian vegetation retention rules along Type N and Type D streams are the following:

- Grow and retain vegetation sufficient to support the functions and processes that are important to downstream waters that have fish;
- Maintain the quality of domestic water; and
- Supplement wildlife habitat across the landscape.

These streams have reduced buffer widths and reduced basal area retention requirements as compared to similar sized Type F streams. In the design of the rules, this was judged appropriate based on two assumptions. First, it was assumed that the amount of large wood entering Type N and D channels over time was not as important for maintaining fish populations in downstream reaches. Second, it was assumed that the future stand could provide some level of “functional” wood input over time to support nutrient and sediment storage processes. The validity of these assumptions needs to be evaluated over time through monitoring.

With the exception of small Type D and N streams, basal area targets are established and used for any type of management within the RMA\textsuperscript{21}. These targets were determined based on the data that was available at the time, with the expectation that these targets could be achieved on the ground. There is also a minimum tree number requirement of 40 trees per 1000 feet for Type F streams, and 30 trees per 1000 feet for medium Type F streams\textsuperscript{22}. The specific levels of large wood inputs that the rules are designed to achieve vary by stream size and type. Given the potential large wood that is functional for a given stream, a combination of basal area targets, minimum tree retention, buffer widths, and future regenerated stands and ingrowth are used to achieve the appropriate large wood inputs for a given stream.

The expectation is that the 20-foot no-harvest area on all but small Type N streams, combined with the shade provided by trees left outside of the first 20 feet for basal area requirements when an RMA is managed to the standard target, will be sufficient towards maintaining stream temperatures consistent with ‘natural’ conditions. In the design of the Water Protection Rules, shade data was gathered for 40 small nonfish-bearing streams to determine the shade recovery rates after harvesting. One to two years after harvest, 55 percent of these streams were at or above pre-harvest shade levels due to understory vegetation re-growth. Most of these streams had a bankfull width averaging less than six feet, and most shade was provided by shrubs and grasses within 10 feet of the bank. Since 1991, there has also been a 120-acre limit on a single clearcut size, which is assumed to result in a scattering of harvested area across a watershed over time. In the development of the rules, it was assumed that this, combined with the relative rapid shade recovery along smaller nonfish-bearing streams, would be adequate in protecting stream temperatures and reduce possible cumulative effects. The monitoring program is collecting data to test these assumptions, evaluate the effectiveness of the rules, and evaluate whether or not water quality standards for temperature are being achieved.

\textsuperscript{21} Small Type D streams require a 20-foot, no-harvest RMA. Type N streams do not require an RMA.

\textsuperscript{22} The leave tree requirements for Type D and N streams are 30 live conifers per 1000 feet for large streams and 10 for medium streams.
APPENDIX G

VOLUNTARY MEASURES
Voluntary Measures

The Oregon Plan contains several voluntary measures to supplement the conifer stocking within riparian areas and the recovery rate for large wood available to streams. This is accomplished during harvest operations by (1) placing appropriate-sized LW within streams that meet parameters of gradient, width, and existing wood in the channel; and (2) relocating in-unit leave trees in priority areas\(^{23}\) to maximize their benefit to salmonids while recognizing operational constraints, other wildlife needs, and specific landowner concerns.

The measures can be described as either active restoration measures, or passive restoration measures that provide long-term large wood recruitment. Voluntary measures ODF 3.2 and 3.5 are active restoration activities. ODF 3.2 restores hardwood-dominated riparian areas back to a conifer-dominated condition, where appropriate, using a site-specific plan. Site-specific plans require additional consultation with the ODFW to minimize potential damage to the resource. They often result in conditions that are more protective of the resources than would occur without the site-specific plan. ODF 3.5 addresses LW placement if stream surveys determine there is a need. Measures ODF 3.3, 3.4, 3.6, and 3.7 provide future LW recruitment through additional riparian protection. This additional protection is accomplished by retaining in-unit leave trees, snags, and downed wood within and along RMAs, and by changing the ratio of in-unit leave trees to 75 percent conifer.

The following application priority has been developed for harvest units containing more than one stream type. The list establishes the general priority for placement of in-unit leave trees.

- Small and medium Type F streams.
- Nonfish bearing streams (Type D or Type N), especially small low-order headwater stream channels, that may affect downstream water temperatures and the supply of large wood in priority area streams.
- Streams identified as having a water temperature problem in the DEQ 303(d) list of water quality limited water bodies, or as evidenced by other available water temperature data; especially reaches where the additional trees would increase the level of aquatic shade.
- Potentially unstable slopes where slope failure could deliver large wood.
- Large Type F streams, especially where low gradient, wide floodplains exist with multiple, braided, meandering channels.
- Significant wetlands and stream-associated wetlands, especially estuaries and beaver pond complexes, associated with a salmon core area stream.

The voluntary private landowner measures (ODF 3 of the Statewide Work Plan) include the following:

**ODF 3.2 - Conifer Restoration (ODF 8S)**

Forest practice rules have been developed to allow and provide incentives for the restoration of conifer forests along hardwood-dominated RMAs where conifers historically were present. This process enables sites capable of growing conifers to contribute conifer large wood (LW) in a timelier manner. Conifer restorations within

\(^{23}\) The Executive Order replaced the concept of “core areas” with “priority areas”. See (1)(f) of the Executive Order (p.5).
priority areas are subject to additional review and require a site-specific plan to be submitted and reviewed by the department.

**ODF 3.3 - Additional Conifer Retention along Fish Bearing Streams in Priority Areas (ODF 19S)**
This measure retains more conifers in RMA by voluntarily limiting harvest activities to 25 percent of the conifer basal area above the standard target. This measure is only applied to RMAs containing a conifer basal area that is greater than the standard target.

**ODF 3.4 - Limited RMA for Small Type N Streams in Priority Areas (ODF 20S)**
This measure provides limited 20-foot RMAs along all perennial or intermittent small Type N streams for the purpose of retaining snags and downed wood.

**ODF 3.5 - Active Placement of Large Wood during Forest Operations (ODF 21S)**
This measure provides a more aggressive and comprehensive program for placing Large Wood in streams currently deficient of Large Wood. Placement of Large Wood is accomplished following existing ODF/ODFW placement guidelines and determining the need for placement is based upon a site-specific stream survey.

**ODF 3.6 - 25 Percent In-unit Leave Tree Placement and Additional Voluntary Retention (ODF 22S)**
This measure has one regulatory component and two voluntary components:

1. The State Forester, under statutory authority, will direct operators to place 25 percent of in-unit leave trees in or adjacent to riparian management areas on Type F and D streams.

2. The operator voluntarily locates the additional 75 percent in-unit leave trees along Type N, D or F streams, and

3. The State Forester requests the conifer component be increased from 50 percent to 75 percent.

**ODF 3.7 - Voluntary No-Harvest Riparian Management Areas (ODF 62S):**
Establishes a system to report and track, on a site-specific basis, when landowners voluntarily take the opportunity to retain no-harvest RMAs.

The ODF voluntary management measures are implemented within priority areas. Several of the measures utilize in-unit leave trees and are applied in a “menu” approach to the extent that in-unit leave trees are available to maximize their value to the restoration of salmonid habitat. The choice of menu measures is at the discretion of the landowner, but one or more of the measures may be selected.
Summary of Relevant ODF Monitoring Data

Fish Bearing Streams

Function: Shade
In a study of 31 sites in the Blue Mountain Georegion (Allen and Dent, 2001), on average, shade was 15% lower on harvested sites than on unharvested sites, however this result was confounded by the dominance of white fir stands (80% of sites) in the unharvested sample. Dominant overstory species played an important role in influencing shade. White fir-dominated stands averaged 71% shade, Douglas-fir/Englemann spruce stands averaged 61% shade, and pine stands averaged only 51% shade. Harvest entry did not appear to influence stream shade in Douglas-fir/Englemann spruce stands, but harvested white fir stands averaged 11% lower shade than unharvested white fir stands. Unharvested pine stands were not sampled. Sites that were grazed had lower shade than sites that were not grazed, however, this result is also confounded by the lack of grazed sites in unharvested or white fir stands.

Shade on Harvested and Unharvested Sites
(Allen and Dent, 2001)

A predicative model showed that shade increased as stand density increased (number of trees/acre). However, the importance of overall stand structure in influencing stream shade (as opposed to a single variable) cannot be overemphasized. Stand structure refers to combinations of basal area, stand density (trees/acre), species composition, average stand diameter (QMD), and live crown ratios. Furthermore, the interaction between stand structure and aspect are clearly important when predicting shade. Managers must consider carefully what their objectives are for stream shading in relation to stand structure and the myriad of other functions produced by a riparian stand. For example, if the objective is to maximize shade, this would suggest promoting stands in the stem exclusion stage across the landscape. This may not, however, meet other goals, such as recruiting large woody material to act as stable key pieces in the stream.
Function: Large Diameter Trees (Key Pieces) in Blue Mountain Riparian Areas
Data from the Blue Mountains (Allen and Dent, 2001) reveal that riparian areas in that region are dominated by trees from 6-20 inches in diameter at breast height (DBH). Aquatic research has emphasized the importance of “key pieces” of wood in the stream for high quality fish habitat. Key pieces of wood are of sufficient diameter and length as to minimize mobility and capture smaller wood that is otherwise more mobile. Key pieces thereby support the formation of complex and relatively stable habitat features. The desirable diameter of a key piece of wood is dependent on the width of the stream, and ranges from 10-22 inches according to ODF guidelines for wood placement. Data from Allen and Dent (2001) indicate that Blue Mountain riparian areas have few trees greater than 22 inches at both harvested and unharvested sites.
**Basal Area**

Monitoring data from Robben and Dent (2002) and Allen and Dent (2001) indicate that basal area in Eastern Oregon riparian areas varies greatly. On average basal area ranged from 66 ft²/acre in the Blue Mountain georegion to 140 ft²/acre in the East Cascades.

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Georegion</th>
<th>Range in BA (ft²/acre)</th>
<th>Average Basal Area (ft²/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP and Rip.Fun.</td>
<td>9</td>
<td>E. Cascades</td>
<td>77-240</td>
<td>154</td>
</tr>
<tr>
<td>Riparian Function</td>
<td>2</td>
<td>Siskiyou</td>
<td>114-171</td>
<td>143</td>
</tr>
<tr>
<td>Shade and Rip.Fun.</td>
<td>65</td>
<td>Blue Mountains</td>
<td>13-142</td>
<td>66</td>
</tr>
</tbody>
</table>

Shade Study: Dominant Overstory

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Georegion</th>
<th>Range in BA (ft²/acre)</th>
<th>Average Basal Area (ft²/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Douglas Fir/Eng. Spruce</td>
<td>9</td>
<td>Blue Mountains</td>
<td>24-86</td>
<td>51</td>
</tr>
<tr>
<td>-Pine</td>
<td>8</td>
<td>Blue Mountains</td>
<td>28-104</td>
<td>59</td>
</tr>
<tr>
<td>-White Fir</td>
<td>14</td>
<td>Blue Mountains</td>
<td>28-118</td>
<td>68</td>
</tr>
</tbody>
</table>

**No-touch and RMA Rule Compliance (Robben and Dent, 2002)**

Twenty-five sites were randomly selected in eastern Oregon to evaluate compliance with riparian forest practice rules. There was 100% compliance with Riparian Management Area (RMA) rules governing basal area retention (n=7), 20-foot no-cut buffers (n=7), and RMA widths (n=18). Seven sites were managed with the general prescription (standard basal area target). Managers retained the required basal area and did not harvest within 20 feet of the stream on seven out of seven sites. On these seven sites, managers retained basal area beyond that required by the rules, ranging from 8-254% of what was required. On 18 sites, the written plan indicated the manager’s intention to treat the entire RMA as a no-cut area. On these 18 sites, there was no harvest within 50, 70, and 100 feet on small, medium, and large streams, respectively.

![EOA Basal Area Prescription RMAs](image-url)
Flood-prone Width (Allen and Dent, 2001)

Streams are expected to migrate laterally over time, this is sometimes referred to as the channel migration zone (CMZ). While the ODF monitoring program has not collected data on CMZs, data were collected on the flood-prone width. Flood-prone width is a measure of the channel width when the stream stage is estimated at a frequent flood event, 50-year return period or less. Because the channel migration zone can be much wider than the flood-prone width, especially for unconfined channels, the flood-prone width should be thought of as an index of the minimum CMZ width. Data from 31 sites in the Blue Mountain Georegion indicate that flood-prone width varied greatly on small streams (11 – 104 feet). The ranges in flood-prone widths for medium and large streams were similar (30–87ft., 45–88ft respectively). On average, the flood-prone widths for small, medium and large streams were 37, 52, and 70 feet respectively.

Small Type N Streams (Robben and Dent, 2002)

The Oregon Department of Forestry has monitored compliance with forest practice rules on small Type N streams. Compliance with stream protection rules is very high both for individual rules and when averaged for separate divisions (90- 100%). The one exception is with regard to prior approval for written plans (75% compliance). The compliance rates for each rule are listed in the following tables.
EOA Compliance Related to Type N Protection

Skidding and Yarding

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-630-100</td>
<td>Yarding - Slopes &gt;35%</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>629-630-100</td>
<td>Skid Trail Location - Minimize Sidecast</td>
<td>20</td>
<td>95.0</td>
</tr>
<tr>
<td>629-630-100</td>
<td>Skid Trail Location - Stable Areas</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>629-630-100</td>
<td>Yarding - Minimize Soil Disturbance</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td><strong>629-630-100</strong></td>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>99.0</strong></td>
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</tbody>
</table>

Landings

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-630-200</td>
<td>Landing Design - Minimize</td>
<td>259</td>
<td>100</td>
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<tr>
<td>629-630-200</td>
<td>Landing Location - Stability</td>
<td>259</td>
<td>100</td>
</tr>
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<td>629-630-200</td>
<td>Prior Approval - RMA Landings</td>
<td>4</td>
<td>75.0</td>
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<td>629-630-200</td>
<td>Landing Waste - Stability</td>
<td>259</td>
<td>100</td>
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<tr>
<td><strong>629-630-200</strong></td>
<td><strong>Total</strong></td>
<td><strong>781</strong></td>
<td><strong>99.9</strong></td>
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</table>

Drainage Systems

<table>
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<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
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</thead>
<tbody>
<tr>
<td>629-630-300</td>
<td>Skid Trail Drainage - Filtering</td>
<td>20</td>
<td>90.0</td>
</tr>
<tr>
<td>629-630-300</td>
<td>Skid Trail Drainage - Dispersal</td>
<td>20</td>
<td>95.0</td>
</tr>
<tr>
<td>629-630-300</td>
<td>Landing Drainage - Dispersal</td>
<td>259</td>
<td>98.8</td>
</tr>
<tr>
<td><strong>629-630-300</strong></td>
<td><strong>Total</strong></td>
<td><strong>299</strong></td>
<td><strong>98.0</strong></td>
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</table>

Felling and Removal of Slash

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-630-600</td>
<td>Felling - Fell Away From WOS</td>
<td>30</td>
<td>96.7</td>
</tr>
<tr>
<td>629-630-600</td>
<td>Slash - F/D Stream, Lake, S. Wetland Removal</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>629-630-600</td>
<td>Slash - Minimize in N Streams., Lakes, Wetlands</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>629-630-600</td>
<td>Slash - Place Above High Water</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td><strong>629-630-600</strong></td>
<td><strong>Total</strong></td>
<td><strong>101</strong></td>
<td><strong>99.0</strong></td>
</tr>
</tbody>
</table>
EOA Compliance Related to Type N Protection (continued)

Yarding and Ground-Based Equipment Near WOS

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-630-800</td>
<td>Ground Equipment - Minimize Disturbance</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>629-630-800</td>
<td>Ground Equipment - Not in Streams</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>629-630-800</td>
<td>Ground Equipment - Minimize Crossings</td>
<td>28</td>
<td>96.4</td>
</tr>
<tr>
<td>629-630-800 4a</td>
<td>Temp. Xing Design - Min. Sediment To WOS</td>
<td>9</td>
<td>100</td>
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<tr>
<td>629-630-800 4b</td>
<td>Temp. Xing Location</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>629-630-800 4c</td>
<td>Written Plan - Temp. Xing Fill &gt; 8'</td>
<td>0</td>
<td></td>
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<tr>
<td>629-630-800 4d</td>
<td>Temp. Xing Design - Fish Passage</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>629-630-800 4e</td>
<td>Temp. Xing Fill - Removal Timing</td>
<td>2</td>
<td>100</td>
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<tr>
<td>629-630-800 6</td>
<td>Temp. Xings - Sediment Barriers</td>
<td>9</td>
<td>100</td>
</tr>
<tr>
<td>629-630-800 7</td>
<td>Machinery - Minimize WOS Disturbance</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>629-630-800 8</td>
<td>Skid Trail Loc. - &lt;35' of Strms, runoff filtering</td>
<td>20</td>
<td>85.0</td>
</tr>
<tr>
<td>629-630-800 9</td>
<td>Skid Trail Location - High Water</td>
<td>20</td>
<td>95.0</td>
</tr>
<tr>
<td>629-630-800</td>
<td>Total</td>
<td>181</td>
<td>97.2</td>
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</tbody>
</table>

Retention of Vegetation Within 10' of Perennial Small Type N Streams

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># of Rule Applications</th>
<th>% Rule Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-640-200</td>
<td>SN RMA - 10' HWL Veg. Retention</td>
<td>13</td>
<td>92.3</td>
</tr>
</tbody>
</table>

Wetlands (Robben and Dent, 2002)
The Oregon Department of Forestry has monitored compliance with wetland protection rules. NOTE: The sample size is sufficiently low for significant wetlands (n = 5) as to cast doubt on the statistical reliability of the results. Compliance rates ranged from 20% (none of these resulted in an impact to the vegetation or hydrology of the wetland) to 100%. The lowest compliance rate dealt with a lack of information in written plans regarding protection of understory vegetation. However, there was 100% compliance in the field with protection of understory vegetation, as well as hydrology, soils, and tree retention standards. A sample size of 19 for wetlands less than 8 acres suggest relatively low compliance with protection measures designed to protection the vegetation and hydrology of these very small wetlands. Compliance rates for individual rules are shown in the following table.
## Eastern Oregon Area Wetlands

### Administrative Requirements

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># App.</th>
<th>% Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-605 170</td>
<td>Prior Approval - W/in 300' of Significant Wetlands</td>
<td>5</td>
<td>60.0</td>
</tr>
<tr>
<td>629-645 030</td>
<td>Written Plan - Wetland Filling</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>629-645 030</td>
<td>Written Plan - Wetland Machinery</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>629-645 030</td>
<td>Written Plan - Wetland Road Construct.</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>629-645 040</td>
<td>Written Plan - Protection of Understory Vegetation</td>
<td>5</td>
<td>20.0</td>
</tr>
</tbody>
</table>

### Significant Wetlands (> 8 Acres)

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># App.</th>
<th>% Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-645 010</td>
<td>Significant Wetlands - Tree Retention</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>629-645 010</td>
<td>Significant Wetlands - Tree Retention</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>629-645 030</td>
<td>Significant Wetlands - Soil Disturbance</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>629-645 030</td>
<td>Significant Wetlands - No Draining</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>629-645 040</td>
<td>Significant Wetlands - Understory Veg. Retention</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>629-645 050</td>
<td>Significant Wetlands - Retain Snags/Down Wood</td>
<td>4</td>
<td>100</td>
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</table>

### Other Wetlands (< 8 Acres)

<table>
<thead>
<tr>
<th>Rule Number</th>
<th>Description</th>
<th># App.</th>
<th>% Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>629-655 000</td>
<td>Other Wetlands - Soil/Water Quality</td>
<td>19</td>
<td>78.9</td>
</tr>
</tbody>
</table>
APPENDIX I

REFERENCES


anadromous fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to fresh water to reproduce, e.g., salmon, steelhead.

avulsion – a sudden change in the bed or course of a stream.

basal area - The area of the cross-section of a tree stem derived from diameter at breast height (DBH).

basal area credit – In the forest practice rules, the credit given in towards meeting the live tree requirements within riparian management areas for placing material such as logs, rocks or rootwads in a stream, or conducting other enhancement activities, such as side channel creation or grazing exclosures.

best management practices (BMPs) - Practices determined by a designated planning agency to be the most effective and practicable means (including technological, economic, and institutional considerations) of controlling point- and non-point source pollution.

canopy - The foliar (leaf, branch, stem, etc.) cover in forest, shrub, or grassland community, consisting of one or several layers.

channel – In the forest practice rules, a distinct bed or banks scoured by water which serves to confine water and that periodically or continually contains flowing water.

channel migration zones - A channel migration zone, or CMZ, is the lateral extent of likely movement along a stream reach with evidence of active stream channel movement over a given interval of time. Using a 100-year time interval as an example, the CMZ would encompass the lateral extent along a stream reach where that stream is likely to migrate within the next 100 years. CMZs generally make up a small percentage of the entire stream network, but can occur on a large percentage of a mainstem river. Characteristics of CMZs include numerous side channels with bed elevations at or below the bankfull width elevation, as well as signs of bank migration at meander bends. Where CMZs do not occur, channel movement is accounted for within the bankfull channel width.

DEQ - Oregon Department of Environmental Quality

diameter at breast height (DBH) - The diameter of a tree inclusive of the bark measured four and one-half feet above the ground on the uphill side of the tree.

desired future condition - A description of the land or resource conditions that are believed necessary if goals and objectives are fully achieved. The desired future condition developed by ERFAC is shown in Recommendation A of this report.

ERFAC - The Eastside Riparian Functions Advisory Committee, an ad hoc advisory committee convened in 2001 to provide the Oregon Department of Forestry with recommendations related to forest practices and riparian functions in eastern Oregon.
**fish use stream (also Type F stream)** – In the forest practice rules, a stream inhabited at any time of the year by anadromous or game fish species or fish that are listed as threatened or endangered species under the federal or state endangered species acts.

**Forest Practices Act (also Oregon Forest Practices Act)** - ORS 527.610 to 770, 527.990(1), and 527.992. The Forest Practices Act describes practices necessary to maintain the continuous growing and harvesting of forest trees on private forestland in Oregon, consistent with sound management of soil, air, water, and fish and wildlife resources.

**forest practice rules** – Rules promulgated by the Oregon Board of Forestry under the Oregon Forest Practices Act.

**FPAC** - The Forest Practices Advisory Committee, an ad hoc advisory committee convened in 1999 to provide recommendations related to forest practices, fish habitat, and water quality to the Oregon Board of Forestry

**growth basal area (GBA)** - The basal area per acre at which the dominant trees grow at a rate of one inch in diameter per decade.

**Harvest Type 1** - A harvest that requires reforestation but not wildlife trees. Shelterwood harvests fit into this category. See ORS 527.620(8).

**Harvest Type 2** - An operation that requires leave trees but not reforestation. This type of operation is sometimes called a “green clearcut,” because most of the larger trees have been removed but there is a significant component of healthy, younger trees. See ORS 527.620(9).

**Harvest Type 3** - An operation that requires reforestation and leave trees. This often describes a traditional “clearcut,” where most of the larger trees are removed and there is not a significant component of healthy younger trees after harvest. See ORS 527.620(10).

**high water level** - In the forest practice rules, the stage reached during the average annual high flow. The high water level often corresponds with the edge of streamside terraces, a change in vegetation, or a change in soil or litter characteristics.

**hydrologic** - Relating to the storage, movement, or behavior of water.

**mature forest condition** - This term refers to the “mature conifer forest” condition that is the desired future condition for the current water protection rules. Forests in a “mature” condition will provide large wood, shade, and other riparian functions expected from forests 80 to 120 years old.

**monitoring** - Collection of information over time, generally on a sample basis, to determine the effects of resource management treatments. Monitoring information is often used to help determine if changes in management are needed to achieve specified goals.

**no-harvest zone** - This refers to the restriction on harvesting within 20 feet of fish use streams, domestic-use streams, or large or medium streams with neither of these uses (see OAR 629-640-0100(2)(b) and 629-620-0200(2)(b)).
**nonmerchantable tree** - In the forest practice rules, this refers to trees that are less than six inches DBH. The rationale is that trees that small are not yet valuable enough to harvest, and so are not considered “merchantable.”

**ODF** - Oregon Department of Forestry

**reforestation** - The reestablishment of forest cover either naturally or by seeding or planting.

**regeneration** - As used in this report, regeneration is either synonymous with reforestation or it means the actual seedlings or young trees that are growing in a forest, i.e., the forest has “regenerated.”

**riparian** - Related to, living, or located in conjunction with a wetland, or on the bank of a river or stream.

**riparian area** - The ground along a water of the state where the vegetation and microclimate are influenced by year-round or seasonal water, associated high water tables, and soils which exhibit some wetness characteristics.

**Riparian Management Area (RMA)** – In the forest practice rules, an area along each side of specified waters of the state within which vegetation retention and special management practices are required for the protection of water quality, hydrologic functions, and fish and wildlife habitat.

**RMA stratification** - Segregating portions of riparian management areas with different stand densities, usually with the intention of treating the segregated portions differently.

**rotation** - In forest management, the period between regeneration establishment and final harvesting.

**salmonid** - Of, belonging to, or characteristic of the family *Salmonidae*, which includes the salmon, trout, char, and whitefish.

**sediment** - Solid material, both mineral and organic, that is in suspension and being transported from its site of origin by forces or air, water, gravity, or ice. “Sediment” also refers to the material after it has been deposited. In the context of this report, “sediment” refers to the mineral material.

**site class (cubic foot)** - A classification of site quality based on the number of cubic feet of fiber a unit area (e.g., an acre) of forestland is capable of growing.

**site index** - A method of classifying site productivity by determining how tall dominant trees grow in a given time period, generally 100 years for eastern Oregon.

**site potential** - Site productivity.

**site potential tree height** - The height a dominant tree would be expected to grow on a site at a specified age, usually 100 years for eastern Oregon.
**site productivity** - The inherent capability of a site to grow trees, i.e., how tall the trees would be expected to grow, or how much volume the trees would be expected to produce.

**site specific plan** - An alternate plan developed by the landowner subject to the review of the Oregon Department of Forestry, and used to tailor activities to local conditions not addressed in standard rule prescriptions (see OAR 629-640-0400).

**snag** - A tree which is dead but still standing, and that has lost its leaves or needles and small limbs.

**standard target** - A basal area target used in the water protection rules (1) to determine which RMA management options are available to a landowner, and (2) to specify how much basal area landowners must retain in RMAs.

**stream** - In the forest practice rules, a channel, such as a river or creek, that carries flowing surface water during some portion of the year. “Channel” means a distinct bed or banks scoured by water which serves to confine water and that periodically or continually contains flowing water. “Stream” includes the bed and banks and any other features that are below the high water level.

**sustainability** - The capacity of forests to maintain their health, productivity, diversity, and overall integrity in the long run and in the context of human use.

**tree leaning over the channel** - A tree within a riparian management area if a portion of its bole crosses the vertical projection of the high water level of a stream.

**Type D stream** - In the forest practice rules, a stream that has domestic water use, but no fish use.

**Type F stream** - In the forest practice rules, a stream with fish use, or both fish use and domestic water use.

**Type N stream** - In the forest practice rules, a stream with neither fish use nor domestic water use.

**understory** - Vegetation growing in the lower portions of the forest, e.g., small trees, shrubs, grasses, and herbaceous plants.

**ungulates** - Hoofed animals, including cattle, swine, horses, deer, elk, etc.

**voluntary measures** - As used in this report, activities undertaken voluntarily by landowners and others to restore, protect, and enhance water quality and salmonid habitat.

**water protection rules** - OAR 629-635-000 through 629-660-0060. These rules specify the protection requirements when forest operations are conducted near streams, lakes, or wetlands.
**wetlands** - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and other similar areas.

**written plan** - A plan submitted by an operator, for written approval by the State Forester, which describes how the operation will be conducted, including the means to protect resource sites described in ORS 527.710(3)(a) (relating to the collection and analysis of resource site inventories), if applicable.