OREGON STATE PROGRAMS FOR MANAGING RIPARIAN RESOURCES

REPORT BY THE RIPARIAN MANAGEMENT WORK GROUP

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I. BACKGROUND

Purpose of this Report

In January 1999, Governor Kitzhaber issued Executive Order 99-01 related to the ongoing development and implementation of the *Oregon Plan for Salmon and Watersheds*. Section (3) of the order, related to *Key Agency Efforts*, lists several activities that are "critical to the success of the Oregon Plan." Paragraph (3)(n) is directed at the management of riparian vegetation:

> *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.*

In March 1999, staff from all six agencies met to develop a process to address this section of the Executive Order. By July 1999, the "Riparian Management Work Group" had developed an approach to evaluating agency programs, and had taken a field trip to various sites in the southern Willamette basin to look at different riparian conditions and management approaches.

The purpose of this project is to evaluate agency riparian management programs in order to identify improvements which may be needed to achieve water quality standards and restore aquatic habitat. In the course of discussing and evaluating agency programs, the group concluded that the state should develop a comprehensive "landscape approach" to managing riparian areas, and identified several factors which should be considered in that process.

This report describes the purpose and effect of Oregon state agency programs that are designed in part to manage riparian resources. It is intended to help inform discussions about how state programs may be managed to achieve water quality and aquatic habitat objectives. The report is organized into six sections. First, this section contains background information. Section two contains the key conclusions of the Riparian Management Work Group. Section three presents a summary of the important riparian functions, which provide a foundation for evaluating riparian management programs. The fourth section presents a landscape perspective in developing a riparian management policy. Section five contains a brief summary of the state programs that affect riparian resources, including the different definitions of the term "riparian" in use in the state programs, and identifies some of the fundamental differences among three state programs that affect the riparian landscape. Finally, literature cited in this report—principally in the section on riparian functions—constitutes the last section. The detailed program evaluations are all contained in Appendix A; Appendix B presents a summary of water quality standards related to riparian areas.

Oregon's Riparian Landscapes

In general, Oregon's landscape can be divided into three categories: lands managed for farming (including range lands); lands managed for forest uses; and urban areas, including lands to be used for future urban growth. Of course, streams, and therefore riparian areas, are a dominant feature—and in fact represent the predominant landscape function—across the entire landscape, regardless of land use.

Broadly speaking, the present condition of riparian corridors across the landscape reflects a mixture of current regulations and current management practices, as well as past regulations and past practices. On any given *specific* site, one of these regimes is likely to be most in evidence. For example, the riparian corridor through an established subdivision will probably still reflect the practices and regulations related to streams and riparian areas that were in effect at the time of development, when trees were removed and understory vegetation was typically replaced with lawns and gardens. Stream corridors in agricultural areas today often reflect the past "clean farming" techniques used to remove vegetation along streams and fencerows. These practices were thought to reduce weeds and other pests, which interfered with cultivation. And a new forest harvest operation will reflect a much more protective approach to managing the riparian area compared to a site harvested forty years ago. Yet the effects of older approaches to harvest can persist in the landscape. There is clear evidence in all areas of the state that the protection of stream corridors has historically *not* been a high priority.

But at the same time, in many places one can see evidence of changing approaches to riparian area management. In new subdivisions, houses and roads are being built away from streams, and state law now requires that local ordinances control riparian vegetation removal. Rules governing timber harvests now foster the protection and management of riparian areas, more closely emulating historic forest conditions. Water quality management plans and rules are being developed for agricultural areas throughout Oregon. Parts of these plans and rules address riparian conditions, including plant cover and streambank integrity.

The delineation of land uses in the Oregon *landscape* is reflected in Oregon *law* as well. That is, the laws that govern the management of forests are separate and distinct from those which govern agricultural activities, and likewise from those which govern land used in urban areas. These three bodies of law have evolved independently of each another, in response to specific environmental problems, public perceptions, scientific understanding, and political circumstances. More specifically, the processes of adopting policies and practices to improve the protection of stream corridors has occurred at different speeds, so that Oregon now has different kinds and levels of protection for streams and riparian areas in forested areas, agricultural areas, and urban areas. These different regulatory regimes also reflect different public expectations—largely driven in turn by economic and aesthetic considerations— about streams and their associated riparian features. In Oregon, as elsewhere, this situation reflects the tendency of governments to develop *multiple programs for managing multiple resources,* in contrast to *managing a landscape for multiple values and outputs*. In the absence of consideration for the entire landscape, the laws which correspond to different land uses will treat features common to all of them—such as streams and riparian corridors—somewhat differently.

Based on the extent of water quality problems documented in Oregon's 303(d) list, and the status of dozens of native anadromous fish populations, it has become clear that many of Oregon's streams, rivers, and watersheds have serious problems. Numerous studies have shown that both water quality and salmon population problems related to freshwater habitat can be strongly linked to the condition of riparian areas.

Properly managing riparian areas is a critical component to solving Oregon's water quality and native fish problems. There are other tasks as well; the *Oregon Plan for Salmon and Watersheds* contains hundreds of salmon recovery measures. But it is likely that only a few will equal the long-lasting impact of riparian area management.

II. KEY CONCLUSIONS OF THE RIPARIAN MANAGEMENT WORK GROUP

Over the course of more than 18 months of regular meetings and discussions, and through the process of developing this report, the Riparian Management Work group arrived at several conclusions which are important to appreciate throughout the process of improving Oregon's riparian management programs. Many of these "key" conclusions do not derive from specific information in this report about particular program characteristics, but rather result from an appreciation of the larger context—both institutionally and ecologically—in which these programs operate.

These "key" conclusions are detailed below.

Oregon does not have an overarching comprehensive riparian or stream corridor management policy or program. For the most part, three state programs influence the management and use of riparian areas, and each one has evolved to achieve different objectives. Restoration and maintenance of productive aquatic habitat is not a common, stated objective of all three of these programs. While development of TMDLs under the Clean Water Act has become the dominant framework for setting stream corridor management objectives, TMDLs are also limited in their ability to meet state goals for aquatic habitat.

The condition of Oregon's surface water bodies and aquatic habitat is such that, in order to achieve water quality and aquatic habitat objectives, riparian vegetation and the functions it provides will need to be restored in many areas. State programs which have an effect on activities in the riparian corridor are primarily regulatory programs, which present limited opportunities for restoring resources damaged by past practices. In many areas, land use activities outside the riparian area can have a strong influence on the health and integrity of a stream and its riparian environment.

Important points emerged in the work group's initial discussions. First, the *evaluation* of a program in the absence of a *standard* appeared to be problematic. The standard contained in the executive order is to achieve water quality standards and to protect and restore aquatic habitat. However, this "standard" is very difficult to quantify and assess. Second, it became clear that existing programs for managing riparian vegetation—or even for managing riparian corridors—alone would not be sufficient to meet water quality standards or to protect and restore aquatic habitat across all land uses. And third, the group agreed that the focus on riparian *vegetation* should be expanded to include a range of riparian *functions* that are important for both water quality and aquatic habitat.

The group did not attempt to develop recommendations for new programs or for changes to statutes or existing programs which would involve clear policy choices. Instead, a broader discussion in a policy-oriented forum is more appropriate for such purposes.

- **In many areas, restoration of the riparian corridor will be necessary to meet water quality standards and aquatic habitat objectives.**

  Riparian corridors have been substantially degraded across large portions of the landscape. Achieving water quality standards and aquatic habitat objectives in such areas will require that vegetated, functional riparian areas be reestablished and maintained.

❖ **Non-regulatory tools work best for encouraging such restoration. Regulations work best to prevent future resource degradation.**

Where riparian corridors are in a satisfactory condition, regulation can be an effective strategy to prevent resource degradation. However, where resources have already been degraded by past practices, regulation will generally *not* be the most effective strategy to improve and restore resource conditions.

Riparian restoration and protection priorities should be established across the landscape using Oregon's protocols for watershed assessment, monitoring, and for aquatic restoration. Highest priority should be placed on those resource restoration and protection improvements that can most significantly and efficiently protect and restore water quality and fish habitat. In other words, set priorities where possible according to the identification of limiting factors on fish populations. For example, encouraging riparian buffers along currently unbuffered fish-bearing streams is probably a higher priority than widening existing buffers elsewhere. Finally, it may be logical and worthwhile to define the level of riparian habitat degradation or alteration above which investments in restoration should be assigned a low priority, since the return on the investment may be quite low.

❖ **In some areas, riparian corridor management alone will not be adequate to meet water quality standards or aquatic habitat objectives.**

Activities *outside* the riparian area (see table below) can have an immense effect on water quality and aquatic habitat. For example, in urban areas, stormwater drainage systems capture rainfall and pollutants and normally channelize runoff through the riparian area. Thus the entire urban landscape outside the riparian corridor can affect water quality and aquatic habitat conditions in the stream.

Activities outside waterways and riparian areas	Effect on water quality
Surface and ground water withdrawals	Temperature, and habitat impacts due to decreased instream flow
Direct pipe or channelized discharges (including, such things as point sources, stormwater, tile drains, and irrigation canals)	Temperature Sediments Toxics
Channelization	Habitat impacts due to loss of floodplain connectivity.
Roads and impervious surfaces	Sedimentation and hydrology
Atmospheric deposition	Toxics Sediments (dust)

- **Protection of water quality and aquatic habitat are not stated purposes of some programs that are now being viewed as tools or mechanisms to improve water quality and aquatic habitat.**

  Several state programs regulate or otherwise influence activities in riparian areas. As such, those programs may be viewed as primary mechanisms to improve water quality and aquatic habitat. However, in some cases, those programs were developed for purposes other than to improve water quality or aquatic habitat, and achieving desired conditions for these parameters is not stated as one of the program objectives.

- **There is no overall comprehensive riparian corridor management strategy or framework (landscape perspective) in state law, policy, or rule. Each program that affects riparian resources is independently evolving in its ability and approach to address water quality and aquatic habitat objectives.**

  Since the adoption of the Oregon Plan for Salmon and Watersheds much progress has been made in providing a more comprehensive framework for dealing with landscape-scale issues. Although these activities have been significant no comprehensive riparian corridor management strategy has been developed. A major reason for this situation is that each state program is built in response to specific departmental needs. Most often these needs are addressed in the absence of consideration of the objectives for other departments. Secondly, departments are often charged with resource-specific tasks that do not directly involve other departments. This situation is not unique to state government and obviously occurs in a variety of arenas, including academia. Academic research is also going through the same types of evolution as it struggles with finding the better ways to collaborate on issues that transcend the boundaries of traditional disciplines.

  Relatively new disciplines such as landscape ecology and conservation biology will provide increased opportunity to increase transdiscipline activities. (See the “Landscape” discussion in this report for a more detailed discussion of these points). New technologies, such as spatial statistics, remote sensing techniques, and visualization software will provide further opportunity to work on a landscape scale and to form policy that addresses issues at that level.

- **TMDL development provides a state-wide framework for addressing “water quality limited” streams on the 303(d) list, and for creating riparian area management objectives in the state of Oregon.**

  While TMDLs bring a strong focus to the most degraded stream reaches known in the state (based on available data), they do not necessarily address any or all of the important water quality and aquatic habitat functions produced by riparian vegetation. This is in part due to the nature of TMDLs which legally apply only to 303(d) listed parameters. Some of these parameters, such as temperature and sedimentation, may be influenced by streamside vegetation. Others may not be. However, the process for establishing and implementing TMDLs brings together key resource agencies, watershed councils, and restoration work volunteers—a connectivity that creates further opportunity for improving water quality by increasing the vegetative health of riparian corridors.

- ❖ **Responsibility for implementing the Clean Water Act varies across the different programs that affect land use activities.**

  The statutory relationship between DEQ and ODF on how water quality standard compliance will be assured during commercial forest operations differs from the relationship that exists between DEQ and ODA, for agricultural activities, even though both ODF and ODA are Designated Management Agencies under DEQ. Apart from establishing TMDLs, the mechanism to achieve water quality standard compliance on urban lands is even less clear.

  The statewide planning program has never been viewed as a Designated Management Agency for the purposes of implementing the Clean Water Act. As such, the linkage between water quality and the land use planning program is not well developed. While Statewide Planning Goal 6 refers to point source discharges, the utility and applicability of Goal 6 to broader water quality objectives is not clear. In this context, it is important to note that the purpose of land use planning in general is to establish land use patterns, and therefore may not be the most effective or appropriate tool for regulating activities to protect water quality.

- ❖ **There are no state standards defining specific desired riparian or aquatic habitat conditions.**

  While several agency programs are attempting to implement policies to improve protection for riparian and aquatic habitat, the state does not have any specific standards—aside from those for water quality—for riparian and aquatic habitat conditions.

- ❖ **Oregon does not have a comprehensive system to monitor compliance with and the effectiveness of state and local laws and ordinances to protect riparian and aquatic habitats.**

  Two kinds of monitoring are important. First, monitoring compliance with permits and laws; and second, monitoring the effectiveness of program requirements in achieving the desired landscape objectives. The chief programs for managing riparian areas implement widely varying levels of monitoring. Adaptive management, which is one important goal of the Oregon Plan for Salmon and Watersheds, is not possible without at least some monitoring to determine both the level of compliance with regulatory requirements and the effects on the ground of those requirements.

- ❖ **Program effectiveness relies largely on the assent of those who are the subject of regulations, and can be improved through education and technical assistance.**

  Regulatory programs are more effective and have higher compliance rates when supported by a majority of the publics they regulate. Those affected by ODF, ODA and DLCD programs have differing levels of acceptance and support for state regulation. The state should support and promote a major public education effort so the public both understands the need to protect and restore watersheds, and becomes actively engaged in protection and restoration efforts. Education, however, will not resolve problems associated with different approaches to riparian management across different land uses, and which can be viewed by some as being inequitable.

- **General concepts about the effect of riparian vegetation on water quality are generally well established and understood. However, accurate and equitable application of those concepts to individual sites is difficult.**

  Whereas an economic value can easily be placed on a stand of trees, it is extremely difficult to place an exact ecological value on those same trees. The framework for regulating private activities in the United States demands that environmental protection measures provide just enough protection, but no more. The difficulty of regulating individual activities on the basis of their contribution to the cumulative effects of all individual activities has produced a set of management policies which may not be sufficient to protect water quality.

- **Current statutes are vague on the process and standards that must be followed by local governments in order to regulate commercial forest practices inside Urban Growth Boundaries, supplanting Forest Practices Act jurisdiction.**

  The FPA requires that, in order to replace state regulation, local ordinances must protect soil, air, water, fish, and wildlife resources and be "acknowledged as being in compliance with land use planning goals." However, it is unclear to what extent local regulations are expected to be comparable to the FPA in the level of resource protection provided. Further, the requirement that ordinances be "acknowledged" to be in compliance with the land use goals is problematic; the only state mechanisms to provide such acknowledgement, as it is customarily understood in the context of Oregon's land use program, are DLCD's periodic review program and its review of local comprehensive plan amendments. DLCD staff expertise does not include forest practices regulation.

  ODF has drafted a 2001 legislative concept on this topic.

- **Scientific information is needed to provide a sound foundation for policy decisions, but policy decisions cannot be made based solely on science.**

  Scientific facts, scientific hypotheses, scientific theories, scientific opinions, and the opinions of persons who are scientists are five very different types of information, any and all of which may be valuable to consider in natural resource policy-making and in evaluating the potential consequences of policy decisions. Science will usually not provide precise answers to questions about what level of resource protection is appropriate, or what level of risk to protected resources is acceptable. These are ultimately policy choices that must be made within a context that also considers social, economic, political, and scientific values and desired outcomes.

- **Although riparian management programs in general need to manage for the full range of riparian landscape functions, it may not be feasible or possible to manage all individual sites for the same level or types of riparian functions.**

  There are a range of conflicts (including economic and safety issues) that may arise when riparian management strategies are intended to provide for the full range of riparian functions. The pertinence and severity of these conflicts can vary among types of land use. Recognizing these conflicts and avoiding unintended consequences are important considerations in creating riparian protection strategies. The degree that providing riparian functions is balanced with other needs is a policy choice that may result in different strategies among the various land uses. In developing the range of strategies, issues of equity and mitigation should be considered among the various land uses. At a minimum, a level of riparian function should be provided that does not prevent compliance with water quality standards across all land uses.

II. Riparian Functions

Several important riparian functions affect water quality and aquatic habitat (see Table 1). This section provides a brief summary of some of the more important influences of riparian vegetation on water quality and aquatic habitat conditions. Information included in this summary is intended to address statewide issues, but the listed research findings relate most closely to environments on the west side of the Cascade Mountains.

Table 1. Key riparian functions and related state water quality standards to protect and/or restore aquatic habitat for salmonids.

Riparian Vegetation Function	Water Quality Standard Affected *	Aquatic Habitat for Salmonids Affected
Shade	Numeric Temperature Standard: OAR 340-041-(basin)(2)(b).	Temperature-related beneficial uses: Resident Fish & Aquatic Life, Salmonid Fish Spawning and Rearing: OAR 340-41-(basin).
Bank Stability and Erosion Control	Sedimentation: OAR 340-41-(basin)(2)(j).	Sediment-related beneficial uses: Resident Fish & Aquatic Life, Salmonid Fish Spawning and Rearing: OAR 340-41-(basin).
	Turbidity: OAR 340-41-(basin)(2)(c).	Turbidity-related beneficial uses: Resident Fish & Aquatic Life: OAR 340-41-(basin) [Also: Water Supply and Aesthetics].
Large Wood Source	Sedimentation: OAR 340-41-(basin)(2)(j).	Sediment-related beneficial uses: Resident Fish & Aquatic Life, Salmonid Fish Spawning and Rearing: OAR 340-41-(basin).
	Habitat Modification Standard:** OAR 340-41-(basin)(2)(i).	Habitat Modification-related beneficial uses: Resident Fish & Aquatic Life, Salmonid Fish Spawning and Rearing: OAR 340-41-(basin)
	Biological Criteria **:OAR 340-41-27	Bio-criteria-related beneficial uses: Resident Fish and Aquatic Life: OAR 340-41-(basin)
Nutrients (Litterfall)	Not applicable	Yes. (see narrative below)
Filtering of Sediments	Sedimentation: OAR 340-41-(basin)(2)(j).	Sediment-related beneficial uses: Resident Fish & Aquatic Life, Salmonid Fish Spawning and Rearing: OAR 340-41-(basin).
	Turbidity: OAR 340-41-(basin)(2)(c).	Turbidity-related Beneficial uses: Resident Fish & Aquatic Life: OAR 340-41-(basin) [Also: Water Supply and Aesthetics].
Filtering of Toxics	Toxics: OAR 340-41-(basin)(2)(p)	Toxics-related beneficial uses: Resident Fish and Aquatic Life: OAR 340-41-(basin) [Also: Drinking Water].
Flood Storage and Mitigation	Not applicable	Yes (see narrative below)
Wildlife Habitat	Not applicable	Yes (see narrative below)

* May be subject to TMDL targets (by Basin or Sub-basin; see OAR 340-41-0026 for policies and guidelines.) See Appendix B for additional information on specific water quality standards.

** This standard or criteria could be applicable to all of the listed functions in this table.

Several water quality conditions are integrally related to aquatic habitat. Based largely on the Clean Water Act, desired or optimum water quality *conditions* are reflected in Oregon's water quality *standards*, which are adopted as Administrative Rules by the Environmental Quality Commission. Water quality standards that relate closely to aquatic habitat include temperature, dissolved oxygen, sedimentation, turbidity, habitat modification, biocriteria, and toxics. Several of these standards can be influenced by riparian conditions. A summary of the statutes and administrative rules for water quality standards that relate most closely to riparian area management is contained in Appendix B.

Readers are encouraged to refer to published scientific studies and literature summaries for additional detail on the relationship between riparian vegetation, water quality, and aquatic habitat (e.g. Meehan, 1991; Naiman, 1992; Spence et al., 1996; Murphy, 1995; Salo and Cundy, 1987; etc.).

Aquatic shade and water temperatures

Maintaining high rates of survival and production in salmonid populations may be enhanced by maintaining stream temperatures within the ranges preferred by these species during their various life history stages (Table 2). These water temperature conditions can be influenced by adequate quantities of cool water, and on the availability of shaded channels, pools and backwaters areas. Solar radiation input is generally considered to be the most important factor influencing daily stream temperature increases for most streams (Spence et al., 1996; Beschta et al., 1987). In order to maintain water temperatures suitable to support beneficial uses, including salmon survival and production, supporting water bodies ideally require shade levels similar that which resulted from historic landscape conditions (IMST, 1999).

Table 2. Optimum ranges and lethal temperature limits for coho, chinook and bull trout. (DEQ 1995)

Fish Species	Coho	Chinook	Bull Trout
Preferred juvenile rearing	54-57°F	50-60°F	39-50°F
Adult migration, holding, or spawning	45-60°F	46-55°F	39-54°F
Lethal limit	77°F	77°F	NA
State Water Quality Standard	64°F	64°F	50°F

Cool, well-oxygenated water is required by salmon, trout, other cold-water fish, and many aquatic invertebrates, with a preferred temperature range of approximately 40° to 60° F, and dissolved oxygen levels of greater than 5 parts per million. As stream temperatures rise, the ability of water to hold dissolved oxygen content decreases. Prolonged exposure to water temperatures above 70° to 77° F can be lethal to salmon and steelhead, and poor development or mortality of salmonid eggs can occur above 55° F (Brett, 1952; CDWR, 1988). Table 3 on page 10 provides additional information on temperature effects.

High water temperature and resultant reductions in available dissolved oxygen tend to have deleterious effects on fish and other organisms by:

- ❖ Inhibiting growth and disrupting metabolism;
- ❖ Amplifying the effects of toxic substances;
- ❖ Increasing susceptibility to diseases and pathogens;

- Altering fish species assemblages by providing competitive advantages to warm water species.

Table 3. Modes of Thermally Induced Cold Water Fish Mortality (Brett, 1952; Bell, 1986; Hokanson et al., 1977)

Modes of Thermally Induced Fish Mortality	**Temperature Range**	**Time to Death**
Sub-Lethal Limit—Conditions that cause decreased or lack of metabolic energy for feeding, growth or reproductive behavior, encourage increased exposure to pathogens, decreased food supply and increased competition from warm water tolerant species	64°F to 74°F 20°C to 23°C	Weeks to Months
Incipient Lethal Limit—Breakdown of physiological regulation of vital bodily processes, namely: respiration and circulation	70°F to 77°F 21°C to 25°C	Hours to Days
Instantaneous Lethal Limit—Denaturing of bodily enzyme systems	> 90°F > 32°C	Instantaneous

Streamside vegetation is a *key* to protecting water temperature. In winter, riparian vegetation reduces rapid and excessive cooling of streams by inhibiting energy losses through evaporation, convection and long-wave radiation from streams (Beschta et al., 1987). This function of riparian vegetation is important where winter air temperatures remain below freezing for extended periods of time (e.g., in high elevation and eastern Oregon streams).

Channel morphology and hydrology affect stream temperatures by influencing channel width, channel shape, flow volumes, and ground water. As the quality of streamside vegetation increases, the negative affects of other factors affecting temperature may decrease. For example, channels properly stabilized with vegetation tend to be deeper, narrower, and have a greater complexity of form, which allows less heat loading, and transfers less channel sediments downstream. High sediment-carrying flows can gouge out and widen channels, particularly if channel banks are poorly vegetated. Wider, shallower channels allow more solar radiation (less shade), thus increasing the heat load.

Streambank stability and erosion processes

Well-vegetated riparian areas help maintain the stability of stream banks, reduce bank erosion, and foster the development of complex habitats along channel margins.

Riparian vegetation increases the resistance of stream banks to erosion. The roots of trees and shrubs adjacent to streams stabilize the soil column and thus help to maintain bank integrity (Spence et al., 1996) and reduce the release of sediments stored in stream banks. An exposed coarse root network can also physically deflect erosive flows. Complex stream margin habitats, such as undercut banks, are also created when water erodes soil from beneath the roots while the root mass maintains soil materials at the ground surface. These habitats provide important hiding and rearing cover for salmonids.

Vegetation immediately adjacent to a water body is the most important for maintaining stream bank integrity (USDA Forest Service, 1993). Vegetation can help maintain bank integrity over a distance of up to one-half of the crown diameter of a tree (USDA Forest Service, 1993). The root systems of most Pacific coast conifers commonly extend from the bole to approximately the outer edge of the tree canopy (Arney, personal communication, 1999; Arney, 1973). Beyond this point, the contribution of root strength to stream bank integrity declines (USDA Forest Service, 1993).

The local disturbance regime has a significant effect on the spatial and temporal appearance and functioning of bank integrity and on the structural components in the system—such as large wood, sediment load, and riparian root systems—that contribute to streambank integrity. Although heavy rains, floods, fire, tree uprooting, and other destabilizing events can cause sediment to enter streams on a regular basis, properly-functioning riparian zones will contribute structural elements to the stream that can minimize the negative effects of these events. For example, large wood in the stream—which often increases with such disturbances—can create back eddies and low-velocity areas that allow for the deposition of suspended sediments.

Physical conditions that contribute to decreasing or preventing stream bank erosion can be summarized as:

- Rough surfaces slow the velocity of water flow;
- Reduced velocity in turn reduces the shear stress of the water on the stream bank;
- Lowered shear stress will in turn be less likely to detach and entrain stream bank particles;
- The presence of vegetation roots along the stream margin will stabilize the soil column and armor the bank against erosive forces.

Streambank erosion can be reduced by retaining types of riparian vegetation that increase stream bank and flood plain roughness. The species composition and condition of the riparian vegetation determines stream bank roughness. Values of roughness (Manning's *n*) can be correlated to various riparian conditions, as shown in Figure 1 on the next page. In essence, the "roughness coefficient," or Manning's *n* helps explain the relationship between types of riparian vegetation and rates of streambank erosion. Consequently, the

- Highest streambank erosion rates can be correlated with annual/perennial riparian vegetation types that have a low Manning's *n* (roughness coefficient); and

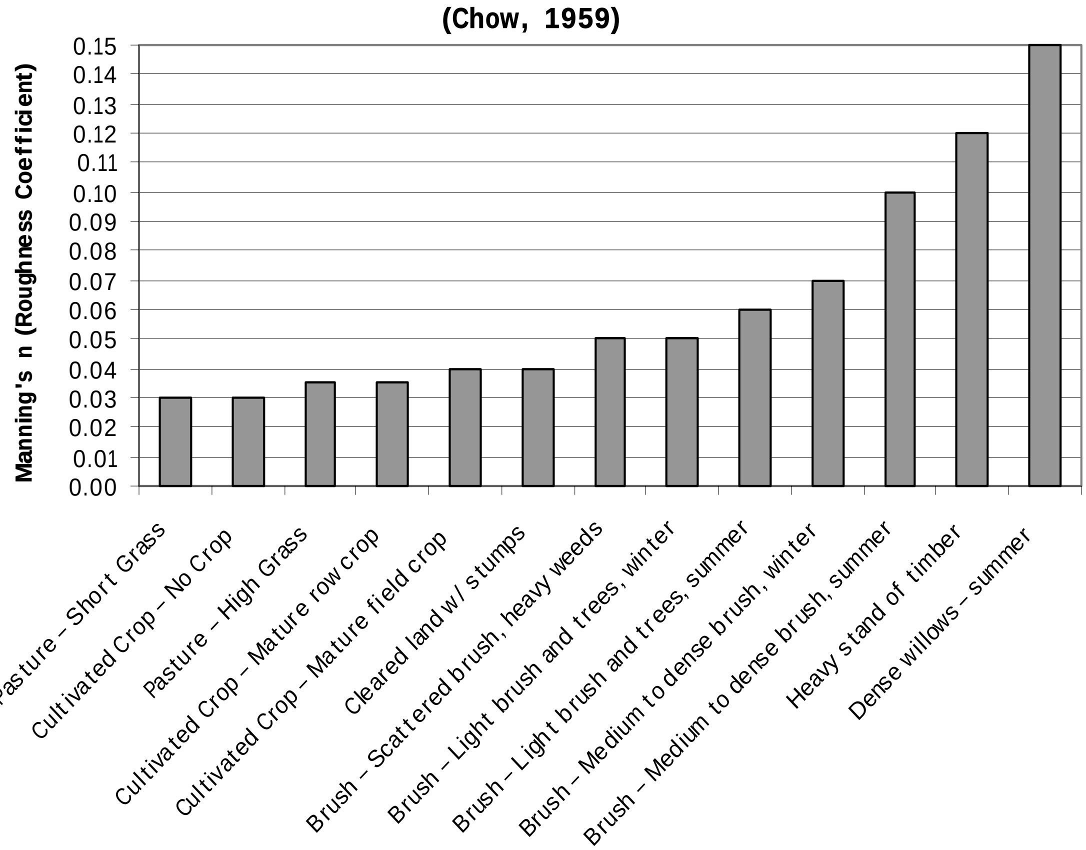
- Furthermore, low stream bank erosion rates can be correlated with woody riparian vegetation types that have a high Manning's *n* (roughness coefficient).

Production of large wood and detritus (small sticks, leaves, and wood)

One of the most important functions of riparian vegetation is to deliver trees into streams. Large pieces of wood are a critical component of aquatic ecosystems. In the northwest, large wood is important for the freshwater survival and production of salmonids.

Several processes recruit trees into aquatic habitats. These include stream bank erosion, windthrow, tree mortality, beaver activity, and landslides (Swanston, 1991; Bisson et al., 1987). Large wood in streams comes from several sources: 1) trees fall into the stream from the riparian zone; 2) downed trees and logs are transported from upper stream reaches; and 3) trees and logs are delivered to streams by landslides. The relative importance of these sources will vary according to the geomorphic and hydrologic conditions of the basin, and the composition and characteristics of riparian vegetation within the basin. This section focuses on the first of these, the recruitment of large wood from the riparian zone.

Figure 1. Manning's *n* (Roughness Coefficient) Related to Riparian Vegetation



Extensive research has been done on the potential for trees located various distances from a stream channel to enter the stream. As might be expected, trees closest to a stream channel have the highest potential to interact with the stream, and the probability of a tree falling into a channel decreases rapidly as the distance from the stream increases (Robison and Beschta, 1990). The probability that a falling tree will enter a channel depends primarily on tree height and its distance from the channel (USDA Forest Service, 1993). The slope of the hillside adjacent to the stream has also been identified as a factor in this process (Spence et al., 1996).

Current literature states that a 100-foot wide zone of intact mature or old-growth riparian forest would provide from 80 to near 99 percent of the potential in-stream large wood (McDade et al., 1990; Murphy and Koski, 1989; VanSickle and Gregory, 1990). McDade et al. (1990) found that approximately 92 percent of potential large wood would be delivered from a riparian buffer of 100 feet in mature forests of western Oregon and Washington. The same study estimated that for old-growth forests, a buffer of 120 feet would be required to achieve 90 percent potential wood recruitment, due to greater tree heights in these stands. In a study done in the Oregon Coast Range, Andrus (unpublished) analyzed riparian stand data and windthrown trees within riparian buffers containing 55 to 85-year-old trees, and showed that approximately 92 percent of potential conifer debris and 100 percent of potential hardwood debris would be maintained with 100-foot riparian vegetation buffers. One model estimated that between 80 and more than 95 percent of potential large wood input could be delivered from a 100-foot riparian zone consisting of a stand of uniform-height conifers (165 feet tall), and a stand of mixed heights and species of trees, respectively (VanSickle and Gregory, 1990).

The widest area to potentially contribute large wood to a stream is often identified as a distance equal to one site-potential tree height. The probability is low that trees farther away will reach a stream (USDA Forest Service, 1993) without a delivery mechanism such as a landslide. McDade et al. (1990) identified the maximum source distances for wood delivery as approximately 165 and 180 feet for mature and old-growth forests, respectively. These distances were slightly less than the site-potential tree heights for the respective stands in the study area (Spence et al., 1996). Andrus (unpublished) concluded that no appreciable amounts of large wood would be recruited from second-growth trees growing more than 150 feet from streams in Oregon. In several large-wood recruitment models, it is assumed that trees outside one tree-height distance will not reach stream channels (Robison and Beschta, 1990; VanSickle and Gregory, 1990).

A large proportion of structural diversity and complex fish habitat within aquatic systems can be provided by root wads, trees, and limbs that fall into the stream as a result of bank undercutting, mass slope movement, normal tree mortality, or windthrow. In seeking a path around large wood obstructions, streams create complex hydraulic patterns that carve pools and side channels, form falls, enhance channel sinuosity, and develop numerous physical variations. The structural diversity of a stream that is created by wood of all sizes is essential to provide a range of necessary habitats for fish, particularly for spawning and rearing.

In addition to providing structural diversity, large wood serves many other vital ecological and landscape functions in a stream. Large wood:

- Dissipates and redirects the force of water
- Contributes to the creation of complex habitats, including off-channel features like alcoves, oxbows and side channels, by re-directing streamflow
- Captures and stores sediments and organic material, including spawning gravels and leaf litter
- Stabilizes the streambed
- Provides important habitat for fish, including cover from predators and protection during high streamflows
- Aerates and mixes water
- Facilitates fish passage in high-gradient streams by providing ”stair steps” up the channel, which alternate with pools used for resting
- Helps retain nutrients by trapping carcasses of spawned-out fish
- Contributes to the instream food web through decomposition
- Provides habitat for aquatic invertebrates
- Represents a source of nitrogen in nutrient-poor streams
- Facilitates the development of cold water microhabitats (deep pools, areas of groundwater flow through gravel accumulations, etc.)

Large logs of decay-resistant species such as western red cedar, Douglas fir, and western hemlock, are valuable because they form stable features that can persist in the streambed for significant time periods, possibly over 100 years. Addition of large wood is important in affecting channel-forming processes. Conifer logs typically decay more slowly than deciduous logs of equal size, and therefore have a greater capacity to maintain diverse structural features needed by fish and wildlife over time. Conifer species can also attain larger sizes (diameter and length) than deciduous species. Larger materials can function in larger streams, and large "key piece" materials are important for anchoring complex accumulations of woody material.

Nutrient sources

Streamside vegetation provides a nearly constant input of leaves, wood, insects, spores, and other materials into forested streams (Gregory et al., 1987). This material constitutes an important part of the aquatic food chain, and contributes to the overall productivity of aquatic systems. Small organic material primarily enters a stream directly, by falling or being blown into the channel, although other mechanisms such as overland flow, floods, or freshets can also move such material into streams (Spence et al., 1996; Richardson, 1992). After entering a stream, most small organic material is eventually transported downstream (Richardson, 1992), and therefore, can influence productivity throughout the stream system. Although researchers do not yet completely understand the relative importance of small perennial and intermittent channels in the nutrient cycle of watersheds, these channels do provide areas where small organic material is collected, processed, and routed to downstream reaches.

The composition of riparian vegetation can influence aquatic productivity. The timing of organic inputs, the rate of decay, and nutritional quality all influence how organic material is processed and used by aquatic invertebrates. Deciduous leaves are delivered to stream systems over several months and decompose rapidly, providing a food base during summer and fall. Conifer needles are delivered to streams regularly and decompose slowly, providing a more constant food source throughout the year. A mixture of leaves, needles, and instream coarse wood provides optimal year-round food sources for fish and aquatic invertebrates.

Organic materials decay and are processed at different rates. For example, red alder leaves decay 50 percent in less than two months, while conifer needles may require more than nine months to decay the same amount. The nutritional quality of these materials also differs. Deciduous leaves are of high nutritional quality and are used by invertebrates fairly rapidly after they enter the aquatic system. Conifer needles, in contrast, are of low quality and require significant microbial processing to improve their nutritional value before other species can use them. These differences assure that food is available for aquatic invertebrates continuously throughout the year (Murphy and Meehan, 1991). Because of these differences, it can be hypothesized that a basin with a diverse riparian vegetation community would more likely support greater aquatic invertebrate diversity and production than a basin with more homogenous vegetation.

There is limited information on the relationship between the input of small organic materials to streams and the distance of source materials from streams (Spence et al., 1996; USDA Forest Service, 1993). The federal Forest Ecosystem Management Assessment Team (FEMAT) report (USDA Forest Service, 1993) inferred that vegetated riparian corridors at least 100 feet on either side of a stream would deliver a supply of small organic material sufficient to maintain the biotic community structure of a stream. This conclusion was based on a study by Erman et al. (1977) that reportedly found no difference between the composition of aquatic invertebrate communities in streams with riparian buffers greater than 100 feet, and communities in streams flowing through unharvested watersheds. Others have more recently suggested that the zone of influence of riparian vegetation may actually be less than reported by FEMAT for this function. Beschta (unpublished) re-assessed the generalized curves contained in FEMAT figures and concluded that vegetation within approximately 50 feet of a channel provides full support of the riparian functions associated with litterfall.

Filtration of sediments and organic material in surface runoff

All streams under natural conditions have sediment inputs at varying levels from terrestrial sources (background levels) depending upon soil, topography, vegetation and rainfall. Sediment enters water through various processes that include soil surface erosion, channel erosion and mass movements (landslides, debris flows), and these inputs can be either chronic or episodic. Studies have indicated that high sediment levels can affect fish by increasing mortality, reducing growth rates, causing physiological stress, impairing homing instincts, and reducing feeding rates.

Sedimentation of streams can have a significant detrimental effect on salmonid resources, particularly on gravel used for spawning (Iwamoto et al., 1978). Efforts to relate sediment concentration to fish response had mixed results (Everest et al., 1987). Some studies have found that increased sedimentation reduces egg and alevin survival. However, not all sediment increases have detrimental effects and there are cases where fish have maintained large and viable populations in streams with high chronic loads of fine sediment (Everest et al., 1987). Everest et al. (1987) observed that several watershed characteristics—geology, landform, fire frequency, and so on—as well as erosion and bedload processes affect the level of risk to salmonids from sedimentation. Whether the effects of increased sediment are adverse depends upon the nature and timing of sediment delivery, the type of material delivered, and the prior condition of the stream. Fish appear to react most negatively when fine sediment concentrations are high and persistent.

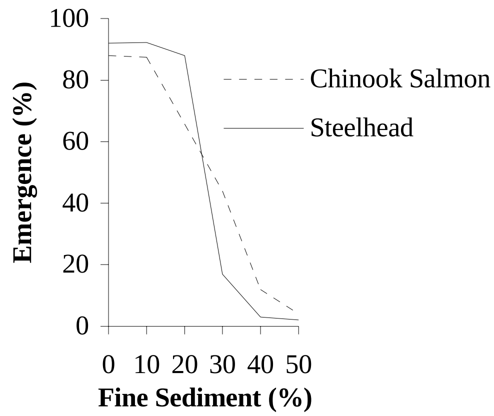
Increased sediments are often accompanied by channel widening and braiding, which in turn results in increased bank erosion and decreased channel complexity. Reduced channel complexity may be associated with reduced habitat complexity for both salmonids and food sources such as macroinvertebrate communities. Beschta et al. (1981) concluded that bedload processes are extremely important in shaping the character and quality of stream habitats.

Deposition of fine sediments (6.4 mm or less) can affect the survival of salmon eggs and alevins present in gravel, either through the reduction of intergravel dissolved oxygen or by entombment (Figure 2). Studies have shown that fry emergence is seriously compromised as fine sediments are introduced into spawning gravel (Tappel and Bjornn, 1993). When fine sediments cover spawning gravel (redds), anadromous sac-fry (larval fish) may emerge prematurely. As fine sediments fill the intergravel spaces of a redd, resulting in a lack of oxygen, sac-fry are often forced out of gravel before they have absorbed their yolk sacs (Tappel and Bjornn, 1993). Sac-fry that have been forced to prematurely emerge from the redd experience low survival rates.

Fine sediments can affect fish survival and production by:

- ❖ Filling rearing pools and spawning gravels with sediment;
- ❖ Decreasing or eliminating oxygen flow through gravel, which suffocates fish eggs and developing fry;
- ❖ Eliminating hiding and resting places for juvenile fish and aquatic insects;
- ❖ Suppressing macroinvertebrate food sources;
- ❖ Decreasing bed roughness which increases flow velocities so that aquatic insects and young fish cannot maintain positions;
- ❖ Clogging or abrading fish gills;
- ❖ Inhibiting feeding and growth;

Figure 2. Percentage Emergence of Sac Fry from Newly Fertilized Eggs in Gravel/Sand Mixtures. Fine sediment was granitic sand with particles less than 6.4 mm (Bjornn, 1974).



- ❖ Decreasing or delaying migration;
- ❖ Forcing avoidance of some waters by salmonids;
- ❖ Widening and de-watering stream channels resulting in the stream flow going subsurface

Riparian vegetation can influence the movement and storage of sediments within and near stream channels. Vegetation in a high water zone provides physical obstructions that can reduce water velocities. In turn, reduced water velocity can allow the deposition and storage of sediments suspended in the water column. Soil particles and debris deposited during high water events help build stream banks (Spence et al., 1996) and provide sites where new vegetation can become established.

Riparian vegetation and fallen trees and logs may help intercept and store sediments originating from upland sources. These materials can create physical barriers that restrict the movement of sediments, thereby intercepting and storing soils that might otherwise reach stream channels (Knutson and Naef, 1997, Spence et al., 1996). However, this function is primarily limited to sediment moved during small-scale flow events. Riparian vegetation has limited effectiveness in regulating sediments generated from large events such as mass slope failures or channelized erosion (Spence et al., 1996). These events can move large amounts of material and typically travel long distances, even in fully forested conditions. The interception of sediments from surface erosion (overland flow) is generally less important on many forested lands in western Oregon because most forest soils have a high infiltration capacity (Spence et al., 1996). Landslides and debris flows are a part of the natural disturbance regime and can also provide benefits by the delivery of large wood to the stream channel.

The optimum width of riparian vegetation necessary to intercept sediments from upslope sources is very difficult to define because of the great variety of mechanisms that can supply and deliver sediments (Spence et al., 1996) and because of the great variety of possible riparian vegetation (see Figure 1 on page 17). Given the variability in riparian conditions, Spence et al. (1996) concluded that, except on steep slopes, buffers designed to provide other riparian functions should generally be adequate to control sediments from upland sources.

Filtration of toxic substances

Major potential stream pollutants include nutrients such as nitrates and phosphates, and organic compounds such as insecticides, herbicides, and industrial chemicals. Properly functioning riparian corridors can detoxify limited amounts of chemicals and animal waste. The dominant mechanism by which nitrogenous wastes are degraded prior to entering streams is de-nitrification by soil bacteria. Remaining nitrogen may be utilized as a nutrient by riparian vegetation. Phosphates and heavy metals tend to be trapped and stored along with fine sediments in the humus layers. (Connell and Miller, 1984).

The fate of pesticides and other chemicals in riparian systems depends on their unique properties like water solubility and adsorption, which largely determine a compound's mobility through water and soils. Many organic and metallic pollutants readily attach themselves to soil particles, and are transported along with suspended sediments through waterways. Thus, a well-vegetated riparian system that prevents sediments from entering the stream can also prevent or retard the migration of other pollutants into the waterway. Where riparian vegetation interrupts the movement of pollutants, the entry of toxics into waterbodies may be further reduced by chemical degradation processes. Chemicals can also be taken up by plants, in which case they may be further degraded (Connell and Miller, 1984).

Riparian vegetation can also block air pollutants, such as aerially applied pesticides or dust, from entering water bodies.

Flood storage and mitigation

Riparian areas frequently contain numerous streamside channels, sloughs, and seasonal wetlands. These off-channel habitats often add structural complexity to the mainstem and provide very important winter rearing areas for salmonids. These areas may also function to store floodwaters during some high flow events, potentially resulting in reduced flow velocities and decreased hydrologic impacts on channel integrity.

Wildlife habitat

A large number of wildlife species in the Pacific Northwest use riparian habitats. In western Oregon and Washington, it is estimated that 359 species of wildlife utilize riparian or wetland habitat during some season, or portion of their life cycle (Oakley et al., 1985). In the Great Basin of southeast Oregon and the Blue Mountains, it is estimated that 288 and 285 terrestrial wildlife species, respectively, use riparian areas more than other habitats (Thomas et al., 1979a; Thomas et al., 1979b). In these arid regions, these estimates reflect that 79 percent and 75 percent, respectively, of the total known wildlife species that utilize riparian habitats for some portion of their life history.

Riparian areas provide greater habitat diversity, and often support higher species diversity, than most other habitat types. In healthy riparian ecosystems, structural complexity and habitat diversity results from diverse plant species, multiple canopy layers, a well-developed shrub layer, and abundant snags and down wood. The higher diversity and abundance of wildlife in these areas is also influenced by the abundance of food sources, the availability of water; and the presence of a moist and moderate microclimate.

III. A LANDSCAPE CONTEXT FOR A STATEWIDE RIPARIAN POLICY

The Executive Order states:

> *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.*

As part of the process of responding to the order, the Riparian Work Group evaluated the following riparian functions for each program:

- Shade
- Bank Stability/Erosion Control
- Large Wood Source
- Nutrient Source
- Filtering of Sediments
- Filtering of Toxins
- Flood Storage and Mitigation
- Wildlife Habitat

These functions are dynamic in both space and time and vary depending on where they are in the landscape. State agencies are faced with applying policy related to these functions in situations where these dynamics are commonplace while managing programs in ways that reflect the agency's mission.

Given that responsibilities and missions are not consistent between agencies, what can be done to increase consistency in riparian corridor management and provide clearer communication regarding riparian corridors? One helpful approach is to put the landscape into a generic framework where consistent terminology can be used to describe landscape elements. Topics such as vegetation, hydrology, soils, geology, climate, disturbances, development patterns, and policy frameworks can then be addressed using a common reference system. The terminology and approaches used in landscape ecology are useful here.

What is a landscape ecology?

Landscape ecology is the study of the structure, function and change in a landscape. A landscape is a diverse land area composed of a variety of interacting ecosystems that are repeated, with similar form, throughout the area. Landscapes vary in size, with the smallest only a few kilometers in diameter (Forman and Godron, 1986). These ecosystems can be characterized by topography, soils, climate, plant communities, geology, and resident disturbance regimes. For projects such as this one, the question is, what is the proper scale or range of scales needed to more comprehensively address riparian functions?

A landscape can also include different types of land use including forestry, agriculture, developed or urban areas. Each land use has a history that has largely resulted from the physical features of the land including topography, soils, climate and vegetation types. Areas used for forestry, agriculture and urban were originally chosen because their physical characteristics were compatible with the chosen land use.

The degree to which these "working landscapes" are altered from their original condition depends on the specific land use and how much it requires the site to be modified to produce its specific commodity. For example, managed timber stands to produce forest products are more similar in structure and function to native forests than land converted to agriculture or urban/suburban development. Each of these working landscapes is necessary to provide for human needs, but that does not preclude managing those functional elements that are present for their contribution to the landscape as a whole.

How does a landscape view differ from a site view?

A site is basically a small piece, or subset, of the landscape. The behavior of a particular site can be closely monitored and its changes under different conditions predicted with relative accuracy. Interactions between two sites are harder to understand, and the interaction of more than two sites is difficult to quantify or predict. Understanding and predicting the behavior of an entire landscape on the same scale as a site is nearly impossible.

Understanding landscapes allows an understanding of a different scale of questions than does a site perspective. A landscape view is useful for understanding the interactions of systems as a whole and of broad scale interactions of the parts of the landscape. Site management may make it possible to understand the effects of a timber harvest on a headwater stream, but it takes the broader view of a landscape to understand what the effects might be on a river system as a whole.

The River Continuum Concept

One concept that describes the changing functions and relationships between landscape elements in river systems from source to mouth is the river continuum (Vannote et al., 1980). The headwater reaches (low order streams) of a river system are smallest, and generally have the steepest gradient. These streams flow quickly in the relatively steep reaches, bottom substrates are large, floodplains narrow, and overhanging vegetation shades the narrow channels. Relative to the volume of water the amount of organic material that enters the stream is large, and aquatic biota are largely adapted to processing this material.

Farther downstream (mid-order streams) the gradient decreases and the stream widens, slowing the flow and opening the canopy to more sunlight, allowing the growth of greater amounts of periphyton. There is relatively less organic material entering the stream, and much of the material that is processed in these reaches has been carried from upstream.

As the stream nears its mouth (high order streams) the stream widens even more and the flow velocity drops. Slower flows are not as able to carry large material, and substrates are smaller here. Vegetation may line the riparian corridor bordering the stream or spread into the broad floodplain, but there is relatively little effective shade for the water column. Increased sunlight allows greater growth of aquatic plants, and materials carried from upstream are small in size, having been repeatedly processed by organisms upstream.

Understanding these relationships can help inform landscape management for the watershed as a whole. Spatially, the different reaches perform different functions in the landscape. For example, upper reaches contribute organic material to the system and have less floodplain interaction due to channel confinement. In contrast, the broad open reaches of higher order streams provide sunlight for photosynthesis, and allow floodwaters to spread out across the floodplain, recharging aquifers and depositing material from upstream. The relative importance of the various riparian functions differs from headwaters to mouth. Effective riparian management will reflect this variability by managing riparian corridors according to their place in the landscape.

Why do we need both landscape and site specific approaches?

Traditionally, management has focused on site-specific management; but with increasing use of finite resources, management decisions may require greater consideration of effects at a variety of scales. The activity of irrigating a field of corn connects to everyone and everything else that depends on water in that basin, including fish and wildlife. In this example, effective site specific management—appropriate irrigation timing and amounts for a corn crop—does not, by itself, consider effects at a broad enough scale to protect the water quantity needs for other users or for salmon. One of the benefits of landscape approaches is their larger scale overview of how elements interact.

The Independent Multidisciplinary Science Team has developed a more detailed description of the importance of a landscape approach in its report entitled *Recovery of Wild Salmonids in Western Oregon Forests: Oregon Forest Practices Act Rules and the Measures in the Oregon Plan for Salmon and Watersheds, Technical Report 1999-1*. This report can be accessed on the World Wide Web at http://www.fsl.orst.edu/imst/tramm.htm.

IV. OVERVIEW OF STATE AGENCY RIPARIAN MANAGEMENT PROGRAMS

Oregon agencies implement a range of programs that can influence how riparian areas and aquatic habitats are managed. These programs, which are described in full in Appendix A, are summarized below.

It has become clear in evaluating agency programs that the differences among them arise from the differences in their fundamental program purposes. In some cases, achieving state water quality standards and maintaining productive aquatic habitats are identified as specific purposes of the program. But for other programs, objectives for these resource conditions are not specifically stated as fundamental program purposes. Historically, these programs developed to address different problems unrelated to water quality or aquatic habitat. The differences between existing programs are discussed briefly following the program summaries.

PROGRAM SUMMARIES

The Oregon Forest Practices Act

The purpose of Oregon's forest practice water protection rules is to protect, maintain and, where appropriate, improve the functions and values of streams, lakes, wetlands, and riparian management areas. These functions and values include water quality, hydrologic functions, the growing and harvesting of trees, and fish and wildlife resources. 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. The protection goal for water quality 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. The protection goal for fish is to establish and retain vegetation consistent with the vegetation retention objectives described in rules for streams, significant wetlands, and lakes that will maintain water quality and provide aquatic habitat components and functions such as shade, large woody debris, and nutrients.

Specific resources that receive protection under the Oregon Forest Practices Act (FPA) include environmentally sensitive sites, riparian areas and stream corridors, air, soil, and water quality, and fish and wildlife habitat. The FPA applies to all commercial forest operations on non-federal forestlands in Oregon. “Forestland” means land used for the growing and harvesting of forest tree species, regardless of how the land is zoned, taxed or how any state statutes or local ordinances, rules or regulations are applied. The FPA establishes standards for forest practices, including timber harvesting, road building and maintenance, slash disposal, reforestation and use of pesticides and fertilizer. The FPA does not prevent the conversion of forestland to another use. Where a landowner is actively converting forestland to a land use not compatible with forestry, the land is considered forestland until the trees are cleared. Landowners invoking a land use change could be exempt from applying some forest practice regulations. Such exemptions require prior approval by ODF.

The FPA goal for managing riparian forests along fish-use (Type F) 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. Non-fish bearing (Type N) and domestic use (Type D) streams have reduced buffer widths and reduced basal area retention requirements as compared to similar sized Type F streams. The overall goals of the riparian vegetation retention rules along Type N and Type D streams are to grow and retain vegetation sufficient to support the functions and processes that are important to downstream waters that have fish; to maintain the quality of domestic water; and to supplement wildlife habitat across the landscape.

The FPA's water protection rules set standards for vegetation retention within riparian management areas (RMAs). RMAs are areas along each side of specified waters of the state within which vegetation retention and special management practices are required to protect water quality, hydrologic functions, and fish and wildlife habitat. The rules require that trees and understory vegetation be retained within RMAs, and that written plans describe how resource protection will be accomplished during the operation. Standards for tree retention vary by stream size (large, medium, or small) and beneficial uses of water. For example, a large stream (greater than 10 cfs average annual flow) used by fish requires the following standards:

- Riparian management area 100 feet wide on each side of the stream.
- Retention of all understory vegetation within 10 feet of the high water level.
- Retention of all trees within 20 feet of the high water level.
- Retention of all trees leaning over the channel.
- Retention of additional trees as needed to meet rule required targets (minimum of 50 to maximum 250 per 1000 ft).
- Retention of all downed wood and snags that are not safety or fire hazards within the RMA.

A recent review and recommendations of the FPA and non-regulatory mechanisms to determine if changes in forest practices are necessary to meet state water quality standards, and to protect and restore salmonids, was completed by the Forest Practices Advisiory Committee (FPAC). The 13-member committee included representatives for family forest landowners, local governments, labor unions, the environmental community, the forest products industry and fishing interests. Guided by the Oregon Plan, FPAC examined current forest practices, studied scientific reports, and outlined potential voluntary, incentive and regulatory measures. The group examined issues of riparian function, landscape perspectives, landslides, and fish passage. Among the changes proposed are those which substantially increase the number of trees left along many forest streams, protect fish habitat and water quality with more miles of stream buffers, encourage using incentives to assist forestland owners and direct the ODF to hire riparian specialists to assist landowners in designing harvest plans that protect streams. The committee's proposed recommendations include both regulatory and non-regulatory recommendations, which will increase shade along forest streams, provide more large wood for fish habitat, remove barriers to fish passage, offer channel migration zone protection, reduce sedimentation caused by wet-weather log hauling, and evaluate and upgrade existing older forest roads. The final report was presented to the Board of Forestry at its September 6, 2000 meeting.

DEQ has generally determined that ODF's water protection rules provide the minimum level necessary to meet water quality standards for the State of Oregon. The development of tree and vegetation retention FPA rules is considered by DEQ to be a key baseline process for establishing a model for healthy, sustainable riparian conditions for the state of Oregon. By statute, forest operators conducting operations in accordance with ODF rules are determined to be in compliance with Oregon’s water quality standards.

The FPA water protection rules are applicable within urban settings where a local jurisdiction has not adopted its own ordinances regulating forest operations within urban growth boundaries (UGBs). A local jurisdiction may choose to adopt an ordinance applicable to all forestlands, in which case ODF would not administer the FPA within that UGB. Alternatively, a jurisdiction may choose to address the requirements of Statewide Planning Goal 5 by adopting the “safe harbor” provisions or other ordinances for protecting riparian vegetation along stream corridors and applying those ordinances or provisions to forest practices. In this case, the jurisdiction would administer its regulations within its riparian corridors, and ODF would administer the FPA for those forestlands within the UGB not included within the safe harbor riparian buffer.

Compliance with the FPA water protection rules remains very high and many forest landowners voluntarily exceed the state’s requirements.

The Agriculture Water Quality Management Program

Background

The Oregon Department of Agriculture's (ODA's) Agricultural Water Quality Management (AgWQM) Areas generally coincide with the Department of Environmental Quality's (DEQ's) Total Maximum Daily Load (TMDL) subbasins. Within these subbasins, allocations for agricultural loads will be integrated with the allocations for forest and urban loads. Allocations are based on the water quality parameters for which the water body was included on the 303(d) list (e.g., stream temperature, sediment, bacteria). AgWQM Area Plans are developed to address water quality concerns that result from agricultural activities in each AgWQM Area. Finally, AgWQM Area Rules are developed to provide specific guidelines on how water quality concerns will be addressed.

Key Features

To understand how ODA's AgWQM program might influence riparian conditions and more specifically the condition of riparian vegetation, four key features must be understood about this program. First, AgWQM planning is based on outcomes rather than practices. Desired landscape conditions are specified to help landowners create a set of land management objectives that will result in better water quality conditions. Second, AgWQM planning is led by an ODA Regional Water Quality Planner, a Local Management Agency (LMA) and a Local Advisory Committee (LAC). The LMA is usually the local Soil and Water Conservation District. The LAC is a cross section of community stakeholders that help to develop draft AgWQM Area Plan and Rules. The AgWQM Area Plan and Rules outline conditions that may create water quality problems in the AgWQM Area, suggest how these conditions might be alleviated, and specify timelines for making needed changes. AgWQM Area Plans and Rules focus on erosion and surface water management, irrigation water management, Confined Animal Feeding Operations (CAFOs), near-stream management, nutrient management, and pesticide management—which may create water quality problems. After adoption of the AgWQM Area Rules, agricultural landowners in the AgWQM Area are subject to compliance with these rules. Third, AgWQM Area Plans are reviewed and adjusted approximately every two years, allowing AgWQM Area Plans to adapt to new water quality information, results of new research, and conditions. Education and information about new practices and technologies are critical adaptive elements that provide landowners with more viable options to address water quality concerns. Adaptivity also provides time for landscape conditions to change in response to improved management strategies. Finally, overall compliance monitoring and enforcement components outline how compliance with AgWQM Area Rules are assessed and enforced.

AgWQM Area Plan and Rules: Review and Codification

After the LAC completes a draft AgWQM Area Plan, it is given informal internal and external review by specialists to ensure it meets the water quality requirements for the area. Administrative Rules for the AgWQM Area are developed concurrently with the final draft plan. The AgWQM Area Plan and the Administrative Rules are then released for public comment. Based on the comments, appropriate changes are made to both documents and are then submitted to the Oregon Board of Agriculture for review and recommendation for adoption by the Director of the Department of Agriculture.

AgWQM Planning Progress

As of mid-August 2000, AgWQM Area Plans and Rules have been completed and adopted for the Tualatin, Bear Creek, Upper Grande Ronde, Umatilla, North Coast, Lower Deschutes, and

Yamhill AgWQM Areas. AgWQM Area Plans and Rules are currently in various stages of development for many other areas. All plans include provisions for the condition of near stream areas or riparian areas. These specifications (outcomes) describe the physical features needed in the near stream area to adequately address water quality concerns. By statute (ORS 568.000 through 568.993) , the department is authorized to develop AgWQM Plans and Rules for the prevention and control of water pollution. The statute does not explicitly authorize the department to require direct establishment of aquatic habitat.

AgWQM Area Plan Adaptivity

Each AgWQM Area Plan and Rule set is reviewed on a two year cycle. The review is to determine whether the plan adequately addresses water quality concerns. After review, adjustments are made and included in revised documents and implementation schedules.

AgWQM Program Compliance and Enforcement

Compliance monitoring by ODA provides the ability to gauge success in achieving improved landscape conditions . A portion of ODA's developing compliance monitoring program is dedicated to assessment of riparian conditions. This compliance monitoring approach has been field-tested in the Tualatin AgWQM Area.

ODA has a handbook that outlines the AgWQM Program enforcement and compliance process that describes how and under what conditions compliance with AgWQM Area Rules will be enforced.

AgWQM Program and the Protection of Riparian Vegetation: A Summary

As mentioned above, The AgWQM Program addresses riparian conditions through the AgWQM Area Planning process. Since each AgWQM Area has distinctive environmental conditions, plans are expected to have correspondingly unique sets of riparian objectives. Riparian conditions in each AgWQM Planning Area are addressed through a Local Advisory Committee process initiated by the ODA Regional Water Quality Planner. Resultant AgWQM Area Plans and associated Rules are reviewed at several levels to ensure that water quality concerns are adequately addressed. Structural features of riparian systems, as specified in each set of AgWQM Area Rules, are monitored through time as indicators of water quality changes. These structural features may include plant cover, plant community development, streambank stability, or stream channel characteristics. Certain functional properties might be inferred from the condition of these structural features.

The AgWQM Program and how it addresses criteria outlined in EO 99-01

The table on the following page summarizes how the existing AgWQM Program addresses water quality and aquatic habitat as outlined in Executive Order 99-01, which states "*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.*"

Table 1. Protection and restoration of riparian vegetation for the purposes of achieving water quality standards and protecting aquatic habitat.

***F**UNCTION*	Yes			Perhaps			No		
	R	**I**	**V**	**R**	**I**	**V**	**R**	**I**	**V**
Shade	*	?	?		*	*			
Bank Stability	*	?	?		*	*			
Erosion Control	*	?	?		*	*			
Large Wood		?	?		*	*	*		
Sediment Filter	*	?	?		*	*			
Nutrient Filter	*	?	?		*	*			
Toxin Filter		?	?	*	*	*			
Flood Storage		?	?		*	*	*		
Wildlife Habitat		?	?		*	*	*		

Program Modes: R – Regulatory; I – Incentive; V - Voluntary

The Statewide Comprehensive Planning Program

Oregon's Statewide Planning Program is the basis in state law for local governments to develop local comprehensive land use and growth management plans.

In the early- to mid-1970s, Oregon's Statewide Planning Program was developed primarily to turn the tide of urban sprawl back into urban and urbanizable areas, primarily in order to protect agriculture and forest lands for commercial agricultural and forestry uses. Unlike Oregon's Forest Practices and Agricultural Water Quality Management Programs, the fundamental purpose of Oregon's planning program is *not* to protect and restore water quality. The fundamental purpose of Oregon's land use program is to *establish land use patterns*, rather than to mitigate the effect of *land use activities* on water quality or aquatic habitat conditions. The fundamental purpose of a land use plan is to allocate lands for appropriate land uses.

Oregon's statewide planning program is a *comprehensive* planning program. State law requires that all local governments develop a land use plan to meet all applicable statewide planning goals, of which there are nineteen. The planning goals themselves do not regulate individual land development decisions. Instead, the goals are implemented through local comprehensive plans, which in turn regulate individual land use and development decisions.

The process of developing a comprehensive plan invariably involves tradeoffs and achieving a balance among several goals and objectives, some of which may clearly conflict with others. Among other things, Oregon's planning goals address protection of farm and forest lands; urbanization; transportation; natural hazards; coastal resources; recreation; the economy; and air, land, and water quality. Over the 25-year history of the program, and for a variety of reasons, certain of the goals have been emphasized over others. In particular, the program has emphasized the two complementary objectives of conserving resource land for resource uses, and providing for efficient urban development in urban areas. One effect of these priorities is that water quality or aquatic habitat protection is not now a priority element in most local plans.

Two of the statewide planning goals require some protection of riparian resources. Goal 5 requires that local plans protect "significant" riparian resources adjacent to fish-bearing streams. And Goal 17, which only applies in coastal areas, requires protection of riparian vegetation adjacent to coastal shorelands. Goal 5, which is the primary mechanism in the land use program for protecting riparian resources, contains a "safe harbor" option which outlines a basic riparian protection program that complies with the goal. The safe harbor uses streamflow and fish presence to establish riparian corridor significance; fish-bearing streams with less than 1000 cubic feet per second (cfs) average annual flow may be protected by a 50-foot structural setback, and those over 1000 cfs by a 75-foot setback. A local program based on the safe harbor must also control vegetation removal within this buffer.

The purpose of Goal 5—which was revised and significantly improved in 1996—is to protect several natural resources, including riparian corridors and wetlands. In other words, Goal 5's primary purpose is not to protect water quality. In fact, within the framework of the statewide planning goals, Goal 6 is intended to be the primary vehicle to address the effects of land use decisions on water quality. However, in general, local plan elements to implement Goal 6 are not highly refined; it is probably safe to say that in general, they reflect the state of knowledge about water quality and land use that prevailed through the 1970s and 1980s.

While local land use plans designate which lands are to be used for farming and which are to be used for forestry, local plans do not apply to commercial farm or forestry *activities*. Other programs have been developed to address the affect of farm and forestry activities on natural resources. *The most pronounced effect of the local plan is on new urban development.* Local plans designate where and—to some degree, how—new development is to take place. Ultimately, the local plan is the vehicle for establishing land use *patterns.* Local plans are implemented predominantly through regulations. They typically have little effect on existing land use activities in developed areas. In most urbanized riparian areas, programs are needed to *restore* riparian functions, and restoration programs are seldom implemented through regulations.

The Removal-Fill Law

The Division of State Lands (DSL) administers the Removal-Fill Law affecting development in rivers, lakes, streams, estuaries and wetlands. Due to concerns over unregulated gravel mining in the rivers, the legislature passed a bill in 1967 requiring a permit from the Division prior to removal of more than 50 cubic yards of inorganic material from the bed or banks of waters of the state. In 1970 the voters of the state created the State Scenic Waterway Law, which required a permit for any removal or fill activity within those specially designated waters. In 1970 voters passed the Scenic Waterway Act, which prohibited removal and/or fill within six designated waterways; later, the law was changed to require permits for *any* fill or removal. In 1971 the Removal Law was amended to include fill of more than 50 cubic yards of material in waters of the state required a permit. In 1993 legislative action established requirements for permits for *any* amount of fill and/or removal in waters of the state within designated Essential Salmonid Habitat areas. The Removal-Fill Law is the primary method DSL has to protect and restore riparian vegetation for the purposes of achieving statewide water quality standards and protecting and restoring aquatic habitat for salmonids.

The purpose of the Removal-Fill Law is to provide a mechanism that allows for necessary work while still providing protection, conservation, and best use of the resources of the waters of the state through the permit issuance. When a permit is issued for work which may potentially modify the bed and/or banks of waters of the state, the permit is conditioned to minimize adverse impacts to the natural resources and/or replace them. A standard condition stipulates that riparian vegetation removal be limited to the minimum amount needed to complete the project; replacement, re-establishment and replanting riparian vegetation is an essential permit condition. Mitigation may include planting riparian vegetation at another location in or near the project site and associated impact. Photo monitoring of vegetation is often included as a condition of Removal-Fill mitigation projects. DSL does not have regulatory authority or input on management of riparian vegetation unless a Removal-Fill permit is involved. However, DEQ does periodically review 'general' Removal-Fill permit conditions for compliance with water quality standards, and a DEQ staff person is assigned to review and 'certify for water quality compliance' individual projects applied under the Removal-Fill Law.

Management of State-Owned Land in Eastern Oregon for Agricultural and Grazing Leases

The Land Board manages its land under Article VIII Section 5 (2) of the Oregon Constitution which states: "the board shall manage lands under its jurisdiction with the object of obtaining the greatest benefit for the people of this state, consistent with the conservation of this resource under sound techniques of land management." To meet its constitutional and statutory objectives, in 1994 the Board adopted an Asset Management Plan. The Asset Management Plan does state, *"rangelands will be managed to prevent loss of rangeland health,… practices that maintain, achieve or restore healthy properly functioning ecosystems, etc."* There are a few significant riparian areas on some of the state-owned grazing lease lands, the full extent of the Division's areas are in the beginning stages of being inventoried. Potential rangeland leasees must apply for a lease with DSL. If they receive authorization from DSL to lease the land for grazing purposes, they must then graze the land in accordance with the written Range Management Plan (RMP) provided by the Division. Each Range Management Plan (RMP) stipulate the special management practices for the lesee including: stocking, seasonal use, duration of grazing, and allowed improvements. DSL informally monitors use and range condition and is making plans for the adoption of rangeland health standards and formalizing monitoring protocols.

Administration of State-Owned Submerged and Submersible Lands

The Division manages the use and development of 1,000,000 acres of tidally influenced waterways, rivers and territorial sea. This includes tidelands and the beds and banks of waterways, often encompassing the riparian vegetation found within the public ownership (commonly below ordinary high water). The Division does not permit the removal of riparian vegetation within its ownership other than in connection with the development and maintenance of uses (marinas, log rafts, pipelines, etc.) authorized by lease, easement or other authorization.

The Department of Environmental Quality's Water Quality Programs

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 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 ODF; Agricultural Water Quality Management Plans for agricultural land administered by the 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.

Cooperative efforts with ODF

ODF and DEQ are continually monitoring the effectiveness of BMPs designed to meet state water quality standards. With advancing watershed assessment tools and methodologies, BMPs will be modified, if necessary, to achieve their water quality and salmon habitat protection goals.

By statute, forest operators conducting operations in accordance with ODF's BMPs will not be considered in violation of any of Oregon's water quality standards. Forest Practices Act (FPA) water protection rules are applicable to all lands on which commercial forest operations occur or may occur.

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.

Grants & Assistance

DEQ offers assistance to watershed councils and other interested parties for monitoring, developing watershed restoration plans, and other voluntary programs and projects that may result in water quality improvement. DEQ is involved with two major funding sources. The Oregon Watershed Enhancement Board (OWEB) program aids in the development of water protection goals and project reviews. DEQ also oversees the distribution of federal Clean Water Act Section 319 grant funds. The main goal of the Section 319 program is to fund nonpoint source pollution control projects that will demonstrate good pollution management practices. Past projects have included the evaluation of measures to mitigate erosion from forest roads, and the determination of the effects of riparian shade on stream temperatures. Finally, DEQ staff to the Healthy Streams Partnership provide assistance to watershed councils in developing and submitting proposals for both Section 319 and OWEB funding sources.

The Oregon Department of Fish and Wildlife

The Oregon Department of Fish and Wildlife (ODFW) is the state agency responsible for protection and enhancement Oregon's fish and wildlife and their habitats, including riparian areas. The protection and enhancement of riparian functions is primarily achieved through agency policies and voluntary incentive programs. ODFW has very limited regulatory authority to directly protect riparian and aquatic habitats.

Agency Policies

ODFW contributes to the management and protection of riparian functions through the agency's policies, including the State Agency Coordination Program (OAR 635-405-0000 through 635-405-0045) and the Fish and Wildlife Habitat Mitigation Policy (OAR 635-415-0000 through 635-415-0025).

The State Agency Coordination Program assures that ODFW programs and actions determined to affect land use comply with the statewide planning goals and are compatible with acknowledged city and county comprehensive plans and land use regulations. To this end, ODFW employees coordinate with affected state and federal agencies and special districts to discuss wildlife habitat inventory and habitat protection and management standards. The information and technical assistance provided may pertain to riparian habitat.

The Fish and Wildlife Habitat Mitigation Policy establishes goals and standards for mitigating impacts to fish and wildlife habitat caused by land and water development actions. ODFW must apply this policy when implementing its own actions. ODFW follows this policy as guidance when making recommendations to regulatory agencies regarding mitigation for impacts to fish and wildlife habitat. The agency recently updated this policy to reflect current policies and resource priorities. Although riparian areas are not addressed individually in this policy, ODFW follows this policy in recommending mitigation for impacts to these areas.

Voluntary Incentive Programs

ODFW promotes the protection and enhancement of riparian functions through the various incentive programs it administers. These programs include the Wildlife Habitat Conservation and Management Program (ORS 215.800 through 215.808), the Riparian Tax Incentive Program (ORS 308.793 through 308.803), the Restoration and Enhancement Program (ORS 496.270), and the Access and Habitat Program (ORS 496.228 through 496.242).

The Wildlife Habitat Conservation and Management Program offers qualifying private landowners a tax incentive for developing and implementing a wildlife habitat conservation and management plan. The objective of a management plan is to preserve, enhance or improve the structure or function of habitat for native wildlife species. Conservation and management practices appropriate to achieve the objectives of this program include planting new riparian vegetation or protecting existing riparian vegetation through fencing or other means.

The Riparian Tax Incentive Program offers complete property tax exemption for qualifying riparian lands up to 100 feet from a stream if the landowner develops a riparian management plan and improves or maintains these lands. The purpose of this program is to protect or restore healthy riparian habitat on private lands adjacent to perennial and intermittent streams. The width of the riparian zone proposed for tax exemption must be sufficient to provide long-term stream bank stability, erosion control, water quality, and fish and wildlife habitat protection or improvement.

The Restoration and Enhancement Program (R&E) was created to restore Oregon's fisheries. Any tax-exempt, non-profit organization may apply for a grant from this program. Enhancement projects that have received funding from the R&E program include restoring natural structure to streams or lakes, fencing riparian zones to control livestock and planting vegetation in riparian areas.

The Access and Habitat Program provides grants to improve fish and wildlife habitat and/or public hunting access on private lands. This program has provided grants for projects to protect or restore riparian areas.

Regulatory Authority

The agency's regulatory authority to manage and protect riparian functions is limited to In-Water Blasting Permit authority (OAR 635-425-0000 through 635-425-0050) and Oregon's Endangered Species Act (ORS 496.171 through 496.192 and OAR 635-100-0100 through 635-100-0130).

ODFW only issues In-Water Blasting Permits if adequate conditions can be applied to prevent injury of fish and wildlife and their habitat, including riparian areas and aquatic habitat. The agency requires permit applications to include information about the fish and wildlife habitat within the area that would be affected by the proposed blasting and the predicted effects of the proposed blasting on these habitats. This information must include predicted effects of the proposed blasting on beds and banks of the waters of the state, the adjacent areas of riparian vegetation and wetlands, and the potential for de-watering waters of the state as a result of substrate disturbance. If ODFW grants an in-water blasting permit, the permit recipient must minimize disturbance to streambanks and riparian vegetation. ODFW, in consultation with other state or local agencies with regulatory authority over reclamation, will require the applicant to re-contour and revegetate disturbed soils.

The State Endangered Species Act requires ODFW to develop survival guidelines for species listed as state threatened or endangered species. These guidelines are applicable to activities on state-owned or managed lands and could include aspects for the protection of riparian and aquatic habitats. For example, the survival guidelines for lower Columbia River coho salmon include prohibitions on actions that would have negative impacts on riparian areas along streams used for spawning or juvenile rearing. For species listed as endangered, state land owning or managing agencies may be required to develop an endangered species management plan. These plans could include elements of riparian area protection. Once a management plan is approved for a state endangered species, the survival guidelines no longer apply.

DEFINITIONS OF "RIPARIAN"

Today's programs for managing riparian areas were not originally developed for that purpose. They have all evolved from their original purpose to have some role in influencing land use and resource management activities in the riparian corridor. As part of that evolution, each program has utilized different definitions of the term "riparian." While these definitions are not in conflict with each other, there may be some value in developing a single definition of the term "riparian area" for the purposes of riparian area management.

Webster's *Ninth New Collegiate Dictionary* defines "riparian" as *"relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or tidewater."*

Listed below are state agency definitions of "riparian" and, in some cases, related terms.

The "Definitions" in the Statewide Planning Goals administered by the **Department of Land Conservation and Development** defines "riparian" as "*Of, pertaining to, or situated on the edge of the bank of a river or other body of water*." The definitions in the goals were developed in 1974. The Goal 5 rule (OAR 660-23-0000), adopted in 1996, contains the following additional definitions related to riparian area management:

> *"Fish habitat" means those areas upon which fish depend in order to meet their requirements for spawning, rearing, food supply, and migration.*
>
> *"Riparian area" is the area adjacent to a river, lake, or stream, consisting of the area of transition from an aquatic ecosystem to a terrestrial ecosystem.*
>
> *"Riparian corridor" is a Goal 5 resource that includes the water areas, fish habitat, adjacent riparian areas, and wetlands within the riparian area boundary.*
>
> *"Riparian corridor boundary" is an imaginary line that is a certain distance upland from the top bank… ."*
>
> *"Stream" is a channel such as a river or creek that carries flowing surface water, including perennial streams and intermittent streams with defined channels, and excluding man-made irrigation and drainage channels.*

The **Department of Forestry** under OAR 629-600-100(50) defines "riparian area" as *"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."*

The **Department of Fish and Wildlife's** definitions are contained in administrative rules for the Riparian Lands Tax Incentive Program. These definitions and rule references were recently updated by the Oregon Fish and Wildlife Commission in July, 2000.

> *'Riparian' means pertaining to or situated on the edge of the bank of a river or stream.* (OAR 635-430-0310 (6))
>
> *'Riparian Land' means land situated along the bank of a stream characterized by vegetation and microclimate influenced by perennial and/or intermittent water normally associated with high water tables and/or hydric soils. This area must be sufficient to support conservation or management measures identified in the riparian management plan and agreement.* (OAR 635-430-0310 (6a))

> *'Riparian Vegetation' means the aquatic and non-aquatic vegetation adjacent to streams that is dependent upon or tolerant of the presence of water near the ground surface for at least part of the year.* (OAR 635-430-0310 (6b))

ODFW's definitions apply to streams only, since only streams are eligible for the tax incentive program. Technically, a riparian area definition should also include other waters, such as lakes, ponds, and wetlands, in order to be scientifically accurate.

The **Department of Environmental Quality** (DEQ) defines "riparian area" as "*a zone of transition from an aquatic to a terrestrial system, dependent upon surface or subsurface water, that reveals through the zones existing or potential soil-vegetation complex the influence of such surface or sub-surface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg, slough, or ephemeral, intermittent or perennial stream."* OAR 340-048-0010 (18).

The **Division of State Lands** defines the term "riparian area" as *"a zone of transition from an aquatic to a terrestrial system, dependent upon surface or subsurface water, that reveals through the zones existing or potential soil-vegetation complex the influence of such surface or sub-surface water. A riparian area may be located adjacent to a lake, reservoir, estuary, pothole, spring, bog, wet meadow, muskeg, slough, or ephemeral, intermittent or perennial stream."* OAR 141-110-020(34). DSL's definition is the same as DEQ's.

The **Department of Agriculture** does not define "riparian area" in administrative rule. However, under OAR 603-095-0010(36) the term "riparian vegetation" is defined as *"plant communities consisting of plants dependent upon or tolerant of the presence of water near the ground surface for at least part of the year."* Under OAR 603-095-0010(46) the term "streambank" is defined as *"the boundary of protected waters and wetlands, or the land abutting a channel at an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape; commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For perennial stream or rivers, the streambank shall be at the ordinary high-water mark."*

Clearly, there is a common theme throughout all the agencies' definitions: the riparian area is the land area that is adjacent to surface waters; or the riparian area is the area of land in transition from submerged aquatic land to permanently dry upland.

PROGRAM DIFFERENCES

Development of a statewide riparian management strategy could involve at least three programs administered by state agencies and described in the appendices: the Forest Practices Act, the Agricultural Water Quality Management Program, and the Statewide Comprehensive Planning Program. These three programs have several characteristics which distinguish them from the other programs, *in particular as they relate to riparian corridors and aquatic habitat*. These fundamental differences—and the reasons for them—need to be fully appreciated in developing a statewide riparian management policy. They are summarized in Table 1.

Probably the most important difference between the three programs is that two of them—the FPA and the Agricultural Water Quality Management Program (AgWQMP)—have been developed in large part specifically to protect water quality. In contrast, the statewide planning program was developed specifically to prevent the inappropriate conversion of land to urban uses. The land use program was not developed specifically to protect water quality. None of the three programs was originally developed to protect aquatic habitat, although the FPA has adapted to address aquatic habitat, and Statewide Planning Goal 5 specifically relates the protection of riparian corridors to fish habitat.

Even though the programs were developed for different purposes, they all do address riparian areas in one way or another. But the riparian components of these programs have different purposes, and they differ in the way they establish riparian management categories. For example, the purpose of the riparian component of the Forest Practices Act is to maintain the characteristics of a mature forest to contribute to meeting state water quality standards, and to create productive aquatic habitats over time.

The purpose of the riparian component of the Statewide Planning Program is, in contrast, to protect “significant” riparian resources. The purpose of the riparian component of the AgWQMP is to protect beneficial uses of water by preventing and controlling pollution (including thermal pollution) and to provide for streambank integrity.

The FPA uses streamflow, fish presence, and domestic water use to arrive at different riparian management prescriptions. The land use program uses streamflow and fish presence. The AgWQMP uses the beneficial uses of the stream and the pollutants for which the stream is listed on the state’s Section 303(d) list.

In short, while there is some overlap in the methods and approaches to riparian management among the three programs, they are marked more by differences than they are by program similarities. Again, these differences developed as each of the programs grew and evolved in a public process to address different problems.

The recent (since 1997) addition to Oregon’s 303(d) list of over 950 streams for persistent nonpoint source water quality problems probably represents the first time there has been a need to evaluate the way different programs affect water quality and riparian resources.

Table 1. Distinguishing Characteristics of Oregon's Programs for Managing Riparian Resources

Program	**Forest Practices Program** **Department of Forestry**	**Agricultural Water Quality Management Program** **Department of Agriculture**	**Statewide Planning Program** **Department of Land Conservation and Development**
Overall Program Purpose	Ensure the continuous growing and harvesting of forest trees, consistent with the sound management of soil, air, water, fish, and wildlife resources and to ensure the continuous benefits of those resources	Protect water quality by preventing and controlling water pollution from agricultural activities and soil erosion	Growth management. Conserve farm and forest land and foster orderly, efficient, and compact urban development
Riparian Program Purpose	Protect water quality and fish and wildlife habitat; maintain the characteristics of a mature forest	Protect water quality and beneficial uses; provide for streambank integrity	Protect "significant" riparian resources in compliance with Goal 5
Regulated Community	Persons conducting commercial forest operations	All agricultural operations and rural landowners	Local governments
Basis for Riparian Categories	Streamflow (small (<2 cfs), medium (2-10 cfs), and large streams (>10 cfs)), fish presence, and domestic use	Water quality limitations and beneficial uses	Streamflow (less than 1000 cfs and greater than 1000 cfs average annual flow) and fish presence

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