

# Life on the Edge: Improving Riparian Function

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This publication focuses on how riparian areas can be improved to enhance water quality and salmon habitat.

## What is a riparian area?

A riparian area is the strip of land bordering a stream, lake, or wetland (aquatic area) plus the zone influencing this area. Its vegetation and microclimate are strongly influenced by annual and intermittent water, a high water table, and wet soils. It provides large wood, smaller organic material, shade, and insects to the stream and riparian area.

Riparian vegetation differs around Oregon. Figure 1 illustrates a western Oregon riparian area dominated by conifers, deciduous (hardwood) trees, and some shrubs, grasses, sedges, and rushes. In contrast,

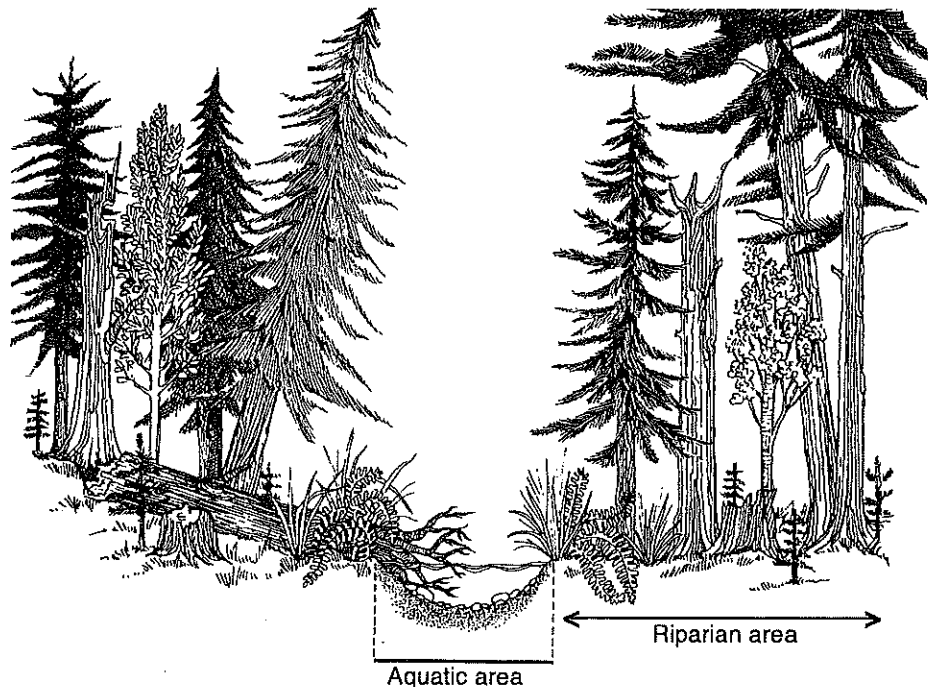


Figure 1.—Riparian and aquatic zones typical of western Oregon.



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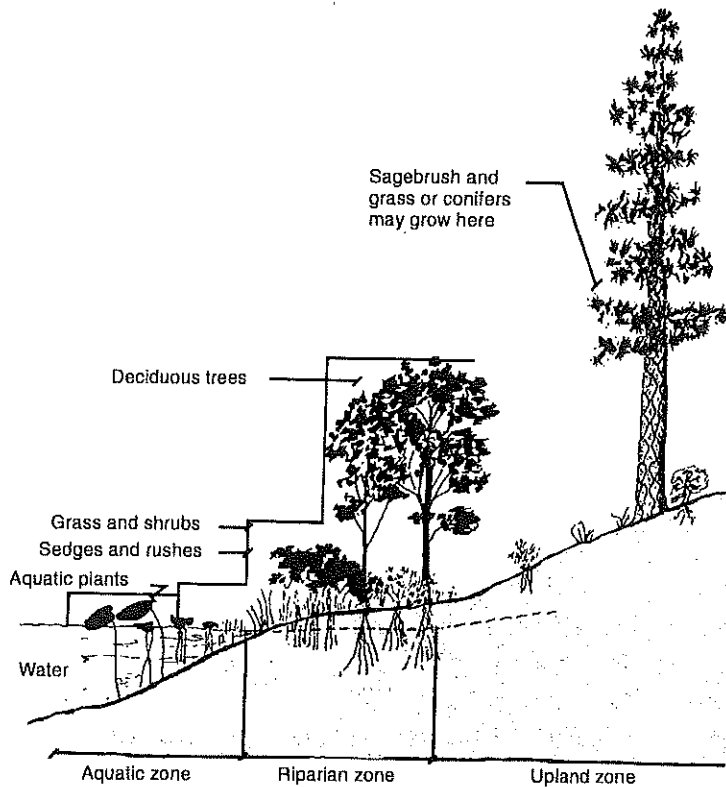


Figure 2.—Riparian and aquatic zones typical of eastern Oregon.

Figure 2 illustrates an eastern Oregon riparian area dominated by grasses, shrubs, sedges, rushes, and some deciduous trees and conifers.

Geography, climate, and past disturbances (e.g., fire and floods) affect natural conditions. However, land use history plays a major role in what we see today.

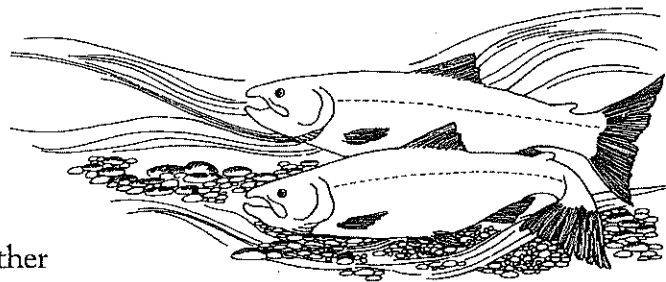
Oregon's Forest Practice Rules regulate timber management and related activities in *Riparian Management Areas* (RMAs) on forestland. RMAs are regulated differently than uplands in order to protect fish, wildlife, and water quality. The width of each RMA depends on the size of its stream (which is largely a function of watershed area and local precipitation) and on whether the stream is used by fish or humans.

## How riparian areas benefit salmon

Beneficial functions of riparian areas include:

- Providing organic material as food for fish and aquatic life
- Supplying large and small wood as stream habitat for fish (primarily in western Oregon)
- Altering how much sunlight reaches the stream—a factor in stream temperature and photosynthesis
- Stabilizing stream banks, thus reducing erosion
- Filtering sediment and materials from overland runoff, as well as trapping and holding sediment in the stream
- Absorbing nutrients from overland runoff and subsurface flow
- Storing and releasing water

*Riparian enhancement activities focus on improving these functions to maintain or improve habitat and water quality for salmon, other aquatic species, wildlife, and humans. The degree of improvement possible depends on the quantity and types of vegetation the site will support and on the social and economic constraints on change.*



## Western Oregon riparian enhancement

Riparian enhancement in western Oregon often focuses on the long-term goal of establishing diverse patches of tree species, sizes, and age classes, including large conifers. Large conifers that fall into a stream last much longer than hardwoods. They provide the long-term building blocks for fish habitat by creating pools, providing cover, stabilizing gravel used by spawning fish, trapping other wood for cover, and holding organic material. The organic material is food for stream insects, which in turn are food for fish.

### Assessing conditions and proposing changes

Soil conditions, water table depth, and flooding cause riparian conditions to vary greatly at different locations along the same stream. You can get technical help to assess riparian conditions and identify vegetation types a riparian area can support (see page 7). Table 1 gives a general description of tree species and their tolerance to shade and flooding. These tolerances play an important role in deciding where to plant trees in relation to a stream and wet soils.

### Increasing diversity of tree species

When converting a hardwood tree- and shrub-dominated riparian area to a mix of conifers and hardwoods, focus on planting patches of the tree species that are desired but not present. Always select species appropriate for the site. A common mistake is to try to convert alder stands to conifers when soil and water conditions limit conifer survival.

A riparian-area assessment might find live conifers under the canopy of hardwoods and tall shrubs. If the conifers are young, healthy, and have good crowns, removing hardwoods and shrubs will improve their growth.

### Protecting the investment

The main concerns for conifer survival are lack of sunlight and water due to competing brush and trees. Since most tree seedlings require lots of sunlight to become established (usually for about 5 years), you may need to remove some hardwoods and shrubs to increase sunlight. Competing brush, grasses, and weeds generally need to be removed until

**Table 1.**—Tree species and their tolerance to shade and flooding.

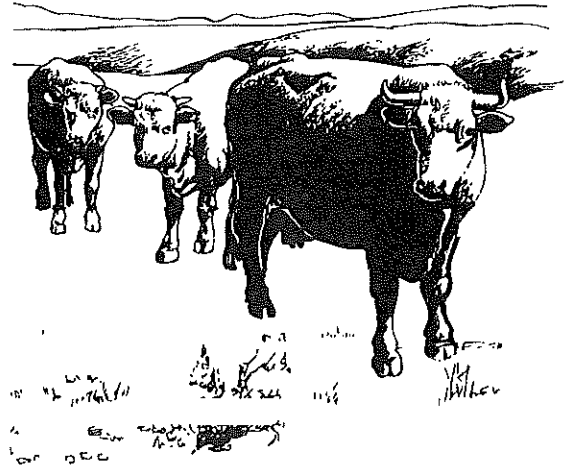
Tree species	Tolerance to flooding	Tolerance to shade
Douglas-fir	Low	Low
Redcedar	Medium	Medium
Redwood	High	High
Spruce	Medium	Medium
Shore pine	Medium	Low
Hemlock	Low	High
Grand fir	Medium	Medium
Willows	High	Low
Alders	Medium	Low
Poplars	Medium	Low
Bigleaf maple	Medium	Medium
Vine maple	Medium	Medium
Dogwood	Low	High
Ash	High	Medium

*Note: Some species may not be appropriate for a given area. Shade tolerance refers to ability to survive in partial light. Most seedlings (usually 1–5 years old) prefer open sunlight for maximum growth.*

trees are well above browse height and competing vegetation.

Browsing by wildlife and livestock also can affect survival. You can place tree protectors over seedlings to reduce wildlife browse. These devices range from solid tubes to wire mesh cages.

A proper livestock management plan is required to regulate timing and intensity of grazing in a riparian area. Fencing and off-stream water are common tools for managing livestock and riparian areas.



## Case example

A stream runs through an agricultural property. The stream's average width is 15–20 feet. It floods over its banks on average once every 1–2 years.

**Management goals:** Manage the riparian area to improve habitat and water quality for salmon, while continuing to graze livestock in the remaining pastures.

**Riparian assessment:** The riparian area is managed as a mixture of grasses with patches of mature willows and alders. It is capable of supporting a mixture of conifers (such as spruce, grand fir, and western redcedar) and hardwoods (such as alder, Oregon white ash, and bigleaf maple). A thin band of willows could grow next to the stream.

**Management change:** The landowners will set aside a 25-foot-wide area next to the stream as a riparian management area. They'll plant patches of hardwoods and conifers in this area and a thin band of willows next to the stream. Some tree species and grass species will seed into the area naturally.

**Protecting the investment:** The landowners will install a fence and off-stream watering sources to ensure the trees are not grazed and the stream bank is not disturbed. To prevent brush from overtopping desired trees, they also will remove or trim competing brush until trees are above brush height.

## Eastern Oregon riparian enhancement

Eastern Oregon riparian enhancement usually focuses on increasing the quantity and variety of vegetation (Figure 3). Land use practices in the late 1800s and early 1900s resulted in fewer wildfires and some heavy grazing. These practices often increased weed species, changed riparian vegetation, and altered stream conditions.

Again, the most important step in riparian improvement is to identify what vegetation the site can support and its current limitations. Many projects fail due to planting inappropriate species or not taking into account frost conditions or a fluctuating water table.

Increasing the quantity and variety of riparian vegetation in rangeland areas primarily involves changing management of livestock or big game (wildlife) grazing. Usually there is plenty of natural seed for grasses, sedges, and rushes to reoccupy the site following a management change. You can plant grasses, shrubs, and trees if the seed supply is lacking or you desire more prompt change.

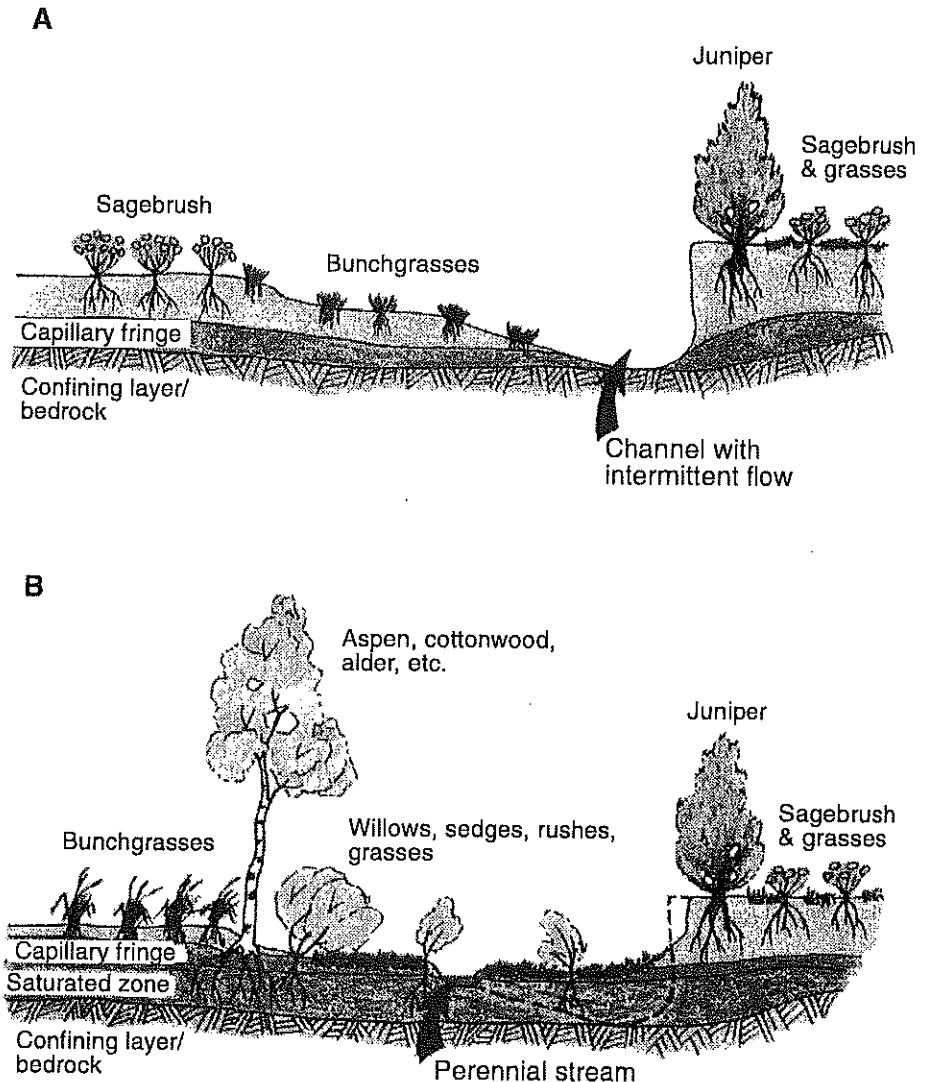


Figure 3.—Characteristics and functions of two riparian areas and related stream conditions.

- (A)
- Little vegetation to protect and stabilize banks, little shading
  - Lowered saturated zone, reduced subsurface storage of water
  - Little or no summer stream flow
  - Warm water in summer and icing in winter
  - Poor habitat for fish and other aquatic organisms
  - Low forage production and quality
  - Low diversity of wildlife habitat
- (B)
- Vegetation and roots protect and stabilize banks, improve shading
  - Elevated saturated zone, increased subsurface storage of water
  - Increased summer stream flow
  - Cooler water in summer, reduced ice effects in winter
  - Improved habitat for fish and other aquatic organisms
  - High forage production and quality
  - High diversity of wildlife habitat

### *Protecting the investment*

The main concerns for plant survival are grazing by livestock and wildlife, competition for water by weeds and upland trees, and poor soil conditions. Protection activities are similar to those in western Oregon.

A livestock management plan that adjusts timing and intensity of grazing in the riparian area is essential. Fencing and providing off-stream water help control grazing. Some areas might require livestock exclusion for a limited time until the area reestablishes its plant diversity.

If upland species such as juniper are overabundant and are affecting recovery efforts, you may need to remove some to allow native grasses, shrubs, sedges, and rushes to become established.

### **Stream bank erosion**

Streams change over time. Figure 4 illustrates a meandering stream that erodes the outside of a bend and deposits sediment on the inside of a bend.

Flood events can cause significant changes in stream patterns. Floods carve new stream channels and deposit new soil in the floodplain.

Riparian areas adjust in species, width, and complexity as streams change. A well-established riparian area with vegetation of various species, sizes, and ages adapts to change better than a simplified, narrow riparian area. It also may reduce erosion and maintain better stream conditions for salmon.

In some cases, stream banks may be heavily eroding due to changes in stream condition, prolonged poor riparian conditions, or upland problems. Planting trees and changing grazing and logging practices may not help stabilize such a site for many years, depending on site

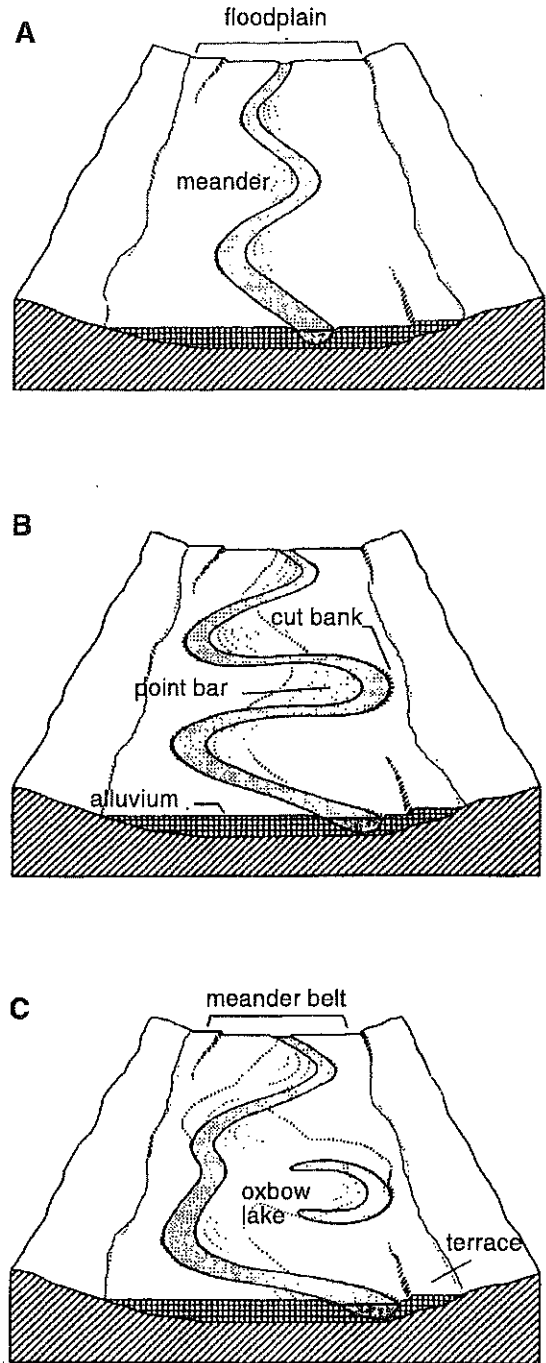


Figure 4.—Stream systems are naturally dynamic. Meanders (A) move by cutting the outside bank and building a point bar (B). In some cases, an oxbow is formed when the channel cuts across a meander (C).

and climatic conditions. These cases require a technical review of the problems so they can be addressed economically in a way that will support good riparian and stream conditions.

## Sources of assistance

Riparian science and management are expanding and evolving rapidly. Scientists and resource specialists continue to study and evaluate historical land use patterns, riparian area functions, and relationships between riparian areas and stream conditions. They strive to better understand and apply effective, economical riparian improvement and restoration techniques. For further assistance and current information, please contact the following professionals and groups.

For technical assistance on purchasing, selecting, planting, and protecting trees; managing riparian vegetation; grazing management; and erosion control; contact your local representatives from:

- Oregon State University Extension Service
- Oregon Department of Forestry
- USDA Natural Resources Conservation Service
- Oregon Department of Agriculture
- Other agencies and private consultants working in your area that specialize in riparian management

For financial assistance, contact your local:

- Watershed council
- Soil and Water Conservation District
- Oregon Department of Forestry
- USDA Farm Services Agency
- US Fish and Wildlife Service
- Other knowledgeable agency representatives

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## For more information

A 12-minute videotape, *Life on the Edge: Improving Riparian Function* (VTP 033), is available. It is in the VHS format and includes one copy of this study guide. Cost is \$19.95 (includes shipping and handling).

Additional copies of this study guide (EM 8738) also are available for \$1.50 per copy.

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This project was funded by the U.S. Environmental Protection Agency (EPA), Oregon Forest Resources Institute (OFRI), and Oregon State University Extension Service.

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Figure 1: From *The Stream Scene: Watersheds, Wildlife, and People*, 2nd edition, Bowers, Patty, et al. (Oregon Department of Fish and Wildlife, 1999)

Figure 2: Oregon Watershed Improvement Coalition

Figure 3: *Rangelands*, December 1987

Figure 4: *Rangelands*, August 1997

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This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

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Published November 1999. Reprinted April 2000.