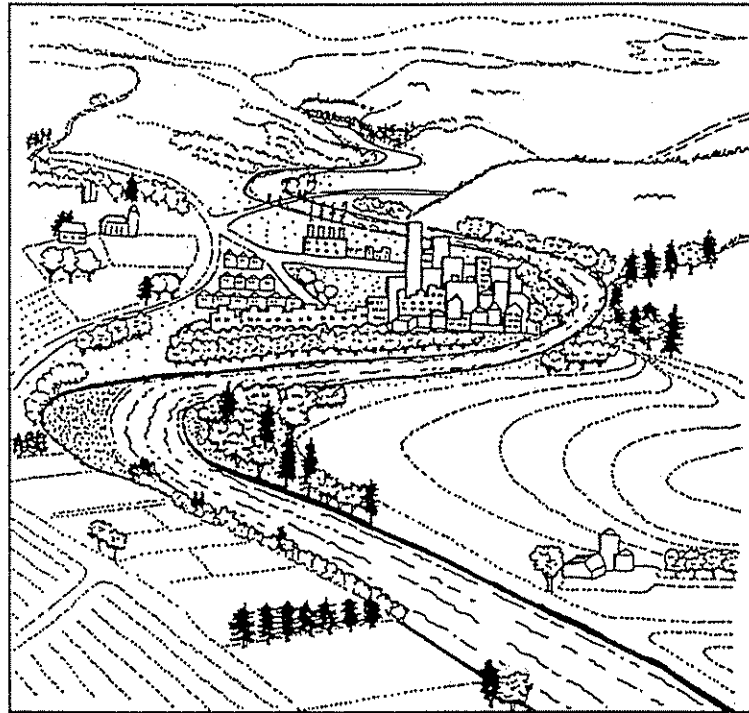


# Urban Riparian Inventory & Assessment Guide

A Tool for Oregon Land Use Planning



Oregon Division of State Lands  
1998



# Oregon

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June, 1998

## MEMORANDUM

State Land Board

John A. Kitzhaber  
Governor

Phil Keisling  
Secretary of State

Jim Hill  
State Treasurer

To: Watershed Councils, Planners, Consultants, other Interested Parties

From: DSL Wetlands Program

RE: Riparian Planning Tools

The Division of State Lands (DSL) has for many years administered a wetland planning program in coordination with Goal 5 of the statewide land use planning program. To this end, DSL has developed standards for preparing inventories of wetland resources within urban growth boundaries, and also a wetland assessment method that can be used to evaluate wetland functions and conditions. As more attention has been focused recently on improving stream health, it became apparent that similar tools are needed to identify and evaluate riparian resources in urbanizing areas.

The enclosed **Urban Riparian Inventory and Assessment Guide** is modeled after wetland planning tools developed by DSL and implemented in over 45 Oregon cities to date. The Riparian Guide can be used alone or in conjunction with Local wetland Inventory and Freshwater Wetland Assessment Methods to provide a solid foundation for city ordinances to protect these resources, and to help identify priorities for restoration. The Goal 5 rules now require cities to adopt programs to protect wetlands, riparian corridors, and several other types of natural resources. There are standards adopted in rule that require specific methods be used to inventory wetland resources, but no specific method is required for riparian zones. The enclosed Riparian Guide is a recommended, but not required, method.

DSL contracted for the development of the Urban Riparian Inventory and Assessment Guide using funds provided by EPA Region 10. The Riparian Guide was prepared with limited review and field testing. We welcome any comments or suggestions to improve the Guide for a future reprint or revision. Please direct your suggestions to Dana Field at 503-378-3805 ext. 238 or by email, [dana.field@dsl.state.or.us](mailto:dana.field@dsl.state.or.us).

Also enclosed is a **model ordinance** for riparian corridor protection. It can be used as is or as a starting point for more specific ordinance language to direct new development in urbanizing areas to be more fish-friendly. We encourage local governments and interested citizens to use both of these tools to help integrate the goals of the Oregon Plan with city land use planning.

# Urban Riparian Inventory & Assessment Guide

## A Tool for Oregon Land Use Planning

March, 1998

Prepared for:

Oregon Division of State Lands

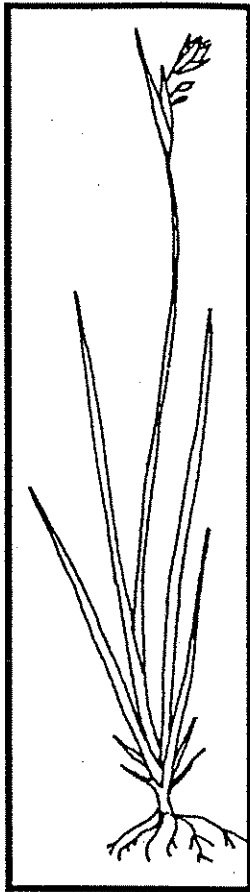


Prepared by: Pacific Habitat Services, Inc.

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Funding for this Riparian Guide was provided by the U.S. Environmental Protection Agency and administered by the Oregon Division of State Lands. Suggestions and comments should be directed to Dana Field at the Oregon Division of State Lands, 775 Summer Street NE, Salem, Oregon 97310, (503) 378-3805, Ext. 238.

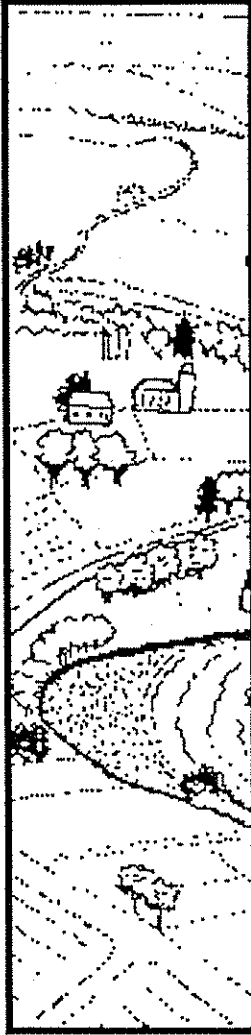




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# Introduction

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The Urban Riparian Inventory and Assessment Guide (Riparian Guide) is a rapid inventory and assessment method for defining the location and the quality of riparian areas. It is intended as a tool to provide consistent riparian inventory results. The Riparian Guide includes a field inventory component, where information is gathered on the width and other physical characteristics of the riparian area. It also includes an assessment of four riparian functions: water quality, flood management, thermal regulation, and wildlife habitat.

A riparian area is the land immediately adjacent to a water resource (rivers, streams, lakes, and ponds, and adjacent wetlands). Riparian areas can enhance water quality, reduce erosion, moderate water temperatures and flood flows, and provide important fish and wildlife habitat. Riparian areas are particularly important for anadromous salmonids, which rely on cold, clean water and the habitat created by large woody debris. With the decline in the Pacific Northwest's salmonid populations, maintaining healthy riparian areas within the urban community has never been more important.

Recognizing their value, several Oregon communities have adopted land use regulations protecting riparian resources, a requirement of Statewide Planning Goals 5 and 17. Some have also conducted riparian inventories. Many of these inventories were completed at the same time as Local Wetlands Inventories, which are conducted using the standards and procedures of OAR 141-86-110 through 141-86-240. No standards or procedures exist for riparian inventories, however. As such, consultants conducting these inventories use a variety of methods, many of which do not assess the quality of riparian areas.

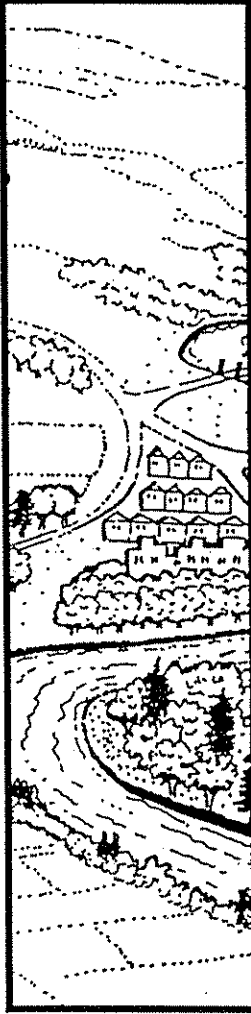
The Riparian Guide will provide consistent results when conducting riparian inventories. Local communities can use these results to prepare land use regulations protecting riparian resources. The Riparian Guide is not a watershed analysis nor a quantitative method for determining the physical characteristics or the functions of a riparian area. Two other methodologies, the Oregon Watershed Assessment Manual and the Oregon Wetland-Riparian Assessment, are currently being developed for these purposes.

This Riparian Guide defines a riparian area as the area immediately adjacent to a water resource, which affects or is affected by the water resource. Water resource is defined as rivers, streams, lakes, and ponds, and adjacent wetlands. Riparian areas do not include the water resource itself, as this can be identified and assessed by other means (e.g. Local Wetlands Inventory, Streamwalk, *Oregon Freshwater Wetland Assessment Methodology*).









# Oregon Land Use & Riparian Protection

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Protection of Oregon's urban riparian areas occurs at the local level. Since 1973, with the formation of the Land Conservation and Development Commission, regulation of many natural resources has occurred through local comprehensive plans. The State requires each city and county to have a comprehensive plan and zoning ordinances to implement the policies of the plan. Each comprehensive plan must be consistent with a set of 19 Statewide Planning Goals (or specific to the Willamette River Greenway or the Coastal Zone Management Act). These Goals reflect the State's policies on land use, citizen involvement, economic development, housing, and natural resources. They are the foundation of Oregon's land use planning program.

Goal 5 and Goal 17 require protection of riparian resources. Goal 5 (OAR 660, Division 23) is intended "to protect natural resources, and conserve scenic and historic areas and open spaces." It applies throughout the state. Goal 17 specifically addresses coastal shorelands. It is intended "to conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics." Goal 17 applies to an area called the coastal shorelands planning area defined in the goal, which is generally all lands bordering the ocean, estuaries, and coastal lakes.

Both Goals recognize the importance of riparian resources and provide a mechanism whereby local jurisdictions inventory the location, quality, and quantity of riparian resources, evaluate the significance of the resources, and implement appropriate protection policies.

## Goal 5

Goal 5 protects riparian corridors, which it describes as including water areas, fish habitat, adjacent riparian areas, and wetlands within the riparian area boundary. A riparian area, one component of a riparian corridor, is "the area adjacent to a river, lake, or stream, consisting of the area of transition from an aquatic ecosystem to a terrestrial ecosystem."

Local governments are required to inventory and determine significant riparian corridors. To conduct the inventory, they are given a choice of implementing the "standard" Goal 5 inventory process or the "safe harbor" process.

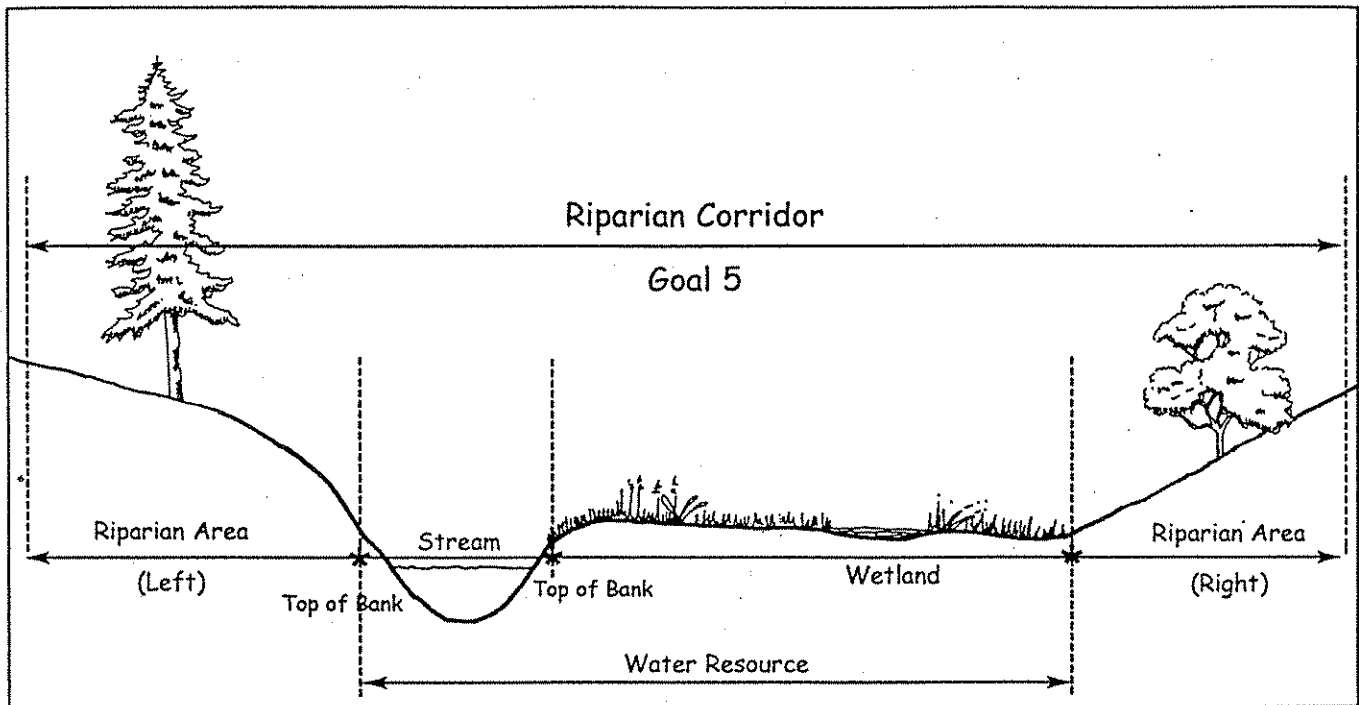


Figure 1: Cross section illustrating terms used in Statewide Planning Goal 5.

The standard process consists of inventorying riparian corridors, identifying land uses which conflict with protection of riparian corridors, and adopting a program to achieve Goal 5 (i.e. policies, zoning, land use ordinances or other mechanisms). The first step is to conduct an inventory of the resource. The standard Goal 5 inventory process, as contained in OAR 660-23-040, consists of the following steps:

- (a) Collect information about Goal 5 resource sites (e.g. wetlands, riparian areas, fish habitat);
- (b) Determine the adequacy of the information;
- (c) Determine the significance of resource sites;
- (d) Adopt a list of significant resource sites.

The Riparian Guide can be used to determine the width and the quality of the riparian area, satisfying (a) and (b) above. Local jurisdictions can use the Riparian Guide's function assessment to develop criteria for determining significance and to adopt a list of significant riparian corridors, thereby achieving (c) and (d).

After the inventory is complete, the local jurisdiction must weigh the importance of protecting the significant riparian corridor against the need for allowing conflicting uses. This

assessment is referred to as the economic, social, environmental and energy (ESEE) analysis (OAR 660-23-040). The ESEE analysis begins with identifying conflicting uses. Conflicting uses are those which, if allowed, may impact the significant resource. Types of conflicting uses include those allowed by the current zoning of the property (e.g. residential housing, commercial or industrial development, and other allowable land uses not specified). Depending on the quality of the riparian corridor, the ESEE analysis may determine that the significant riparian corridor is so valuable it must be fully protected; that the riparian corridor, although valuable, can be partially protected; or that the conflicting uses can be fully allowed. Based on the ESEE analysis, a local jurisdiction must adopt land use regulations to achieve Goal 5.

A local jurisdiction may also opt to follow the "safe harbor" process. The safe harbor process defines significant riparian corridors using a standard setback distance from all fish-bearing streams and lakes (OAR 660-23-090[5]). These setback distances are:

- (a) Along all streams with average annual stream flow greater than 1,000 cubic feet per second (cfs), the riparian corridor boundary shall be 75 feet upland from the top of each bank.
- (b) Along all lakes, and fish-bearing streams with average annual stream flow less than 1,000 cfs, the riparian corridor boundary shall be 50 feet from the top of bank.

**Table 1:**

Examples of average annual flow in Oregon Rivers and their required setbacks using the "safe harbor" process of Goal 5 (cfs = cubic feet per second) (USGS Water Resources Data for Oregon, 1995).

River	Location	Average Annual Flow (cfs)	Setback (feet)
Applegate River	Wilderville	717	50
Bear Creek	Medford	108	50
Clackamas River	Estacada	2,722	75
Columbia River	The Dalles	190,700	75
Deschutes River	Madras	4,517	75
Hood River	Trucker Bridge	1,000	75
John Day River	At Service Creek	1,906	75
Johnson Creek	Milwaukie	67	50
Klamath River	Keno	1,624	75
Long Tom River	Noti	225	50
McKenzie River	McKenzie Bridge	1,670	75
Melolius River	Grandview	1,479	75
Nehalem	Foss	2,627	75
Pudding River	Aurora	1,208	75
Rogue River	Grants Pass	3,361	75
Sandy River	Marmot	1,343	75
Tualatin River	West Linn	1,490	75
Umpqua River	Elkton	7,340	75
Willamette River	Portland	31,370	75
Willamette River	Albany	13,530	75
Wilson River	Tillamook	1,161	75

(c) Where the riparian corridor includes all or portions of a significant wetland, as set out in OAR 660-23-100, the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland.

(d) In areas where the top of each bank is not clearly defined, or where the predominant terrain consists of steep cliffs, local governments shall apply OAR 660-23-030 rather than apply the safe harbor provisions of this section.

Local jurisdictions may choose to adopt the safe harbor method for some areas and undertake a more detailed Riparian Guide-based inventory for others. It may be necessary to use the Riparian Guide where the top of the bank is not clearly defined or where steep terrain exists, thereby satisfying (d) above.

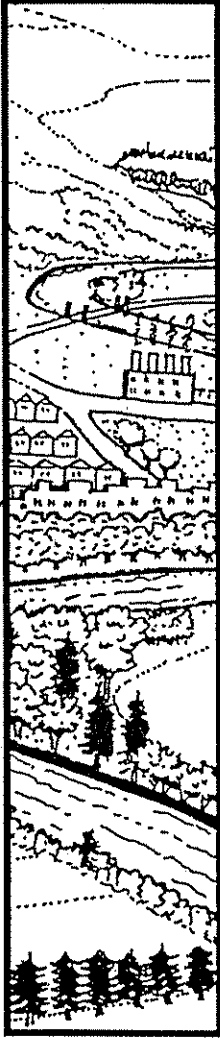
In general, applying the safe harbor process requires minimal resources for designating local protection. However, this protection is only afforded to fish-bearing streams and lakes. If a more detailed analysis between conflicting environmental and urban land uses is desired, or if sufficient protection is not afforded to water resources, the local jurisdiction may choose to use the Riparian Guide and follow the standard inventory process.

## Goal 17

In coastal communities, riparian resources are protected within the coastal shorelands planning area, as defined in Goal 17. Coastal shorelands include "natural or man-made riparian resources, especially vegetation necessary to stabilize the shoreline and to maintain water quality and temperature necessary for the maintenance of fish habitat and spawning areas." Coastal jurisdictions must inventory or identify coastal shorelands, including riparian resources. The Riparian Guide can be used to conduct the inventory and to determine the functions of the riparian resource.

Goal 17 also states that "Because of the importance of the vegetative fringe adjacent to coastal waters to water quality, fish and wildlife habitat, recreational use and aesthetic resources, riparian vegetation shall be maintained; and where appropriate, restored and enhanced, consistent with water-dependent uses." Unlike Goal 5, Goal 17 does not require an ESEE analysis prior to developing land-use regulations for riparian protection.





# Riparian Functions

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Riparian areas provide numerous and complex functions that affect both aquatic and terrestrial systems. Many ecological functions of riparian areas are also provided by wetlands, floodplains, and vegetated upland areas.

Riparian areas provide a buffer zone between upland land uses and water resources, protecting or enhancing water quality, preventing erosion, and moderating flood flows. Riparian areas often provide important wildlife habitat and contribute to in-stream habitat for fish. The following sections provide a brief overview of four riparian functions:

- Water Quality
- Flood Management
- Thermal Regulation
- Wildlife Habitat

## Water Quality

Riparian areas can enhance water quality in many ways. Undisturbed, densely vegetated riparian areas trap sediments, inhibit erosion and filter runoff originating from impervious surfaces, lawns, golf courses, etc.

Declines in water quality can be directly linked to an increase in impervious surfaces, which typically occurs as a result of urbanization in a watershed. Activities such as road construction, building, land clearing, and grading encroach on riparian areas and modify the natural drainage patterns. Sedimentation and erosion, although natural processes, are accelerated in urban areas by increased impervious surfaces. Impervious surfaces also inhibit infiltration.

Another major cause of water quality degradation is sediment. Sediment within a riparian area can be from erosion of poorly vegetated uplands, runoff from impervious surfaces, or floods from an adjacent water resource. Sediments often carry nutrients (e.g. phosphates and nitrates) and pollutants (e.g. heavy metals, hydrocarbons) to water resources, altering water

chemistry, burying spawning gravels and impacting fish and wildlife habitat. Excessive concentration of nutrients in the water can trigger algal blooms, depleting the water of oxygen required by fish and other aquatic organisms.

The sediment trapping capacity of riparian areas is related to slope, riparian area width, and vegetation cover. The most effective sediment trapping occurs in densely vegetated, level riparian areas, where runoff is sheet flow, rather than channelized flow. These factors combine to reduce water flows allowing for deposition of sediments.

The ability of a riparian area to resist erosion is related to slope, soil type, type of vegetation, vegetation cover, landscape position, and degree of human disturbance. Plant roots stabilize the soil of a riparian area, making it less subject to water erosion. Foliage intercepts rainfall, reducing its erosive force. Woody vegetation, in particular trees, provides the greatest ability to bind soils due to the depth and mass of roots. Soil characteristics are also factors in reducing the likelihood of erosion. These characteristics include water erosion hazard information that can be obtained from the appropriate county soil survey published by the Natural Resources Conservation Service (formerly the Soil Conservation Service).

## Flood Management

Riparian areas and associated wetlands and floodplains provide a valuable flood management function by reducing the force and volume of floodwaters. Flood waters flowing into a vegetated flood prone riparian area can be slowed or temporarily stored, reducing peak flows and flooding downstream. Woody vegetation, in particular, resists flood waters and reduces its velocity. Topographic features, such as swales and depressions, can enhance a riparian area's ability to

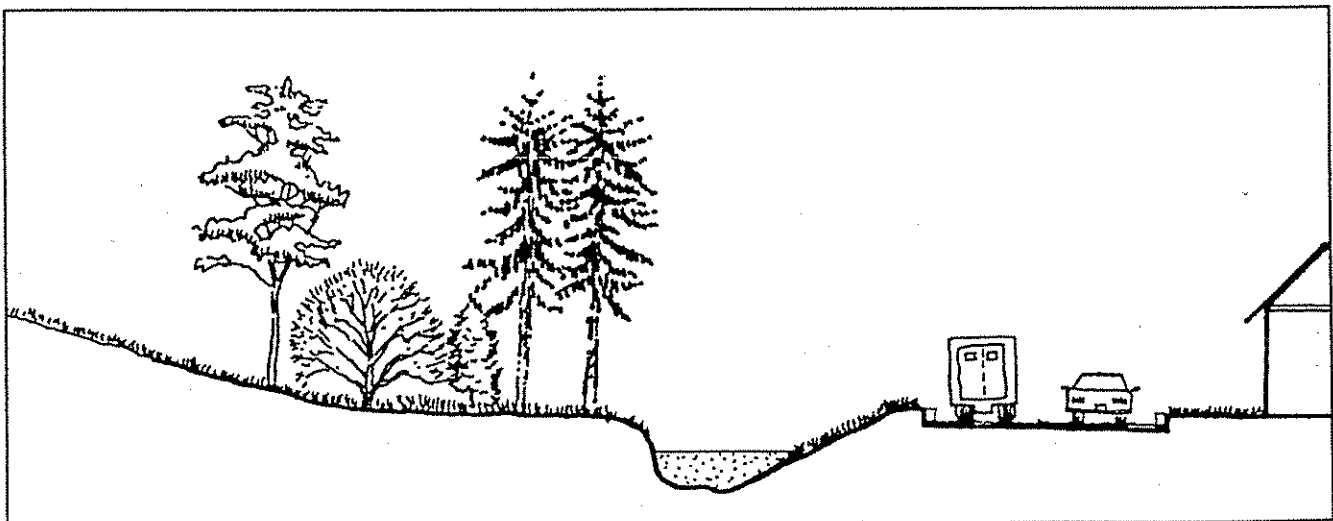


Figure 2: A vegetated riparian area reduces erosion and provides water quality benefits.

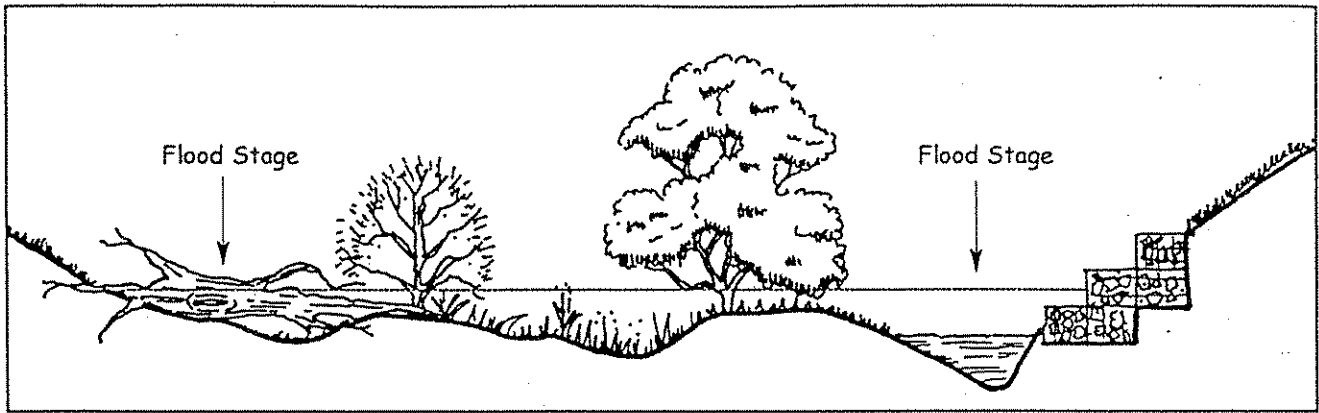


Figure 3: A flood prone riparian area (left) and a channelized stream bank (right).

manage flood flows. Reducing the velocity of flood waters in the riparian area allows infiltration of water into the soil. Water entering the soil is slowly released into the main channel, delaying its movement downstream.

Drainage modifications, increased impervious surfaces, vegetation removal, and the filling of floodplains and wetlands impair the ability of the system to accommodate flood events. Removal of riparian vegetation reduces the ability to slow floodwaters and provide infiltration, resulting in increased runoff frequencies and velocities. Channelization of streams and armoring of banks (e.g. riprap, walls, gabions, and concrete) increases the velocity of floodwaters, contributing to the "flashy" hydrograph of many urban streams. Although channelization may reduce local flooding by separating the water resource from its floodplain, it often increases the risk of flooding downstream.

## Thermal Regulation

Water temperature affects the ability of a stream to support viable populations of certain aquatic organisms. Riparian shade, especially forest canopy, moderates temperature within and adjacent to a water resource.

Although stream temperatures are important throughout the year, summer temperature is generally more critical for fish species such as salmonids. Many streams in Oregon are listed on the Oregon Department of Environmental Quality (DEQ) 303(d) list of Water Quality Limited streams due to high summer water temperatures. High water temperature is detrimental to some plant and animal species. It can promote algal blooms, reducing dissolved oxygen required by anadromous fish and other cold-water dependent organisms.

The aspect or orientation of the water resource plays an important role in how effective riparian vegetation is in providing

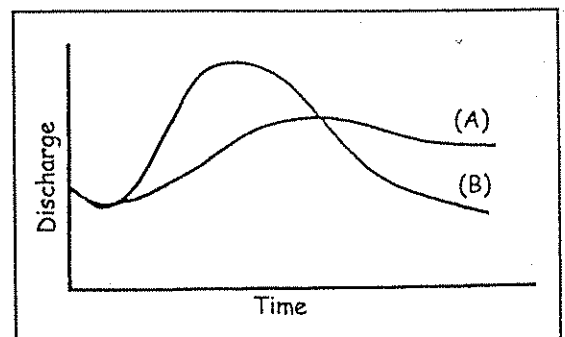


Figure 4: A hydrograph showing undisturbed conditions (A) and a "flashier" urban stream (B).

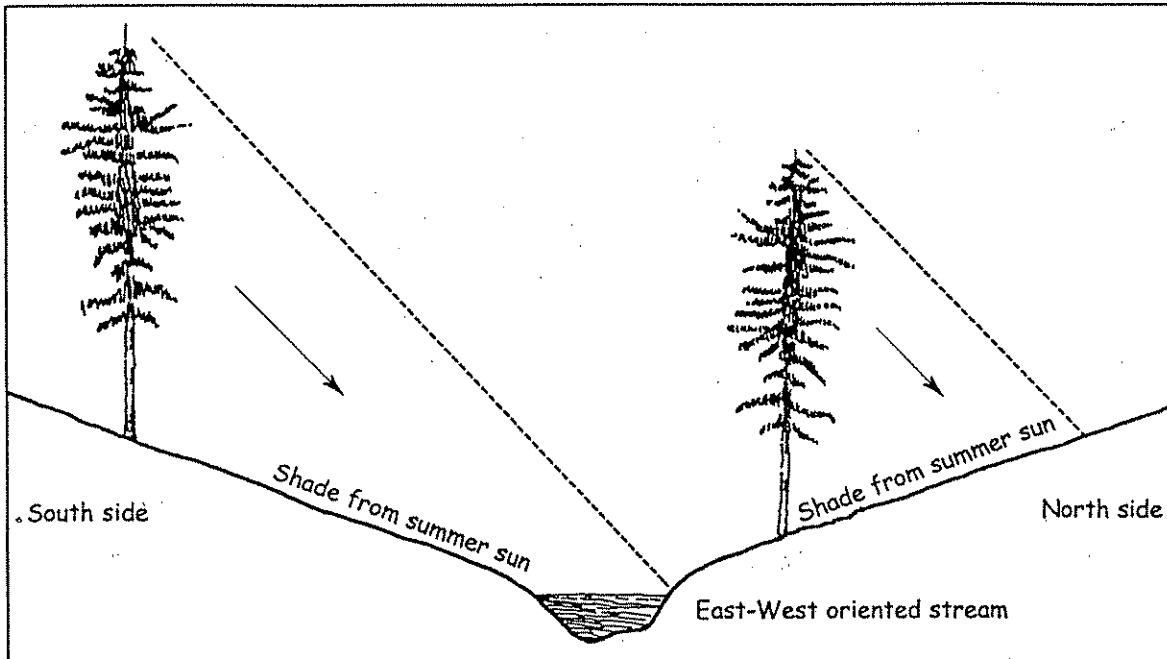


Figure 5: The potential for a riparian area to shade a stream depends on vegetation height and location and the stream orientation.

shade. In Oregon, vegetation on the south side of an east/west-oriented water resource has the highest potential of providing shade in the summer. This is because, at Oregon's latitude, the midday sun is always south of vertical. However, even on a northern slope, overhanging vegetation can provide a valuable shading function by moderating the water temperature at the edge of the water resource. The shade from overhanging vegetation creates micro-climates that are valuable for cold-water dependent species such as anadromous salmonids.

Trees, shrubs and tall woody vines generally provide more shade than smaller plants. The ability to shade the water is enhanced if the plants are elevated on a steep southern slope. There are occasions when even tall herbaceous vegetation along small streams may provide shade.

## Wildlife Habitat

Riparian areas provide valuable habitat for wildlife and influence fish habitat. The highest quality wildlife habitat in urban areas has a variety of plant species and layers, a perennial water source, and some degree of protection or buffering from disturbance.

Riparian areas are particularly important migration corridors between upland and aquatic systems for a wide variety of species. It has been reported that the majority of Oregon's major wildlife species, including amphibians and reptiles, use wetlands or riparian areas during some portion of their life cycle.

A variety of plant species and heights increases the food, cover and nesting opportunities for wildlife. Vertical complexity of vegetation increases the niches available for wildlife. For



example, a forested riparian area contains numerous layers used by a variety of different birds and mammals. It may also provide protection from humans and domestic animals.

Large woody debris (LWD) in the riparian area is important for wildlife and fish habitat. It provides cover for a variety of small mammals, birds, amphibians, reptiles, and insects. It creates microclimatic conditions for both terrestrial and aquatic species. The ability of the riparian area to contribute LWD to the water resource depends on the presence of trees and their potential to reach the water resource. LWD may be deposited directly to the stream by overhanging vegetation or transported to the aquatic system during floods.

Riparian areas and associated water resources can provide travel corridors for wildlife. Wildlife often use corridors to access areas that are critical to the viability of the population. A continuously vegetated riparian area provides the highest value corridor by minimizing disturbance. Roads, street lights, and impervious surfaces may discourage the movement of some species. Even manicured lawns and maintained landscaped areas can form barriers and increase stress on wildlife.

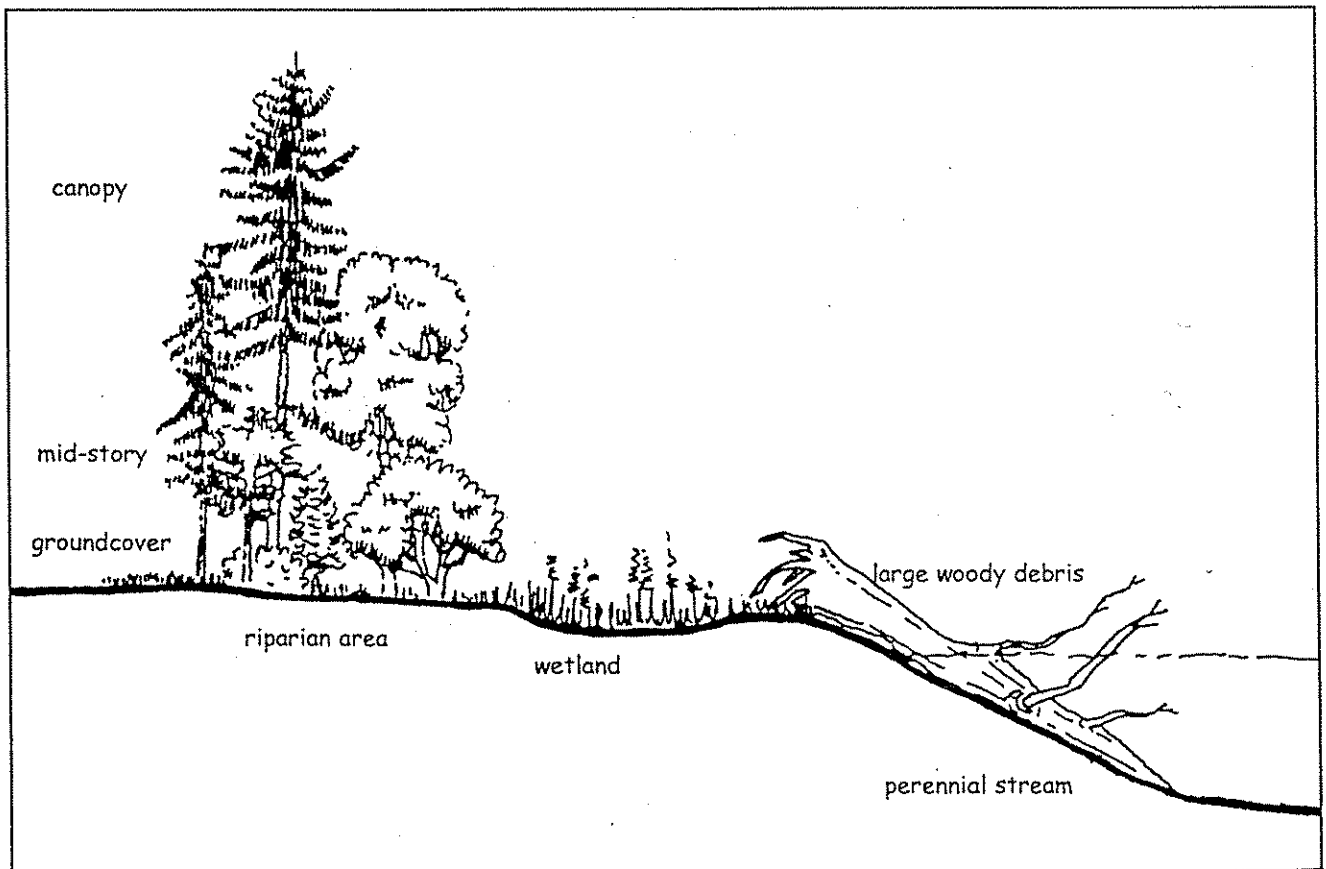
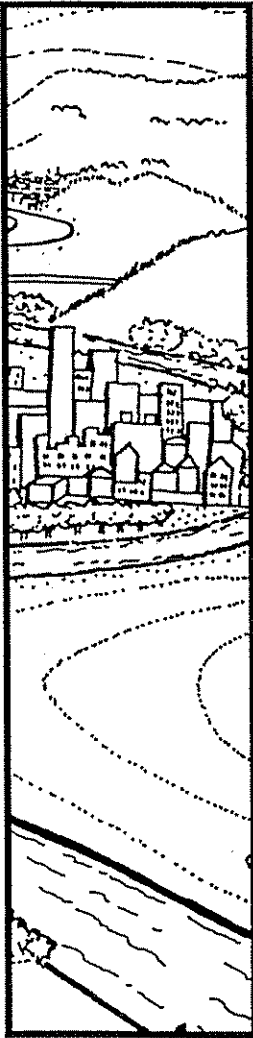


Figure 6: Components of high quality wildlife habitat.





# Completing the Riparian Guide

Completing the Riparian Guide depends on a combination of best available knowledge, field observations, and best professional judgment. The methodology is comprised of the riparian inventory and the riparian assessment. The riparian inventory involves gathering and assimilating information pertinent to the project site, developing a base map, and completing the Riparian Characterization form (Appendix B). The riparian assessment involves completing the Riparian Function Assessment questions evaluating the assessment results.

## STEPS IN COMPLETING THE ASSESSMENT

### **Step 1: Assemble Information & Prepare Riparian Inventory Overlays**

Aerial photos, NWI, FEMA, Street, Tax Lot Maps, etc. Create an overlay to the aerial photo, showing information compiled in Step 1: streams, project boundaries, streets, landmarks, floodplains, etc.

### **Step 2: Determine & Code Hydrologic Basins**

Identify and code the hydrologic basins and add the boundaries and codes to the base map overlays (see Appendix B).

### **Step 3: Determine & Code the Riparian Reaches**

Determine reaches based on field work and review of information. Streams will have separate left and right reaches. The codes and boundaries will be added to the base map overlays in Step 8.

### **Step 4: Complete the Riparian Area Width Determination Form**

Use the form to determine the width of the riparian area. Side 2 of the form contains the list of potential tree heights needed to determine the width.

### **Step 5: Complete the Riparian Characterization Form**

Complete this form in the field for each reach. Data is used in Step 6.

### **Step 6: Complete the Riparian Function Assessment Form**

Use data from Step 5 to answer the questions for each of the four (4) functions. Compile the scores to determine whether the riparian area's function is high, medium, or low.

### **Step 7: Compile Riparian Function Assessment Summary Table**

Transfer the results for all the riparian areas from the forms completed in Step 6.

### **Step 8: Prepare Riparian Inventory Maps**

Compile all the elements including graphics, codes, and boundaries.

### **Step 9: Use the Results**

The riparian information is now ready for use in the local land use decision-making process, policy and ordinance formulation, restoration work, and for educational purposes.

A more detailed description of each step follows:

### **Step 1: Assemble Information & Prepare the Riparian Inventory Overlays**

To increase accuracy and efficiency of field data collection, an aerial photograph is highly recommended. Obtain a low altitude, true color or color infrared aerial photograph (at least 1"= 400') of the study area taken within 5 years.

If an aerial photograph is not available, a base map can be a Local Wetlands Inventory (LWI) map meeting the standards developed by the Oregon Division of State Lands. If an LWI has not been conducted within the study area, base information can be placed on another type of map (e.g. topographic).

The following is a list of pertinent information which should be obtained or reviewed for the specific riparian inventory area. Sources of information are included on page 23.

- Anadromous fish run information
- Drainage basin maps
- Endangered and threatened wildlife listing
- Endangered and threatened plants listing
- Fish stocking information
- DEQ's 1994/1996 303(d) List of Water Quality Limited Waterbodies
- *Atlas of Oregon Lakes*
- Lake water quality information
- Municipal Assessor's/tax maps
- Local comprehensive plan and zoning maps
- Municipal storm drainage plans
- National Wetland Inventory maps
- Local Wetland Inventory maps
- *Rare, Threatened, Endangered Plants and Animals of Oregon*
- Oregon Natural Heritage Program Database
- Water Quality Report to Congress 305(b)
- NRCS (SCS) soil survey maps (by county)
- USGS topographic maps
- 100-year Floodplain maps (Federal Emergency Management Agency Flood Insurance Rate Maps)
- River reach data from Oregon Department of Fish & Wildlife

Overlays to the aerial photograph or base map should be prepared using the information assembled above. The overlays should also note project limits, major streets or landmarks, properties where access is denied, and 100-year floodplains.

### **Step 2: Determine & Code the Hydrologic Basins**

Once the base map has been prepared, the project area should be divided into hydrologic basins. For this Riparian Guide, a hydrologic basin refers to the drainage area for an individual named stream or other water feature, such as a wetland, lake, or pond. For example, a hydro-

logic basin containing a Mill Creek may be assigned the code MC, using the first two letters of the words. The hydrologic basin code will be used on all pertinent data sheets and on the riparian inventory maps. A similar coding methodology will be used to designate riparian reaches.

Appendix B provides guidance for determining basin boundaries. Basin boundaries will usually be determined from topographic maps. Other useful information may be available from the local Public Works or Planning Department, including a stormwater masterplan showing the location of culverts and drainage features. The hydrologic basin boundaries should be transferred to the base map or aerial photograph.

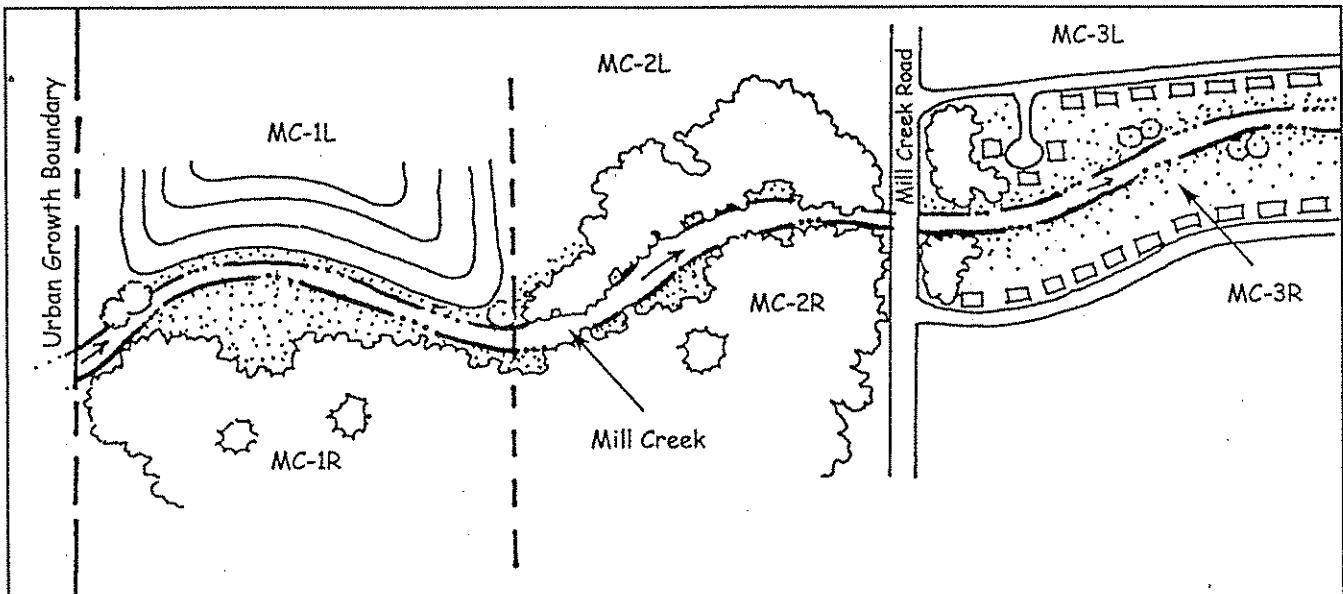


Figure 7: Examples of riparian reach designations and coding system.

### Step 3: Determine and Code the Riparian Reaches

A riparian reach is a segment of a riparian area within the study area. It generally has relatively homogeneous physical characteristics and may be determined by changes in vegetation type, slope, geomorphic stream features (e.g. pool, riffle, run), or by changes in land use. Its length is measured parallel to the water resource. The determination of the reach may depend on a combination of field observations and a review of topographic maps and aerial photographs.

The first portion of the riparian reach code is the hydrologic basin code. Additional coding is required to identify individual reaches and to differentiate between left and right sides. For example, the stream called Mill Creek would be assigned MC (the hydrologic basin code). The first reach would be coded MC-1, with the left and right sides receiving the letters L (left) and R (right), if applicable. The right side of the first reach of Mill Creek would be coded MC-1R. The left and right sides of a stream are defined by looking downstream. Left and right modifiers are usually not used when coding a lake, or pond.

If a Local Wetlands Inventory (LWI) has been conducted within the study area, the code already assigned to the water resource may be used, with the letter "R" inserted in front of the code to avoid confusion. For example, if Mill Creek was identified in the LWI as MC-1 it would become R-MC-1 in the riparian inventory. Reach codes and boundaries should be added to the base map.

#### Step 4: Complete the Riparian Area Width Determination Form

Determining the width of the riparian area is a critical element of the riparian inventory and often the most subjective (see Appendix A). In this Riparian Guide, the riparian width is measured from the edge of the water resource, typically either the top of a streambank or the outer edge of a wetland, lake, or pond.

Table 2: Average potential tree height (PTH) of common riparian trees in Oregon.

Tree species	Common Name	Avg mature height (feet)
<i>Acer macrophyllum</i>	Big leaf maple	90
<i>Abies grandis</i>	Grand fir	120
<i>Alnus rhombifolia</i>	White alder	75
<i>Alnus rubra</i>	Red alder	65
<i>Alnus sinuata</i>	Wavy-leaved alder	20
<i>Crataegus douglasii</i>	Douglas hawthorn	20
<i>Fraxinus latifolia</i>	Oregon ash	75
<i>Juniperus occidentalis</i>	Western juniper	20
<i>Malus fusca</i>	Pacific crabapple	20
<i>Myrica californica</i>	California wax myrtle	20
<i>Picea sitchensis</i>	Sitka spruce	120
<i>Pinus contorta</i>	Lodgepole pine	80
<i>Pinus contorta contorta</i>	Shore pine	50
<i>Pinus ponderosa</i>	Ponderosa pine	100
<i>Populus tremuloides</i>	Quaking aspen	60
<i>Populus trichocarpa</i>	Cottonwood	120
<i>Prunus emarginata</i>	Bitter cherry	25
<i>Pseudotsuga menziesii</i>	Douglas fir	120
<i>Rhamnus purshiana</i>	Cascara	35
<i>Quercus garryana</i>	Oregon white oak	60
<i>Salix amygaloides</i>	Peach leaf willow	35
<i>Salix exigua</i>	Coyote willow	15
<i>Salix geyeriana</i>	Geyer willow	20
<i>Salix hookeriana</i>	Hooker's willow	20
<i>Salix lasioandra</i>	Pacific willow	35
<i>Salix lasiolepis</i>	Arroyo willow	30
<i>Salix scouleriana</i>	Scouler's willow	30
<i>Salix sessilifolia</i>	Soft-leaved willow	20
<i>Salix sitchensis</i>	Sitka willow	20
<i>Thuja plicata</i>	Western red cedar	120
<i>Tsuga heterophylla</i>	Western hemlock	120
<i>Umbellularia californica</i>	California bay	60

measured from the edge of the water resource, typically either the top of a streambank or the outer edge of a wetland, lake, or pond. Riparian areas on both sides of a stream channel are assigned separate widths. Right and left widths are not combined and do not include the channel, as this combination describes the Goal 5-defined riparian corridor.

The first step in determining the riparian width is identifying the dominant riparian tree species within 100 feet of the water resource. This observation area may not be the final riparian area width, but generally represents the typical growing conditions within the riparian area. Dominance can be determined using areal cover or basal area.

The height of the dominant tree species at maturity will be used as a distance to define the outer riparian boundary. In this Riparian Guide, the height of this tree species at maturity is called the potential tree height (PTH). PTH is used as the riparian width because it represents a distance in which a tree can still affect the water resource (e.g. shade, organic material).

Where riparian area trees have been eliminated by land-use activities or natural causes, such as development or land slides, it may be necessary to extrapolate tree heights from a reference site. The reference site should be similar in character and landscape position and should be located as close as possible to the riparian reach. Reference sites should be noted on the inventory base maps and assigned a unique code. If a reference site cannot be located, field observations and reference materials must be used to establish PTH.

Once the dominant species has been identified, refer to Table 2 or use other reference material to determine the height of the tree species at maturity (PTH).

For example, if the dominant species growing within the 100-foot observation area (or the reference site) is quaking aspen (*Populus tremuloides*), the PTH is 60 feet. Therefore, the riparian width measured horizontally from the edge of the water resource is 60 feet.

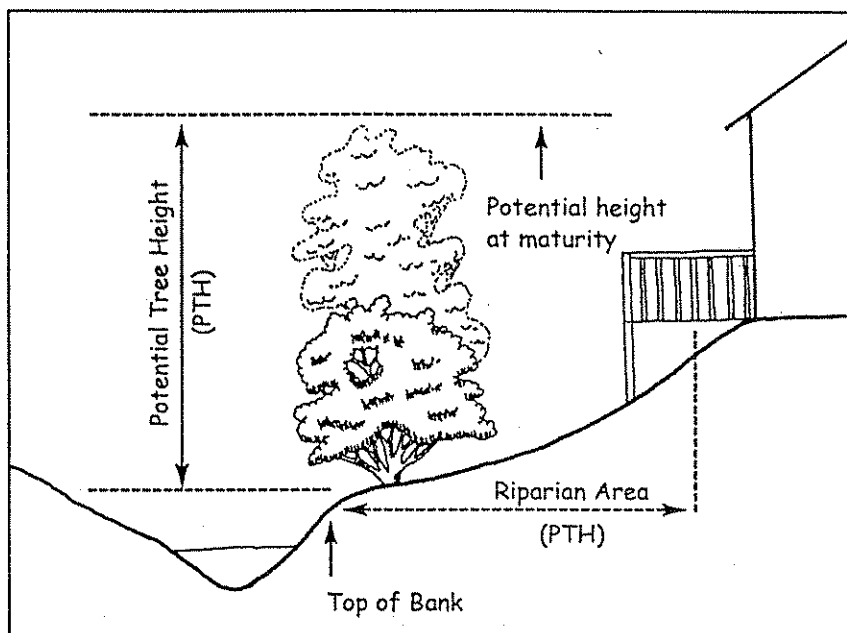


Figure 8: Riparian area determined by potential tree height.

### Step 5: Complete the Riparian Characterization Form

A completed Riparian Characterization Form provides information on the physical and biological characteristics of the riparian area. Most of the Form should be completed on-site, provided access is allowed. However, some portions, such as the mapped soil series, may be completed in the office. Many of the questions must be answered separately for the riparian areas on both sides of a stream. The Riparian Characterization Form is in Appendix B.

### Step 6: Complete the Riparian Function Assessment Form

The Riparian Function Assessment evaluates the ability of the riparian area to provide water quality, flood management, thermal regulation, and wildlife habitat functions. The results indicate whether the functions of each reach are high (intact), medium (somewhat degraded), or low (severely degraded). The assessment is completed by answering a series of questions. Most of the questions are intended to be answered using data from the Riparian Characterization Form, which was completed in Step 5.

The Riparian Function Assessment Answer Forms are included in Appendix C. The Forms include questions for each function and points for each answer.

Because certain elements or characteristics of a riparian area are more critical to its function, the answers are "weighted." The points are then totaled for each side and for each function. Based on the score, the riparian function will be assessed as high, medium or low.

The assessment questions are in Appendix C and include a rationale to help the investigator understand the context for each question.

**Step 7: Complete the Riparian Function Assessment Summary Table**

Transfer the results of the Riparian Function Assessment for all of the riparian areas within the inventory study area into a Riparian Function Assessment Summary Table. An example of a Summary Table is presented below. In addition to the results for each of the functions, the table includes the length of the riparian reach and the width of the riparian area.

**Step 8: Prepare the Riparian Inventory Maps**

The information from the riparian base maps and Riparian Characterization should now be transferred to the final inventory maps. This should include the riparian area widths, riparian codes, locations of data points, flow direction, and reach boundaries. Locations of reference sites should be noted and coded.

The maps should include a legend, north arrow, scale, and a disclaimer if not all riparian areas were assessed on-site or if mapping inaccuracies occur.

**Step 9: Use the Results**

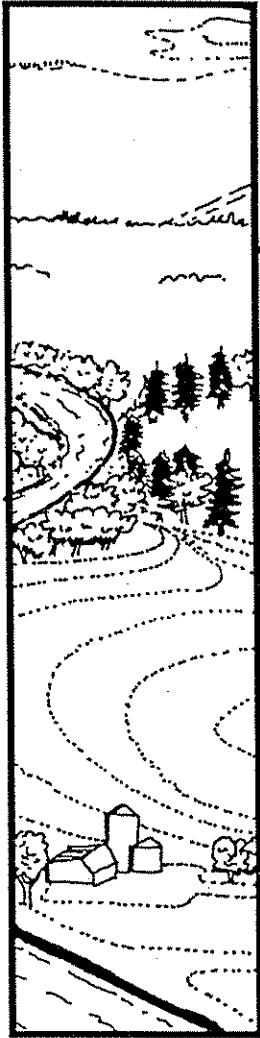
The riparian information is now ready for use in the local land use decision-making process, policy and ordinance formulation, restoration work, and for educational purposes.



Figure 9: Example of Riparian Functional Area Summary Table.

Riparian Code	Riparian Reach Length	Riparian Width	Water Quality	Flood Management	Thermal Regulation	Wildlife Habitat
MC-3L	600 ft	90 ft	Medium	Medium	High	Medium





# Riparian Restoration

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Riparian restoration is the rehabilitation of riparian areas to improve degraded functions. Riparian restoration is especially important in the urban environment, where the majority of riparian areas have been directly or indirectly degraded by human actions. Disturbed riparian areas may no longer adequately perform the four functions (water quality, flood management, thermal regulation, wildlife habitat) assessed by this Riparian Guide.

The results of the Riparian Function Assessment (completed in Step 6) identify whether the four functions are high, medium, or low for each riparian area. Riparian areas with high functions may not require restoration. Those with medium or low functions may be candidates for restoration. To determine which riparian functions may need restoring, review the Function Assessment Summary Table. When a function is assessed as medium or low, review the appropriate sections below for restoration options. The riparian restoration options are very general suggestions. In order to ensure a successful restoration project, specific information will need to be gathered and assessed for each site.

## Water Quality

Riparian areas evaluated as having a low or medium water quality function may not be able to reduce soil erosion, trap or filter sediment carried in surface water runoff, or reduce the flood velocities that can damage streambanks and property.

To restore these functions it will be necessary to re-establish native trees, shrubs, and groundcovers throughout the riparian area. Re-establishing a dense native plant community can slow water flowing through the riparian area, allowing sediment to settle out instead of entering an adjacent stream channel. Revegetation, particularly on steep slopes, is very important in binding the soil and reducing erosion. Establishing a native plant community may involve removing noxious, non-native plants that crowd out more desirable native species.

Erosion control is particularly important at the edge of the water resource. Erosion control methods may include planting live willow stakes, live fascines (bundles of plant cuttings), brush layering or installing brush mattresses (usually live willow cuttings covered with new

soil) along stream banks to reduce sloughing or to anchor the toe of an adjacent slope. Many other erosion protection methods exist. Consult publications by the Natural Resources Conservation Service and many other organizations for more details.

## Flood Management

Riparian areas evaluated as having a low or medium flood management function may not be able to provide water storage or reduce flood flow velocities.

Restoring these functions may require planting dense woody vegetation in flood prone areas to slow and temporarily detain flood flows, delaying flooding downstream. This may level out the flashy flood flows typical of many urban streams. It may also be beneficial to remove artificial structures from riparian areas or along stream banks to re-establish a connection with the stream's historic floodplain.

## Thermal Regulation

Riparian areas evaluated as having a low or medium thermal regulation function may not be able to provide enough shade to moderate water temperature.

In general, restoring the thermal regulation function requires planting woody vegetation along the water's edge or along a south slope. The maximum shade is provided by a closed (forested) canopy above the water resource. Usually, the potential for any kind of vegetation to provide shade to the surface of a water resource is related to the width of the surface water, the height of the vegetation, and the directional orientation of the water resource. Tall vegetation provides the most effective shade, however, small streams may be shaded by shrubs or even tall herbaceous plants.

## Wildlife Habitat

Riparian areas evaluated as having a low or medium wildlife habitat function may not be able to provide food, cover, or shelter for urban wildlife. High quality wildlife habitat is provided by a diversity of plant species and a mix of openings, patches and dense vegetation.

To restore this function increase the density and species diversity of vegetation. Create a wide, undisturbed corridor of vegetation along the water resource to provide wildlife with food, protective cover and access to the water. Install plants that have varying mature heights and forms. Native trees and shrubs, in particular, provide food, cover, and nesting opportunities for wildlife. Forested riparian areas that contribute large woody debris to the adjacent water resource enhance fish habitat. Remove noxious plants to encourage the growth of native plants.





# Glossary

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**Areal Cover:** A measure of dominance defining the degree to which the portions of plants above the ground cover the ground surface (see basal area).

**Armor:** Riprap, concrete or other material to reinforce streambanks against erosion.

**Basal Area:** A measure of dominance. The cross-sectional area of a tree trunk usually at 4.5 feet above the ground and expressed in square inches or square centimeters (see areal cover).

**Channelize:** To straighten the bed or banks of a stream or river or to line them with concrete or other materials (OFWAM).

**Detention:** Temporary storage of water. Typically, low areas that store flood water.

**Erosion Hazard:** Likelihood of soil becoming unstable and subsequently being transported by flooding, surface runoff or channel velocities.

**Function:** A characteristic action or role provided by riparian areas, such as water quality, thermal regulation, flood management, and wildlife habitat.

**Flood prone area:** A topographic feature such as a depression, swale or 100-year floodplain within the riparian area which is prone to flooding.

**Floodplain:** An area adjacent to a water resource that is subject to flooding or inundation during a storm event.

**Headwaters:** A tributary stream located in the upper watershed.

**Hydrologic Basin:** An area of land that drains into a particular river or body of water; usually defined by topography.

**Impervious surface:** A surface that cannot effectively absorb or infiltrate water, such as roads, parking lots, and sidewalks.

**Intermittent Stream:** A stream that has interrupted flow or does not flow continuously.

**Large Woody Debris:** Dead material from trees and shrubs that is large enough to persist more than one season.

**Local Wetlands Inventory:** A Goal 5 resource inventory defined by OAR 141-86-110 through 141-86-240.

**Noxious Vegetation:** A plant that crowds out desirable native vegetation. Usually a non-native plant.

**Perennial Stream:** A continuously flowing stream.

**Potential Tree Height:** The potential height of a mature tree for a particular location. Determined by climate, geology, hydrology, and landscape position.

**Reach:** A segment of a riparian area with relatively homogeneous physical characteristics. Its length parallel to the water resource can be determined by major changes in vegetation type, slope or by changes in land use.

**Reference Site:** An undisturbed area that exhibits the potential natural vegetation under a particular set of conditions. Used as a model for restoration or disturbed sites.

**Restoration:** Action taken to improve degraded functions.

**Riparian Area:** An area adjacent to a water resource which affects or is affected by the water resource.

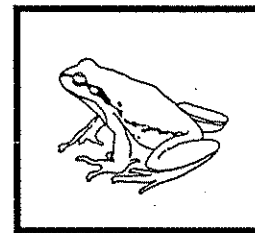
**Riparian Corridor:** A Goal 5 resource that includes the water areas, fish habitat, riparian areas, and wetlands within the riparian corridor boundary.

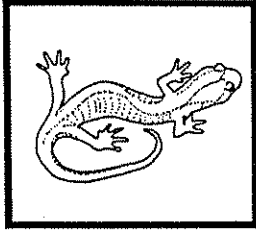
**Top of Bank:** Topographical break at the top of the streambank; point at which flood water leaves the channel.

**Vegetation Layer:** Canopy, midstory and groundcover levels of vegetation, commonly represented by trees, shrubs and herbaceous plant species. Determined by height of vegetation.

**Water Resource:** Rivers, streams, lakes, and ponds, and adjacent wetlands. Forms the inner edge of the riparian area.

**Wetland:** An area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.





# Information Sources

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The following sources may provide useful information for the assessment process:

- Regional Councils of Government
- State Government Agencies
- State and Regional Offices of Federal Agencies
- Non Profit Organizations and Conservation Groups

## Regional Councils of Government

In Oregon, regional councils of government (COG) have been formed to promote greater cooperation between all levels of government. COG's are usually voluntary associations of local governments cooperating on issues and problems that cross city, county, and sometimes state boundaries. They are multi-jurisdictional and multi-purpose organizations, with an emphasis on economic development and developing regional planning strategies.

**Columbia River Estuary Study Taskforce (CREST)**  
750 Commercial Street Room 214  
Astoria, OR 973-4513  
(503) 325-0435

**Metropolitan Service District (METRO)**  
600 NE Grande Avenue  
Portland, OR 97232-2799  
(503) 797-1700

**Clatsop-Tillamook Intergovernmental Council**  
1063 S Hemlock Street  
PO Box 488  
Cannon Beach, OR 97110  
(503)-436-1156

**Lane Council of Governments**  
125 E 8th Avenue  
Eugene, OR 97401  
(541) 687-4283

**Umpqua Regional Council of Governments**  
Room 205  
Douglas County Courthouse  
Roseburg, OR 97470  
(541) 440-4231

**Rogue Valley Council of Governments**  
155 S. Second Street  
PO Box 3275  
Central Point, OR 97502  
(541) 664-6674

**Mid-Willamette Valley Council of Governments**  
105 High Street SE  
Salem, OR 97301  
(503)588-6177

## State Agencies

### Department of Land Conservation and Development (DLCD)

1175 Court Street NE  
Salem, OR 97310-0590  
(503) 373-0050

DLCD reviews and coordinates application of statewide planning goals to city and county comprehensive plan and to state agency land-use programs. There are field offices in Portland, Medford and Bend.

### Department of Environmental Quality (DEQ)

811 SW 6th Avenue  
Portland, OR 97204  
(503) 229-5969/5630

DEQ develops comprehensive plans and programs for environmental quality, conducts field investigations, and establishes standards of quality for Oregon's waters. There are field offices throughout the state.

### Oregon Department of Fish and Wildlife (ODFW)

2501 SW First Street  
PO Box 59  
Portland, OR 97201  
(503) 229-5403

ODFW assists and advises other regulatory agencies and private parties in protecting water quality, water flows, and fish and wildlife habitat. There are regional offices in Corvallis, Roseburg, Bend, La Grande, Hines, Newport and Clackamas.

### Division of State Lands (DSL)

775 Summer Street NE  
Salem, OR 97310  
(503) 378-3805

DSL performs many public services assigned by the legislature, including administering state laws protecting Oregon wetlands and waterways from dredging and filling alterations and approving local wetland inventories and wetland conservation plans. There is a regional office in Bend.

### Natural Heritage Advisory Council (NHAC)

c/o Division of State Lands  
775 Summer Street NE  
Salem, OR 97310  
(503) 378-3805

This council works with DSL to carry out the Natural Heritage Plan approved by the legislature in 1981. Development of an inventory The Natural Heritage Data Bank of native Oregon ecosystems was primary objective of the Council. Material from the data bank is available through: The Nature Conservancy.

### Water Resource Department (WRD)

Commerce Building  
152 12th Street  
Salem, OR 97310  
(503)378-2982

Although mainly concerned with regulations of state laws pertaining to water rights and diversion of surface and groundwater, this department is a good contract of local water resource information. There are regional offices in Salem, Grants Pass, Bend, Baker and Pendleton.

### Governor's Watershed Enhancement Board (GWEB)

255 Capitol St NE  
Salem OR 97310  
(503) 378-3589

Combines the efforts of government agencies with those of private citizens, watershed councils, soil and water conservation districts, organizations, youth, and volunteers. Invests grant funds in projects that maintain and enhance the biological, chemical and physical integrity of riparian zones and associated upland areas of the state's watersheds.

## State Agencies (continued)

**Department of Geology and Minerals Industries (DOGAMI)**  
State Office Building, Suite 965  
800 NE Oregon Street #28  
Portland, OR 97232  
(503) 731-4100

**The Nature of Oregon Information Center**  
Department of Geology  
and Mineral Industries  
800 NE Oregon Street #5  
Portland, OR 97232  
(503) 731-4444

**Department of Forestry (ODF)**  
2600 State Street  
Salem, OR 97310  
(503) 845-7200

**Department of Parks and Recreation**  
1115 Commercial Street NE  
Salem, OR 97310  
(503) 378-6305

**State Historic Preservation Office (SHPO)**  
(503)378-6508

## State & Regional Offices of Federal Agencies

The agencies below can be contacted for information on federal land use, permits and technical assistance.

**US Department of Agriculture, Natural Resources Conservation Service, State Office**  
101 SW Main  
Portland, OR 97204-2881  
(503) 414-3200

**Natural Resources Conservation Service (NRCS) West National Technical Center**  
511 NW Broadway, Room 248  
Portland, OR 97209-3489  
(503) 326-2824

**US Army Corps of Engineers (COE) Portland District**  
Box 2946  
Portland, OR 97208-2946  
(503) 808-4373

**US Environmental Protection Agency (EPA)**  
811 SW 6th Avenue  
Portland, OR 97204  
(503) 326-3250

## State & Regional Offices of Federal Agencies (continued)

### US Fish and Wildlife Services (USFWS) Ecological Services

2600 SE 98th Suite 100  
Portland, OR 97266  
(503) 231-61709

### National Marine Fisheries Service (NMFS)

Pacific Fishery Management Council  
2130 SW 5th, Suite 224  
Portland, OR 97232  
(503) 326-6352

### US Geological Survey National Cartographic Information Center Western Mapping Center

345 Middlefield Road  
Menlo Park, CA 94025  
(415) 329-4309 (California number)  
1-800-USA-MAPS (Virginia number)

## Nonprofit Organizations & Conservation Groups

The following groups are state chapter of some known public interest and conservation organizations, as well as some Oregon-only groups. They often can provide information on other local citizen-activist organizations involved in environmental and governmental issues.

### Audubon Society of Portland

5151 NW Cornell Road  
Portland, OR 97210  
(503) 292-6855

### The Wetland Conservancy/Urban Streams Council

PO Box 1195  
Tualatin, OR 97062  
(503) 691-1394

### Sierra Club, Oregon Chapter

3701 SE Milwaukie  
Portland, OR 97202  
(503) 238-0442

### Oregon Coastal Zone Management Association (OCZMA)

PO Box 1033  
Newport, OR 97365  
(503) 265-8918

### Center for Watershed Protection

8737 Colesville Road  
Silver Spring MD 20910  
(301) 589-1890

### The Nature Conservancy/Oregon Natural Heritage Program

821 SE 14th Avenue  
Portland OR 97214-2531  
(503) 731-3070



# Appendix A

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# Riparian Width Determination

Riparian Code

Date: \_\_\_\_\_ Investigators: \_\_\_\_\_

Dominant tree species: \_\_\_\_\_ (See other side for list of species)

Potential tree height (PTH)/Width of Riparian Area: \_\_\_\_\_ feet  
(Width measured horizontally from edge of water resource)

PTH determined by:    On-site vegetation     Reference site     (Code \_\_\_\_\_)

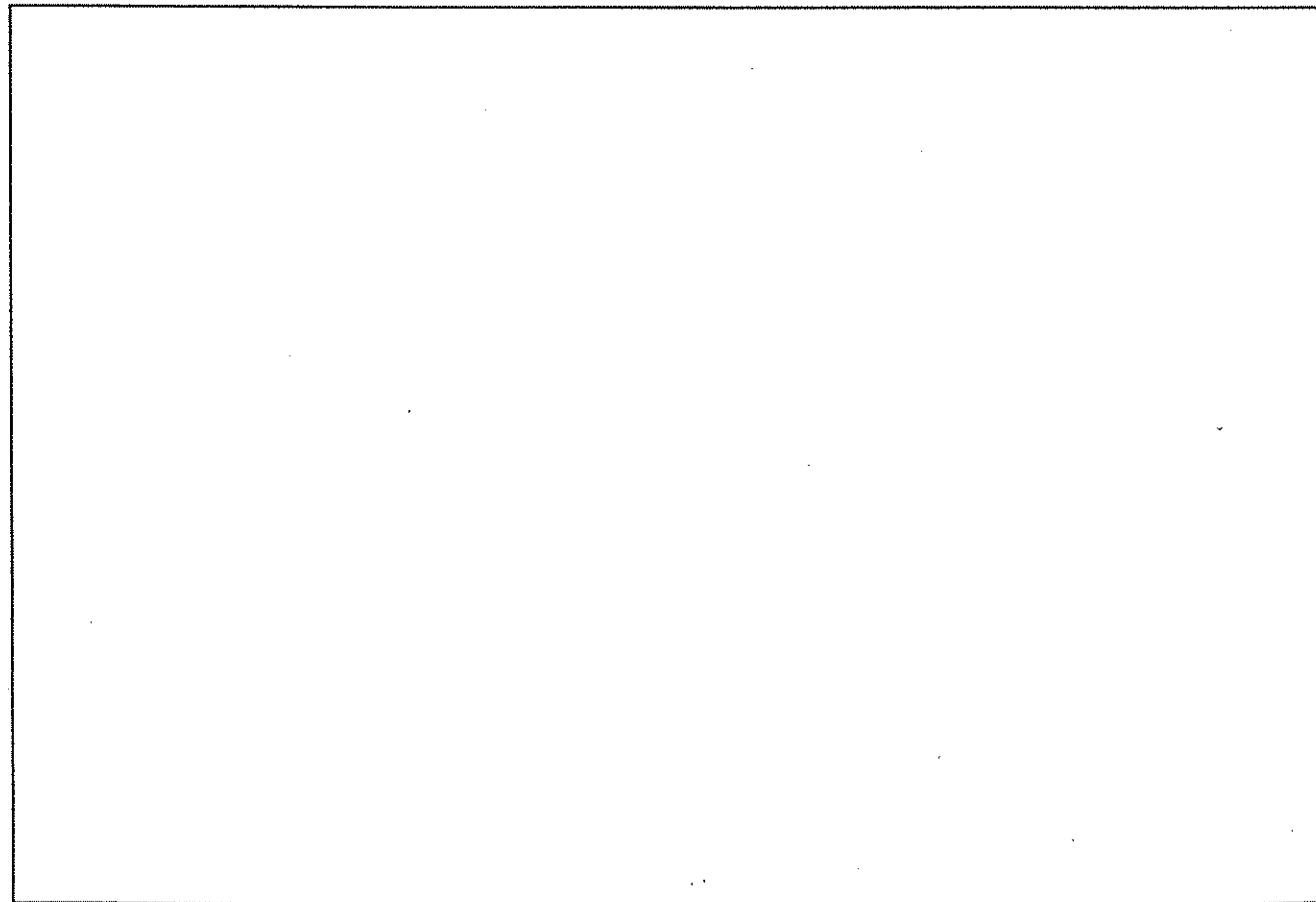
Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Typical Cross Section:



## Potential Tree Heights

Tree species	Common Name	Avg mature height (feet)
<i>Acer macrophyllum</i>	Big leaf maple	90
<i>Abies grandis</i>	Grand fir	120
<i>Alnus rhombifolia</i>	White alder	75
<i>Alnus rubra</i>	Red alder	65
<i>Alnus sinuata</i>	Wavy-leaved alder	20
<i>Crataegus douglasii</i>	Douglas hawthorn	20
<i>Fraxinus latifolia</i>	Oregon ash	75
<i>Juniperus occidentalis</i>	Western juniper	20
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<i>Pinus contorta contorta</i>	Shore pine	50
<i>Pinus ponderosa</i>	Ponderosa pine	100
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<i>Pseudotsuga menziesii</i>	Douglas fir	120
<i>Rhamnus purshiana</i>	Cascara	35
<i>Quercus garryana</i>	Oregon white oak	60
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<i>Salix exigua</i>	Coyote willow	15
<i>Salix geyeriana</i>	Geyer willow	20
<i>Salix hookeriana</i>	Hooker's willow	20
<i>Salix lasiandra</i>	Pacific willow	35
<i>Salix lasiolepis</i>	Arroyo willow	30
<i>Salix scouleriana</i>	Scouler's willow	30
<i>Salix sessilifolia</i>	Soft-leaved willow	20
<i>Salix sitchensis</i>	Sitka willow	20
<i>Thuja plicata</i>	Western red cedar	120
<i>Tsuga heterophylla</i>	Western hemlock	120
<i>Umbellularia californica</i>	California bay	60

# Appendix B

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# Riparian Characterization Form

GENERAL INFORMATION	
Date: _____	Riparian Code: _____
On-site <input type="checkbox"/>	Off-Site <input type="checkbox"/>
Investigators: _____	Hydrologic Basin: _____
	Reach Length: _____

WATER RESOURCE INFORMATION	
Water Resource: Stream/River <input type="checkbox"/>	Width: _____
Lake/Pond <input type="checkbox"/>	Width: _____
Wetland <input type="checkbox"/>	Width: _____
LWI Wetland Code: _____	
Water present year-round: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are salmonids present in the adjacent water resource: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is the water resource listed for temperature on DEQ's 303(d) list: Yes <input type="checkbox"/> No <input type="checkbox"/>	

Within FEMA-mapped 100-year floodplain: Yes  No

Mapped soil series: \_\_\_\_\_

Adjacent Land Uses? (Check as many as needed)

- |  |                                      |
|--|--------------------------------------|
| Agriculture <input type="checkbox"/>           | Roads <input type="checkbox"/>       |
| Commercial/Industrial <input type="checkbox"/> | Undeveloped <input type="checkbox"/> |
| Residential <input type="checkbox"/>           | Forestry <input type="checkbox"/>    |

Woody Vegetation (trees, shrubs, vines > 1 meter)	Herbaceous Vegetation (trees, shrubs, vines < 1 meter)

1 meter = 3.2 feet

**Average slope in the riparian area. (Question 1)**

<10:1 (10%)       Between 10:1 (10%) and 5:1 (20%)       >5:1 (20%)

**Extent of impervious surface within the riparian area. (Question 4)**

<10%       10% - 25%       >25%

**Is the reach constricted by man-made features? (Question 8)**

Yes       No

**Does the orientation of the riparian area allow for shading of the water resource at midday in summer? (Question 9)**

Yes       No

**Dominant vegetation layer within riparian area? (Question 10)**

Woody vegetation       Herbaceous vegetation       Bare ground

**Does woody vegetation hang over the edge of the water? (Questions 11 & 14)**

Yes       No

**Large woody debris in riparian area? (Question 15)**

Yes       No

**Percent of water resource bordered by vegetated riparian area at least 30 feet wide? (Question 16)**

>40%       10% - 40%       <10%

**Degree of development or human caused disturbance. (Question 19)**

<25%       25% - 75%       >75%



## General Information on completing the Riparian Characterization Form

**Hydrologic Basin:** For instructions, see page 33.

**Water Resource:** Is the water resource associated with the riparian area a stream, lake/pond or wetland?

**LWI Wetland Code:** If an LWI has been conducted within the study area, what is the code of the wetland associated with this reach?

**Mapped Soil Series:** Available from the Natural Resources Conservation Service county soil survey.

**Riparian Reach Code:** For instructions, see Step 3 on page 13.

**Adjacent Land Use:** What are the land uses immediately beyond the riparian area?

**Does the associated water resource contain salmonids?** Consult the Oregon Department of Fish and Wildlife field office.

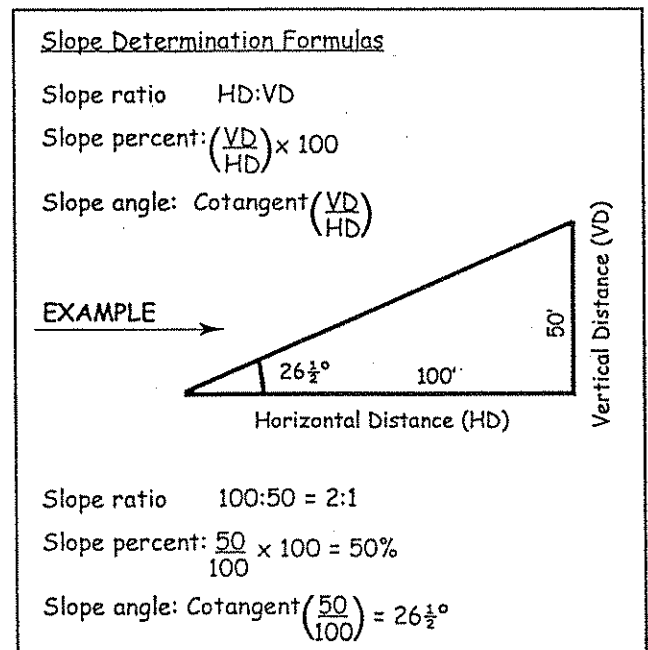
**Extent of impervious surface within riparian reach:** Estimate the percent of impervious surface within the riparian area, not within the adjacent areas or hydrologic basin.

**Is the reach constricted by man-made features?** Are there features (e.g. channelization, riprap, concrete wall) which separate the water resource from its floodplain?

**Does the orientation of the riparian area allow for shading of the water at midday in summer?** Is the general direction of the water resource east/west? This would allow vegetation on the southern side to shade the water at midday in the summer.

**Average slope in the riparian area:** Estimate the slope perpendicular to the water resource. See Slope Determination chart.

**Percent of water resource bordered by vegetated riparian area at least 30 feet wide:** This identifies the extent of a corridor of uncut or undisturbed vegetation.



**Does woody vegetation hang over the edge of the water?** Include trees or shrubs that extend over the water.

**Large woody debris in riparian area:** This refers to the riparian area only, not the stream channel.

**Degree of development or human-caused disturbance:** Estimate the percent of land surface within the riparian area that has been developed or disturbed (e.g. buildings, impervious surfaces, lawns, agriculture, trash).

**Woody vegetation (trees, shrubs, vines >1 meter):** List the dominant species of woody vegetation over 1 meter tall. Include vines if they have a mounding growth form, as does Himalayan blackberry (*Rubus discolor*), for example. Do not include low growing species such as English ivy (*Hedera helix*) even though they may grow on the trunks of tall trees.

**Herbaceous vegetation (include trees, shrubs, vines <1 meter):** List the dominant species of herbaceous vegetation less than 1 meter tall. Include prostrate woody vines and short woody vegetation.

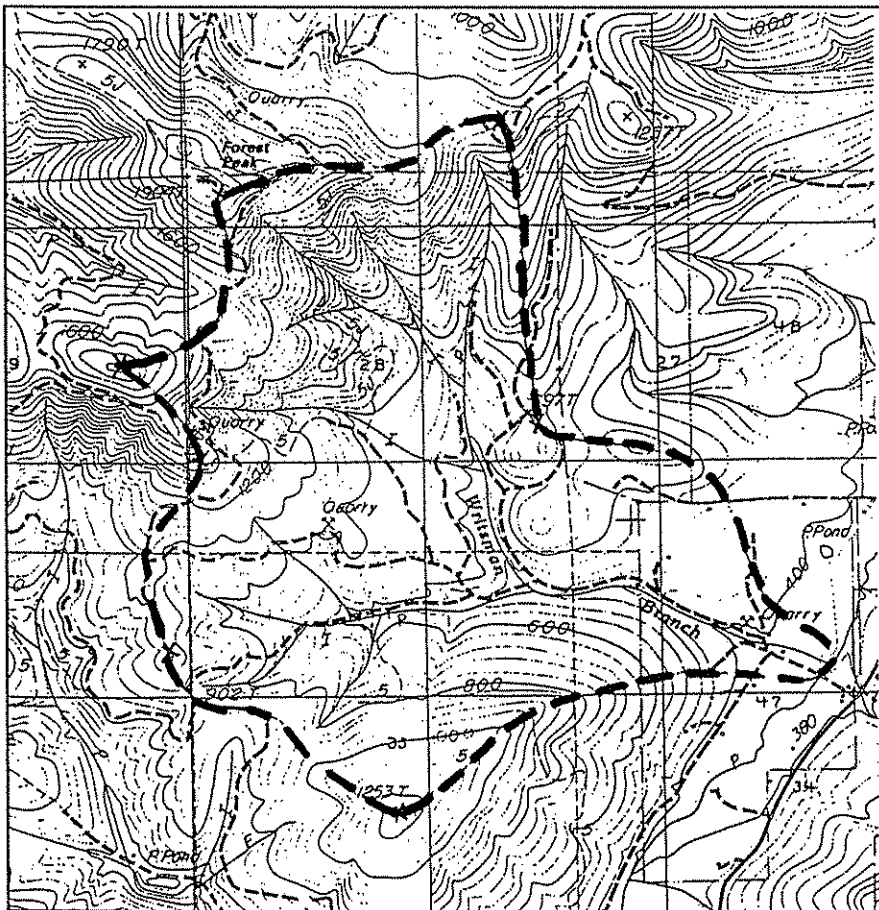
**Dominant vegetation layer within riparian reach:** This refers to the layer of woody vegetation (trees, shrubs, vines >1 meter) or the layer of herbaceous vegetation (include trees, shrubs, vines <1 meter) or, if there's no vegetation, bare ground.



## How to Determine Hydrologic Basin Boundaries (see Step 2, page 13)

The following process will be useful in determining basin boundaries for use in the Riparian Guide. A basin may be a watershed, or it may be a smaller hydrologic unit within a watershed.

1. Locate the downstream point (lowest elevation) of the water resource within the project area.
2. Put an "X" at the high points along both sides of the water resource, working your way upstream towards the headwaters of the basin.
3. Starting at the point identified in Step 1, draw a line connecting the X's. This line should always cross the contours at right angles (i.e. it should be perpendicular to each contour line it crosses). The line should connect back to the beginning point, forming a closed polygon. This is the basin boundary.



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Example of a hydrologic basin boundary determination.

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# Appendix C

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# Riparian Function Assessment Answer Sheet

## Water Quality

Riparian Code
---------------

1. What is the average slope in the riparian area?
  - a. Less than 10:1(10%) ..... 3 pts
  - b. Between 10:1 (10%) and 5:1(20%) ..... 2 pts
  - c. Greater than 5:1 (20%)..... 1 pt
  
2. What is the dominant vegetation cover in the riparian area?
  - a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high ..... 3 pts
  - b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high ..... 2 pts
  - c. Bare ground ..... 1 pt
  
3. What is the dominant vegetation at the top of bank (if defined) or edge of water resource?
  - a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high ..... 3 pts
  - b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high ..... 2 pts
  - c. Bare ground ..... 1 pt
  
4. What is the extent of impervious surfaces within the riparian area?
  - a. Less than 10% ..... 3 pts
  - b. Between 10% and 25% ..... 2 pts
  - c. Greater than 25%..... 1 pt
  
5. How does the Natural Resources Conservation Service (formerly Soil Conservation Service) soil survey rank the water erosion hazard of the dominant mapped unit in the riparian area? Select the highest water erosion hazard description if more than one is listed.
  - a. Low, slight, moderate ..... 2 pts
  - b. High, severe, very high ..... 1 pt

Score

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Total Points: \_\_\_\_\_

Function:    High (12-14 pts)    Medium (8-11 pts)    Low (5-7 pts)

### FUNCTION

- High
- Medium
- Low

# Riparian Function Assessment Answer Sheet

## Flood Management

Riparian Code
---------------

- |  |   |
|--|---|
| <p>6. Are there flood prone areas (adjacent flat areas, depressions, swales, FEMA mapped 100-year floodplain, etc.) beyond the top of bank or edge of the water resource?</p> <p>a. Yes..... 3 pts</p> <p>b. No..... 1 pt</p> <p>7. Is woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high dominant in the flood prone riparian area?</p> <p>a. Yes..... 3 pts</p> <p>b. No or no flood prone area present..... 1 pt</p> <p>8. Is the stream or water resource constricted by man-made features (e.g. channelization, riprap, concrete wall)?</p> <p>a. No..... 3 pts</p> <p>b. Yes..... 1 pt</p> | <p>Score</p> <p>_____</p> <p>_____</p> <p>_____</p> |
|--|---|

Total Points: \_\_\_\_\_

Function:	High (8-9 pts)	Medium (5-7 pts)	Low (3-4 pts)	<b>FUNCTION</b>
				High <input type="checkbox"/>
				Medium <input type="checkbox"/>
				Low <input type="checkbox"/>



# Riparian Function Assessment Answer Sheet

## Thermal Regulation

Riparian Code
---------------

9. Does the aspect or orientation of the riparian area allow for shading of water at mid-day in the summer?
- a. Yes..... 3 pts
- b. No..... 1 pt
10. What is the dominant vegetation layer in the riparian area?
- a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high..... 3 pts
- b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high..... 2 pts
- c. Bare ground..... 1 pt
11. Does woody vegetation hang over the edge of the water?
- a. Yes..... 2 pts
- b. No..... 1 pt

Score

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Total Points: \_\_\_\_\_

Function:	High (7-8 pts)	Medium (5-6 pts)	Low (3-4 pts)	<b>FUNCTION</b>	
				High	<input type="checkbox"/>
				Medium	<input type="checkbox"/>
				Low	<input type="checkbox"/>

# Riparian Function Assessment Answer Sheet

## Wildlife Habitat

Riparian Code
---------------

Score

- |  |  |
|--|--|
| <p>12. How many vegetation layers (i.e. canopy, mid-story, groundcover) are present?</p> <p>a. More than 2 layers ..... 3 pts</p> <p>b. 2 layers ..... 2 pts</p> <p>c. 1 layer, or unvegetated ..... 1 pt</p> <p>13. What is the dominant vegetation layer in the riparian area?</p> <p>a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high ..... 3 pts</p> <p>b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high ..... 2 pts</p> <p>c. Bare ground ..... 1 pt</p> <p>14. Does woody vegetation hang over the edge of the water?</p> <p>a. Yes ..... 2 pts</p> <p>b. No ..... 1 pt</p> <p>15. Is large woody debris present within the riparian area?</p> <p>a. Yes ..... 3 pts</p> <p>b. No ..... 1 pt</p> <p>16. What percent of the water resource edge is bordered by a vegetated riparian area at least 30 feet wide?</p> <p>a. Greater than 40% ..... 3 pts</p> <p>b. Between 10% and 40% ..... 2 pts</p> <p>c. Less than 10% ..... 1 pt</p> | <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> |
|--|--|

*Questions continued on next page.*

# Wildlife Habitat (continued)

Riparian Code
---------------

- 17. Is surface water present throughout the year?
  - a. Yes..... 3 pts
  - b. No..... 1 pt
  
- 18. Is there more than one type of water resource (e.g. stream, wetland, lake/pond) within or immediately adjacent to the riparian reach?
  - a. Yes..... 3 pts
  - b. No..... 1 pt
  
- 19. What is the degree of development or human-caused disturbance (e.g. buildings, impervious surfaces, lawns, agriculture, trash) in the riparian area?
  - a. Less than 25%..... 3 pts
  - b. Between 25% and 75%..... 2 pts
  - c. Greater than 75%..... 1 pt

Score	

Total Points: \_\_\_\_\_

	<b>FUNCTION</b>		
Function:	High (19-23 pts)    Medium (13-18 pts)    Low (8-12 pts)	High	<input type="checkbox"/>
		Medium	<input type="checkbox"/>
		Low	<input type="checkbox"/>

## Water Quality Assessment Questions & Rationale

**1. What is the average slope in the riparian area?**

- a. Less than 10:1(10%)
- b. Between 10:1 (10%) and 5:1(20%)
- c. Greater than 5:1 (20%)

*Rationale:* Erosion risk is directly related to slope; the steeper the slope, the greater the risk of erosion.

**2. What is the dominant vegetation cover in the riparian area?**

- a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high
- b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high
- c. Bare ground

*Rationale:* Vegetation reduces the likelihood of erosion by stabilizing soil through the binding action of roots. Woody vegetation provides the most effective stabilization due to root mass.

**3. What is the dominant vegetation at the top of bank (if defined) or edge of water resource?**

- a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high
- b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high
- c. Bare ground

*Rationale:* Vegetation adjacent to a water resource, such as a stream or lake, reduces erosion by stabilizing banks. Woody vegetation such as trees provides the greatest ability to bind soils due to the depth and mass of roots.

**4. What is the extent of impervious surfaces within the riparian area?**

- a. Less than 10%
- b. Between 10% and 25%
- c. Greater than 25%

*Rationale:* Declines in urban water quality can be directly linked to an increase in impervious surfaces. Impervious surfaces increase the frequency and quantity of runoff, contribute pollutants and reduce natural infiltration provided by soil and vegetation.

**5. How does the Natural Resources Conservation Service (formerly Soil Conservation Service) soil survey rank the water erosion hazard of the dominant mapped unit in the riparian area? Select the highest water erosion hazard description if more than one is listed.**

- a. Low, slight, moderate
- b. High, severe, very high

*Rationale:* The risk of erosion is partially determined by the characteristics of the soil types, such as soil texture, soil structure, and slope. The NRCS has ranked each soil's erosion potential.

## Flood Management Assessment Questions & Rationale

6. Are there flood prone areas (adjacent flat areas, depressions, swales, FEMA mapped 100-year floodplain, etc.) beyond the top of bank or edge of the water resource?
- Yes
  - No

*Rationale:* The ability of the riparian area to provide a flood management function depends on its potential to temporarily store or detain floodwaters. Floodwaters detained in the riparian area infiltrate into the soil and are slowly released downstream.

7. Is woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high dominant in the flood prone riparian area?
- Yes
  - No or no flood prone area present.

*Rationale:* In addition to topography, floodwater detention and infiltration is related to vegetation cover and composition. Woody vegetation reduces the velocity of floodwaters by providing resistance, which increases detention time in the riparian area. The increased detention time allows water to infiltrate into the soil. Both factors delay flooding downstream.

8. Is the stream or water resource constricted by man-made features (e.g. channelization, riprap, concrete wall)?
- No
  - Yes

*Rationale:* Channelization of streams and armoring of banks (e.g. riprap, walls, and concrete) increases the velocity of floodwaters. Although, it may reduce local flooding by separating the water resource from its floodplain, it often increases the risk of flooding downstream.

## Thermal Regulation Assessment Questions & Rationale

9. Does the aspect or orientation of the riparian area allow for shading of water at midday in the summer?
- Yes
  - No

*Rationale:* In Oregon, vegetation on the south side of an east/west-oriented water resource has the highest potential of providing shade in the summer. At Oregon's latitude, the midday sun is always south of vertical.

10. What is the dominant vegetation layer in the riparian area?
- Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high
  - Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high
  - Bare ground

*Rationale:* The ability of vegetation to provide shade is directly related to the height of the vegetation. In general, woody vegetation provides more shade than herbaceous vegetation.

11. Does woody vegetation hang over the edge of the water?
- Yes
  - No

*Rationale:* Overhanging woody vegetation provides shade, creating microclimates.

## Wildlife Habitat Assessment Questions & Rationale

12. How many vegetation layers (i.e. canopy, mid-story, groundcover) are present?
- More than 2 layers
  - 2 layers
  - 1 layer, or unvegetated

*Rationale:* Vertical complexity of vegetation increases the variety of niches available to wildlife.

13. What is the dominant vegetation layer in the riparian area?
- Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high
  - Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high
  - Bare ground

*Rationale:* In general, tall woody vegetation provides more food, cover, and nesting habitat for a variety of wildlife than herbaceous vegetation.

14. Does woody vegetation hang over the edge of the water?
- Yes
  - No

*Rationale:* Overhanging woody vegetation contributes leaves, woody debris, and insects to the water resource. It also shades the water and creates microclimates.

15. Is large woody debris present within the riparian area?
- Yes
  - No

*Rationale:* Large woody debris in the riparian area provides cover for a variety of small mammals, birds, amphibians and insects. It can also be transported to the aquatic system in flood events where it can enhance in-stream fish habitat.

16. What percent of the water resource edge is bordered by a vegetated riparian area at least 30 feet wide?
- Greater than 40%
  - Between 10% and 40%
  - Less than 10%

*Rationale:* A vegetated riparian area increases the quality of wildlife habitat by providing food, cover, and nesting opportunities. They can also create migration corridors for wildlife.

17. Is surface water present throughout the year?
- Yes
  - No

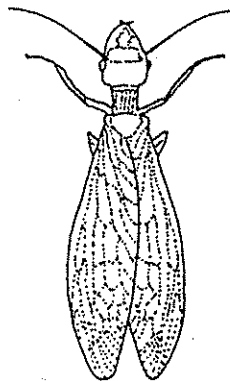
*Rationale:* A perennial water source is valuable to wildlife during the summer months.

18. Is there more than one type of water resource (e.g. stream, wetland, lake/pond) within or immediately adjacent to the riparian reach?
- Yes
  - No

*Rationale:* More than one type of water resource within or immediately adjacent to the riparian reach increases the complexity and quality of wildlife habitat.

19. What is the degree of development or human-caused disturbance (e.g. buildings, impervious surfaces, lawns, agriculture, trash) in the riparian area?
- Less than 25%
  - Between 25% and 75%
  - Greater than 75%

*Rationale:* Human-caused disturbance/development within the riparian area directly affects wildlife use. The proximity of human activities may negatively impact sensitive wildlife species that cannot tolerate noise, light, or traffic.







# Appendix D

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# Riparian Width Determination

Riparian Code  
MC-3L

Date: 5-15-98 Investigators: J. Doe

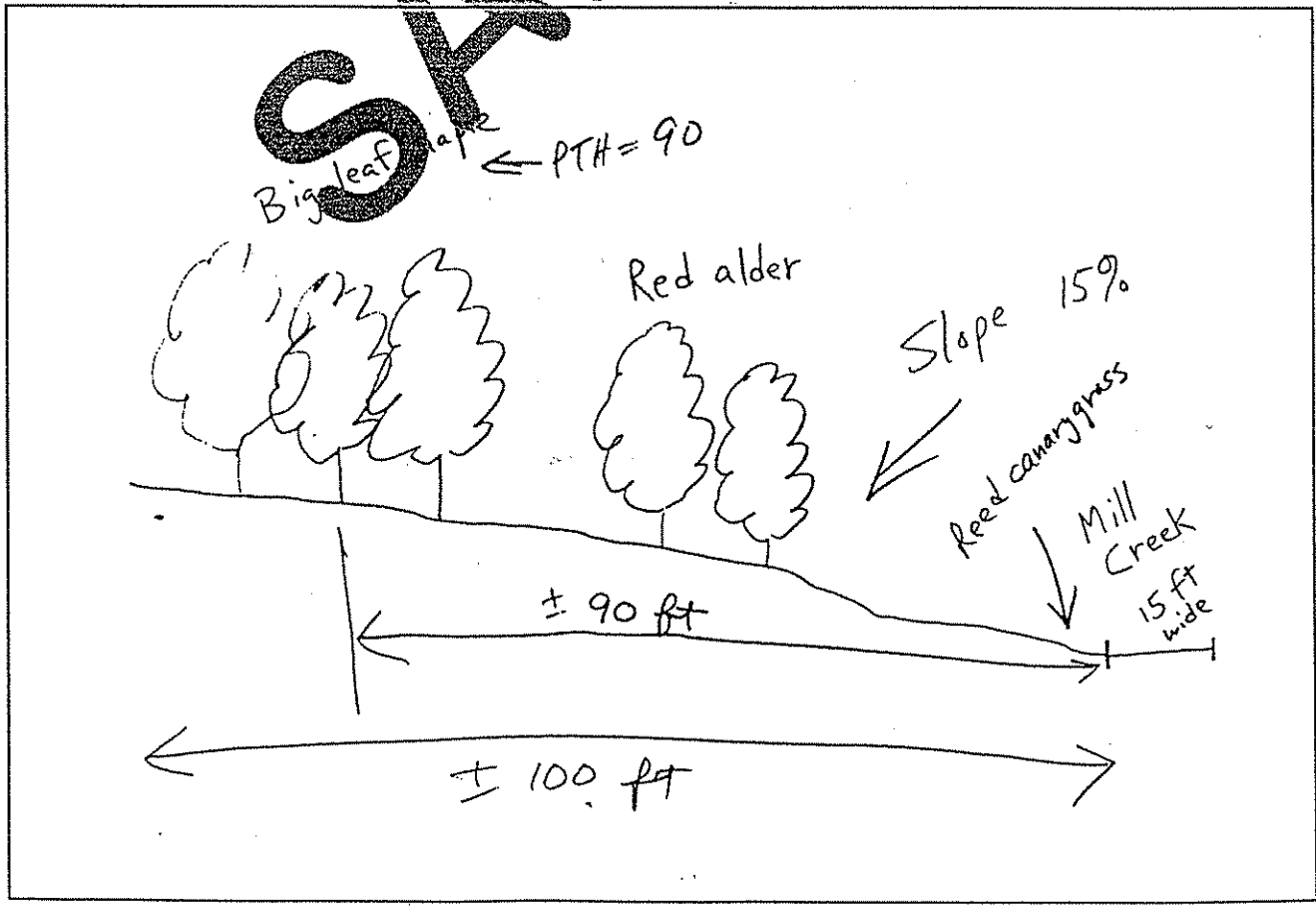
Dominant tree species: Acer macrophyllum (See other side for list of species)

Potential tree height (PTH)/Width of Riparian Area: 90/90 feet  
(Width measured horizontally from edge of water resource)

PTH determined by: On-site vegetation  Reference site  (Code \_\_\_\_\_)

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Typical Cross Section:



Potential Tree Heights

Tree species	Common Name	Avg mature height (feet)
<i>Acer macrophyllum</i>	Big leaf maple	90
<i>Abies grandis</i>	Grand fir	120
<i>Alnus rhombifolia</i>	White alder	75
<i>Alnus rubra</i>	Red alder	65
<i>Alnus sinuata</i>	Wavy-leaved alder	20
<i>Crataegus douglasii</i>	Douglas hawthorn	20
<i>Fraxinus latifolia</i>	Oregon ash	75
<i>Juniperus occidentalis</i>	Western juniper	20
<i>Malus fusca</i>	Pacific crabapple	20
<i>Myrica californica</i>	California wax myrtle	20
<i>Picea sitchensis</i>	Sitka spruce	120
<i>Pinus contorta</i>	Lodgepole pine	80
<i>Pinus contorta contorta</i>	Shore pine	50
<i>Pinus ponderosa</i>	Ponderosa pine	100
<i>Populus tremuloides</i>	Quaking aspen	60
<i>Populus trichocarpa</i>	Cottonwood	120
<i>Prunus emarginata</i>	Bitter cherry	25
<i>Pseudotsuga menziesii</i>	Douglas fir	120
<i>Rhamnus purshiana</i>	Cascara	35
<i>Quercus garryana</i>	Oregon white oak	60
<i>Salix amygaloides</i>	Peach leaf willow	35
<i>Salix exigua</i>	Coyote willow	15
<i>Salix geyeriana</i>	Geyer willow	20
<i>Salix hookeriana</i>	Hooker's willow	20
<i>Salix lasiandra</i>	Pacific willow	35
<i>Salix lasiolepis</i>	Arroyo willow	30
<i>Salix scouleriana</i>	Scouler's willow	30
<i>Salix sessilifolia</i>	Soft-leaved willow	20
<i>Salix sitchensis</i>	Sitka willow	20
<i>Thuja plicata</i>	Western red cedar	120
<i>Tsuga heterophylla</i>	Western hemlock	120
<i>Umbellularia californica</i>	California bay	60

# Riparian Characterization Form

GENERAL INFORMATION	
Date: <u>5-15-98</u>	Riparian Code: <u>MC-3L</u>
On-site <input checked="" type="checkbox"/> Off-Site <input type="checkbox"/>	Reach Length: <u>600</u>
Investigators: <u>J. Doe</u>	Hydrologic Basin: <u>Mill Creek</u>

WATER RESOURCE INFORMATION	
Water Resource: Stream/River <input checked="" type="checkbox"/>	Width: <u>15 ft.</u>
Lake/Pond <input type="checkbox"/>	Width: _____
Wetland <input type="checkbox"/>	Width: _____
LWI Wetland Code: <u>n/a</u>	
Water present year-round: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Are salmonids present in the adjacent water resource: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Is the water resource listed for temperature on DEQ's 303(d) list: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	

Within FEMA-mapped 100-year floodplain: Yes  No

Mapped soil series: Aloha silt loam

Adjacent Land Uses? (check as many as needed)

- |   |   |
|---|---|
| Agriculture <input type="checkbox"/>            | Roads <input checked="" type="checkbox"/> |
| Commercial/Industrial <input type="checkbox"/>  | Undeveloped <input type="checkbox"/>      |
| Residential <input checked="" type="checkbox"/> | Forestry <input type="checkbox"/>         |

Woody Vegetation (trees, shrubs, vines > 1 meter)	Herbaceous Vegetation (trees, shrubs, vines < 1 meter)
Acer macrophyllum	Alnus rubra
Alnus rubra	Hedera helix
Rosa nutkana	Phalaris arundinacea
Rubus discolor	
Salix hookeriana	

1 meter = 3.2 feet

Average slope in the riparian area. (Question 1)

<10:1 (10%)       Between 10:1 (10%) and 5:1 (20%)       >5:1 (20%)

Extent of impervious surface within the riparian area. (Question 4)

<10%       10% - 25%       >25%

Is the reach constricted by man-made features? (Question 8)

Yes       No

Does the orientation of the riparian area allow for shading of the water resource at midday in summer? (Question 9)

Yes       No

Dominant vegetation layer within riparian area? (Question 10)

Woody vegetation       Herbaceous vegetation       Bare ground

Does woody vegetation hang over the edge of the water? (Questions 11 & 14)

Yes       No

Large woody debris in riparian area? (Question 15)

Yes       No

Percent of water resource bordered by vegetated riparian area at least 30 feet wide? (Question 16)

>40%       10% - 40%       <10%

Degree of development or human caused disturbance. (Question 19)

<25%       25% - 75%       >75%

# Riparian Function Assessment Answer Sheet

## Water Quality

Riparian Code MC-3L
------------------------

1. What is the average slope in the riparian area?
  - a. Less than 10:1(10%) ..... 3 pts
  - b. Between 10:1 (10%) and 5:1(20%) ..... 2 pts
  - c. Greater than 5:1 (20%)..... 1 pt
  
2. What is the dominant vegetation cover in the riparian area?
  - a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high..... 3 pts
  - b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high..... 2 pts
  - c. Bare ground..... 1 pt
  
3. What is the dominant vegetation at the top of bank (if defined) or edge of water resource?
  - a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high..... 3 pts
  - b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high..... 2 pts
  - c. Bare ground..... 1 pt
  
4. What is the extent of impervious surfaces within the riparian area?
  - a. Less than 10% ..... 3 pts
  - b. Between 10% and 25% ..... 2 pts
  - c. Greater than 25% ..... 1 pt
  
5. How does the Natural Resources Conservation Service (formerly Soil Conservation Service) soil survey rank the water erosion hazard of the dominant mapped unit in the riparian area? Select the highest water erosion hazard description if more than one is listed.
  - a. Low, slight, moderate..... 2 pts
  - b. High, severe, very high ..... 1 pt

Score

2

3

2

2

2

11

Total Points:

Function: High (12-14 pts) Medium (8-11 pts) Low (5-7 pts)

### FUNCTION

- High
- Medium
- Low

# Riparian Function Assessment Answer Sheet

## Flood Management

Riparian Code MC-3L
------------------------

6. Are there flood prone areas (adjacent flat areas, depressions, swales, FEMA mapped 100-year floodplain, etc.) beyond the top of bank or edge of the water resource?
- a. Yes ..... 3 pts
- b. No ..... 1 pt
7. Is woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high dominant in the flood prone riparian area?
- a. Yes ..... 3 pts
- b. No or no flood prone area present ..... 1 pt
8. Is the stream or water resource constricted by man-made features (e.g. channelization, riprap, concrete wall)?
- a. No ..... 3 pts
- b. Yes ..... 1 pt

Score

3

3

1

Total Points:

7

Function:    High (8-9 pts)    Medium (5-7 pts)    Low (3-4 pts)

### FUNCTION

- High
- Medium
- Low



# Riparian Function Assessment Answer Sheet

## Thermal Regulation

Riparian Code MC-3L
------------------------

9. Does the aspect or orientation of the riparian area allow for shading of water at mid-day in the summer?
- a. Yes..... 3 pts
- b. No..... 1 pt
10. What is the dominant vegetation layer in the riparian area?
- a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high..... 3 pts
- b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high..... 2 pts
- c. Bare ground..... 1 pt
11. Does woody vegetation hang over the edge of the water?
- a. Yes..... 2 pts
- b. No..... 1 pt

Score

3

3

2

Total Points: 8

Function:    High (7-8 pts)    Medium (5-6 pts)    Low (3-4 pts)

**FUNCTION**

High   

Medium   

Low

# Riparian Function Assessment Answer Sheet

## Wildlife Habitat

Riparian Code MC-3L
------------------------

12. How many vegetation layers (i.e. canopy, mid-story, groundcover) are present?
- a. More than 2 layers ..... 3 pts
  - b. 2 layers ..... 2 pts
  - c. 1 layer, or unvegetated ..... 1 pt
13. What is the dominant vegetation layer in the riparian area?
- a. Woody vegetation (trees, shrubs, vines) greater than 1 meter (3.2 feet) high ..... 3 pts
  - b. Herbaceous vegetation or woody vegetation less than 1 meter (3.2 feet) high ..... 2 pts
  - c. Bare ground ..... 1 pt
14. Does woody vegetation hang over the edge of the water?
- a. Yes ..... 2 pts
  - b. No ..... 1 pt
15. Is large woody debris present within the riparian area?
- a. Yes ..... 3 pts
  - b. No ..... 1 pt
16. What percent of the water resource edge is bordered by a vegetated riparian area at least 30 feet wide?
- a. Greater than 40% ..... 3 pts
  - b. Between 10% and 40% ..... 2 pts
  - c. Less than 10% ..... 1 pt

Score

2

3

2

1

2

*Questions continued on next page.*

**Wildlife Habitat (continued)**

Riparian Code <b>MC-3L</b>
-------------------------------

17. Is surface water present throughout the year?
- a. Yes..... 3 pts
- b. No..... 1 pt
18. Is there more than one type of water resource (e.g. stream, wetland, lake/pond) within or immediately adjacent to the riparian reach?
- a. Yes..... 3 pts
- b. No..... 1 pt
19. What is the degree of development or human-caused disturbance (e.g. buildings, impervious surfaces, lawns, agriculture, trash) in the riparian area?
- a. Less than 25%..... 3 pts
- b. Between 25% and 75%..... 2 pts
- c. Greater than 75%..... 1 pt

Score

3

1

2

Total Points: 16

Function: High (19-23 pts) Medium (13-18 pts) Low (8-12 pts)

**FUNCTION**

- High
- Medium
- Low



**A Model Ordinance**  
**to Implement Statewide Planning Goal 5 Rules**  
**Related to Riparian Corridors,**  
**OAR 660-23-090**

*Prepared by Tom Ascher and Greg Verret, Tillamook County;  
with support of DLCD Technical Assistance Grant Program.*

# A Model Ordinance to Implement Statewide Planning Goal 5 Rules Related to Riparian Corridors, OAR 660-23-090

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*Available on-line from DLCD web page: [www.lcd.state.or.us](http://www.lcd.state.or.us)*

*For further information contact Jeff Weber, DLCD Coastal Program,  
503-731-4065 ext. 26.*

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## Introduction

Oregon's Statewide Planning Goal 5: *Natural Resources, Scenic and Historic Areas, and Open Spaces* requires local jurisdictions to adopt programs that will protect natural resources, including riparian corridors. New procedures and requirements for complying with Goal 5 became effective on September 1, 1996, and are contained within Oregon Administrative Rules (OAR) Chapter 660, Division 23. Specific provisions related to riparian corridors are contained in OAR 660-23-090.

The rules provide two alternative ways by which a local jurisdiction may implement Goal 5 requirements related to riparian corridors. One is the "standard" Goal 5 process that requires an inventory of riparian areas, an assessment of their significance, and adoption of a program to achieve Goal 5. Alternatively, a jurisdiction may follow a "safe harbor" process by adopting a standard definition of significant riparian areas under OAR 660-23-090(5), and implementing the "safe harbor" provisions of OAR 660-23-090(8) as a program to achieve Goal 5. The safe harbor provisions specify use restrictions in riparian corridors and provide options for hardship variances and restoration in lieu of fully meeting the standards.

Note that while it may not be entirely clear by reading the rule, jurisdictions are *not* constrained to apply either one option or the other jurisdiction-wide. A jurisdiction may implement the safe harbor alternative in areas where it makes most sense to do so, and undertake a more detailed inventory and analysis process in other areas. Likewise, riparian resources determined to be significant through a standard Goal 5 process may be protected by an ordinance adopted under the safe harbor option.

This model was developed specifically to implement the safe harbor alternative provided for in the Riparian Corridor rules. The model is a strict interpretation of the safe harbor provisions, and reflects feedback from DLCD staff. There are three sections: Definition and Inventory, Protecting the Resource, and Hardship Variances and Restoration Provisions. Each of the first three sections states the rule requirements and draft ordinance language.

## One: Definitions and Inventory

### Requirement: OAR 660-230-090 (5) and (4)

- (5) *As a safe harbor in order to address the requirements under OAR 660-23-030, a local government may determine the boundaries of significant riparian corridors within its jurisdiction using a standard setback distance from all fish-bearing lakes and streams shown on the documents listed in subsections (a) through (f) of Section (4) of this rule, as follows:*
- (a) *Along all streams with average annual stream flow greater than 1,000 cubic feet per second (cfs) the riparian corridor boundary shall be 75 feet upland from the top of each bank.*
  - (b) *Along all lakes, and fish-bearing streams with average annual stream flow less than 1,000 cfs, the riparian corridor boundary shall be 50 feet from the top of bank.*
  - (c) *Where the riparian corridor includes all or portions of a significant wetland as set out in OAR 660-23-100, the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland.*
  - (d) *In areas where the top of each bank is not clearly defined, or where the predominant terrain consists of steep cliffs, local governments shall apply OAR 660-23-030 rather than apply the safe harbor provisions of this section.*

The Documents identified in Section (4) of this rule are:

*At a minimum, local governments shall consult the following sources, where available, in order to inventory riparian corridors along rivers, lakes, and streams within the jurisdiction:*

- (a) *Oregon Department of Forestry stream classification maps;*
- (b) *United States Geological Service (USGS) 7.5 minute quadrangle maps;*
- (c) *National Wetlands Inventory maps;*
- (d) *Oregon Department of Fish and Wildlife (ODFW) maps indicating fish habitat;*
- (e) *Federal Emergency Management Agency (FEMA) flood maps; and*
- (f) *Aerial photographs.*

### Draft Ordinance Language:

#### I. Definitions and Inventory

- (A) The purpose of this ordinance is to protect and restore water bodies and their associated riparian areas, thereby protecting and restoring the hydrologic, ecologic and land conservation functions these areas provide. Specifically, this ordinance is intended to protect habitat for fish and other aquatic life, protect habitat for wildlife, protect water quality for human uses and for aquatic life, control erosion and limit sedimentation, and reduce the effects of flooding. The ordinance attempts to meet these goals by excluding structures from buffer areas around fish-bearing lakes, streams and associated wetlands, and by prohibiting vegetation removal or other alteration in those buffers. For cases of hardship, the ordinance provides a procedure to reduce the riparian buffer. Alteration of the riparian area in such cases shall be offset by appropriate restoration or mitigation, as stipulated in the ordinance.

(B) Definitions

- (1) "Building Envelope" means the land area, outside of all required setbacks, which is available for construction of a primary structure on a particular property.
- (2) "Fish Use" means inhabited at any time of the year by anadromous or game fish species or fish that are listed as threatened or endangered species under the federal or state endangered species acts. Fish use is determined from Oregon Department of Forestry Stream Classification maps.
- (3) "Impervious surface" means any material which reduces and prevents absorption of storm water into previously undeveloped land.
- (4) "Lawn" is grass or similar materials maintained as a ground cover of less than 6 inches in height. For purposes of this ordinance, lawn is not considered native vegetation regardless of the species used.
- (5) "Mitigation" means taking one or more of the following actions listed in order of priority:
  - (a) Avoiding the impact altogether by not taking a certain development action or parts of that action;
  - (b) Minimizing impacts by limiting the degree or magnitude of the development action and its implementation;
  - (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
  - (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the development action by monitoring and taking appropriate corrective measures;
  - (e) Compensating for the impact by replacing or providing comparable substitute resources or environments.
- (6) "Net Loss" means a permanent loss of habitat units or habitat value resulting from a development action despite mitigation measures having been taken.
- (7) "Non-conforming" is a structure or use that does not conform to the standards of this ordinance but has been in continuous existence from prior to the date of adoption of this ordinance up to the present. Non-conforming uses are not considered violations and are generally allowed to continue, though expansion, re-construction, or substantial improvement may be regulated
- (8) "Off-Site Mitigation" means habitat mitigation measures undertaken in areas distant from a development action, and which are intended to benefit fish and wildlife populations other than those directly affected by that action.



- (9) "On-Site Mitigation" means habitat mitigation measures undertaken within or in proximity to areas affected by a development action, and which are intended to benefit fish and wildlife populations directly affected by that action.
- (10) "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.
- (11) "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.
- (12) "Structure" is a building or other major improvement that is built, constructed or installed, not including minor improvements, such as fences, utility poles, flagpoles, or irrigation system components, that are not customarily regulated through zoning ordinances.
- (13) "Substantial Improvement" is any repair, reconstruction, or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either:
  - (a) Before the improvement or repair is started, or
  - (b) If the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition Substantial Improvement is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

The term does not, however, include either:

- (c) Any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or
  - (d) Any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.
- (14) "Top of Bank" means the stage or elevation at which water overflows the natural banks of streams or other waters of the state and begins to inundate upland areas. In the absence of physical evidence, the two-year recurrence interval flood elevation may be used to approximate the bankfull stage or delineate the top of bank.

(C) Riparian Corridors

The inventory of riparian areas contained in the Comprehensive Plan specifies which streams and lakes are fish-bearing, and the stream-size category. Based on the classification contained in this inventory, the following riparian corridors shall be established:

- (1) Along all fish-bearing lakes, and fish-bearing streams with average annual stream flow less than 1,000 cfs, the riparian corridor boundary shall be 50 feet from the top of bank, except as identified below.

- (2) Along all streams with average annual stream flow greater than 1,000 cubic feet per second (cfs) the riparian corridor boundary shall be 75 feet upland from the top of each bank.
- (3) Where the riparian corridor includes all or portions of a significant wetland as identified in the Goal 5 or Goal 17 elements of the Comprehensive Plan, the standard distance to the riparian corridor boundary shall be measured from, and include, the upland edge of the wetland.
- (4) Except as provided for in I(C)(3), the measurement of distance to the riparian corridor boundary shall be from the top of bank. The measurement shall be a slope distance. In areas where the top of each bank is not clearly defined, the riparian corridor boundary shall be measured from the ordinary high water level, or the line of non-aquatic vegetation, whichever is most landward. In areas where the predominant terrain consists of steep cliffs, the distance to the corridor boundary shall be measured as a horizontal distance until the top of the cliff is reached, and as a slope distance on from that point.

## Two: Protecting the Resource

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### Requirement: OAR 660-230-090 (8) (a - c)

- (8) *As a safe harbor in lieu of following the ESEE process requirements of OAR 660-23-040 and 660-23-050, a local government may adopt an ordinance to protect a significant riparian corridor as follows:*
  - (a) *The ordinance shall prevent permanent alteration of the riparian area by grading or by the placement of structures or impervious surfaces, except for the following uses provided they are designed to minimize intrusion into the riparian area:*
    - (A) *Streets, roads, and paths;*
    - (B) *Drainage facilities, utilities, and irrigation pumps;*
    - (C) *water-related and water-dependent uses;*
    - (D) *Replacement of existing structures with structures in the same location that do not disturb additional riparian surface area.*
  - (b) *the ordinance shall contain provisions to control the removal of riparian vegetation, except that the ordinance shall allow:*
    - (A) *Removal of non-native vegetation and replacement with native plant species;*
    - (B) *Removal of vegetation necessary for the development of water-related or water-dependents uses;*
  - (c) *Notwithstanding subsection (b) of this Section, the ordinance need not regulate the removal of vegetation in areas zoned for farm or forest uses pursuant to statewide Goals 3 or 4;*

## Draft Ordinance Language

### II. Activities Within the Riparian Area

- (A) The permanent alteration of the riparian area by grading or by the placement of structures or impervious surfaces is prohibited, except for the following uses provided they are designed to minimize intrusion into the riparian area, and no other options or locations are feasible:
- (1) Streets, roads, and paths;
  - (2) Drainage facilities, utilities, and irrigation pumps;
  - (3) water-related and water-dependent uses;
  - (4) Replacement of existing structures with structures in the same location that do not disturb additional riparian surface area;
  - (5) Structures or other non-conforming alterations existing fully or partially within the riparian area may be expanded provided the expansion does not occur within the riparian area. Substantial improvement of a non-conforming structure in the riparian area shall require compliance with the standards of this ordinance.
  - (6) Existing lawn within the riparian area may be maintained, but not expanded within the riparian area. Development activities on the property shall not justify replacement of riparian area with lawn.
  - (7) Existing shoreline stabilization and flood control structures may be maintained. Any expansion of existing structures or development of new structures shall be evaluated by the Director and appropriate natural resource agency staff. Such alteration of the riparian area shall be approved only if less-invasive or non-structural methods will not adequately meet the stabilization or flood control needs.
- (B) Removal of riparian vegetation is prohibited, except for:
- (1) Removal of non-native vegetation and replacement with native plant species. The replacement vegetation shall cover, at a minimum, the area from which vegetation was removed, and shall maintain or exceed the density of the removed vegetation.
  - (2) Removal of vegetation necessary for the development of approved water-related or water-dependents uses. Vegetation removal shall be kept to the minimum necessary to allow the water-dependent or water-related use.
  - (3) Trees in danger of falling and thereby posing a hazard to life or property may be removed, following consultation and approval from this department. If no hazard will be created, the department may require these trees, once felled, to be left in place in the riparian area.

- (C) Exceptions: The following activities are not required to meet the standards of this section.
- (1) Commercial forest practices regulated by the Oregon Forest Practices Act.
  - (2) Normal and accepted farming practices other than buildings or structures, occurring on land zoned for exclusive farm use and existing in the riparian area since prior to the date of adoption of this ordinance.

### **Three: Hardship Variances and Restoration Provisions**

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**Requirement:** 660-230-090 (8)(d) and (e)

- (d) *the ordinance shall include a procedure to consider hardship variances, claims of map error, and reduction or removal of the restrictions under subsections (a) and (b) of this Section for any existing lot or parcel demonstrated to have been rendered not buildable by application of the ordinance; and*
- (e) *The ordinance may authorize the permanent alteration of the riparian area by placement of structures or impervious surfaces within the riparian corridor boundary established under subsection (5)(a) of this rule upon a demonstration that equal or better protection for identified resources will be ensured through restoration of riparian areas, enhanced buffer treatment or similar measures. In no case shall such alterations occupy more than 50% of the width of the riparian area measured from the upland edge of the corridor.*

### **Draft Ordinance Language:**

#### **III. Alteration Requiring Mitigation**

- (A) Permanent alteration of the riparian area by placement of structures or impervious surfaces is allowable under the following procedures, subject to the mitigation requirements of Section III(B).
  - (1) A setback adjustment as allowed under Section III(C).
  - (2) A Variance to the riparian setback approved through the procedures of Section III(D).
  - (3) On streams having average annual stream flow exceeding 1,000 cubic feet per second and having a 75-ft riparian buffer established under this ordinance, the riparian setback may be reduced as allowed under Section III(E).
- (B) Proposals for development activities within the riparian area allowed in Section III(A) shall be reviewed by the Oregon Department of Fish and Wildlife (ODFW), as per OAR 635-415 Fish and Wildlife Habitat Mitigation Policy. A mitigation recommendation shall be obtained from ODFW. For purposes of implementing Goal 5, the goal is no net loss of protected resources; correspondingly, for purposes of designing appropriate mitigation, sites should be considered at least in "Habitat Category 2" (OAR 635-415-030), which strives for no net loss of habitat values.

Approval of the development proposal shall be conditional, requiring compliance with the mitigation recommendations of ODFW.

(C) Setback Adjustment

- (1) Qualifying lots: Lots on which the riparian setback required by this ordinance exceeds any other setbacks in a particular yard, and which, when combined with other required yard setbacks, results in a building area depth of 25 ft or less or a building envelope of 800 sq ft or less.
- (2) Setback reduction procedure Setback reduction shall be the minimum necessary to create a building envelope 25-feet deep or a building envelope of 800 sq ft (whichever requires a lesser reduction of the setback). The yard setback opposite the riparian area may be reduced up to  $\frac{1}{2}$  the standard setback. If this does not create a sufficient building envelope, the riparian setback may be reduced up to  $\frac{1}{2}$  the required setback. Additional reductions of setbacks require a variance. Removal of vegetation within the original riparian setback shall be the minimum necessary to allow development of the use, and shall otherwise conform with the standards of Section IIB of this ordinance.

(D) Variance

- (1) In cases where the provision for a Setback Adjustment under Section III(C) are not sufficient, a property owner may request a Variance to the riparian setback. Granting of a Variance requires findings that:
  - (a) the proposed development requires deviation from the riparian standards; and
  - (b) strict adherence to the riparian setback and other applicable standards would effectively preclude a use of the parcel that could be reasonably expected to occur in the zone, and that the property owner would be precluded a substantial property right enjoyed by the majority of landowners in the vicinity; and
  - (c) the provisions of Section III(C) are insufficient to remedy the hardship.

(E) Large Stream Riparian Reduction: On streams having average annual stream flow exceeding 1,000 cubic feet per second and having a 75-ft riparian buffer established under this ordinance, structures and impervious surfaces may be placed within the riparian setback as follows:

- (1) The removal of vegetation shall be limited to the minimum amount necessary to accommodate the use. Any vegetation removed in excess of this standard shall be non-native species, and the proposal shall specify replacement of that vegetation with native species.

- (2) The applicant shall provide sufficient information regarding the proposed development and potential impacts to riparian resources to allow the staff, in consultation with the Oregon Department of Fish and Wildlife, to determine whether the proposal will provide equal or better protection of riparian resources. This information includes, but is not necessarily limited to: a plot plan showing the top of the stream or waterbody bank, the extent of development within the riparian setback, uses that will occur within the riparian setback and potential impacts (for example: chemical runoff, noise, etc.), the extent of vegetation removal proposed, characteristics of the existing vegetation (types, density), any proposed alterations of topography or drainage patterns, existing uses on the property and any potential impacts they could have on riparian resources.
- (3) In no case shall such alterations occupy more than 50% of the width of the riparian area measured from the upland edge of the corridor.

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June 30, 1998