

# Riparian areas

6

*"Most people camp too close to the creek to make good coffee."*  
— Rube Long

The physical, chemical, and biological makeup of a stream relates to the surrounding physical features of the watershed and its geologic origin. Looking at these features helps us understand stream-watershed relationships and allows managers to predict the effects of human influences on different streams.

Think of the uplands of a watershed as the sides of a funnel, and the stream flowing from the mouth of the funnel. The **riparian area** is the sides of the spout surrounding the stream. The riparian area is the green zone of plants along the stream. Water, nutrients, and sediments from across the uplands move downhill to support this lush and productive area.

Streams and riparian areas develop together, each affecting the development of the other. Headwater streams are small, and the riparian areas that surround them are relatively narrow. Larger streams and rivers flood more often, and floodwaters carve out wide **floodplains**. The plant communities that develop along the edge of the stream are generally distinct from those that cover the broader, and somewhat drier floodplains.

Plants along the stream influence the entire stream ecosystem. Riparian areas (Figure 6) have several unique properties. A riparian area is linear, has a water transport

channel and floodplain, and is connected to upstream and downstream ecosystems.

Riparian habitat is a combination of three areas. Each is distinctive and contributes to the entire ecosystem.

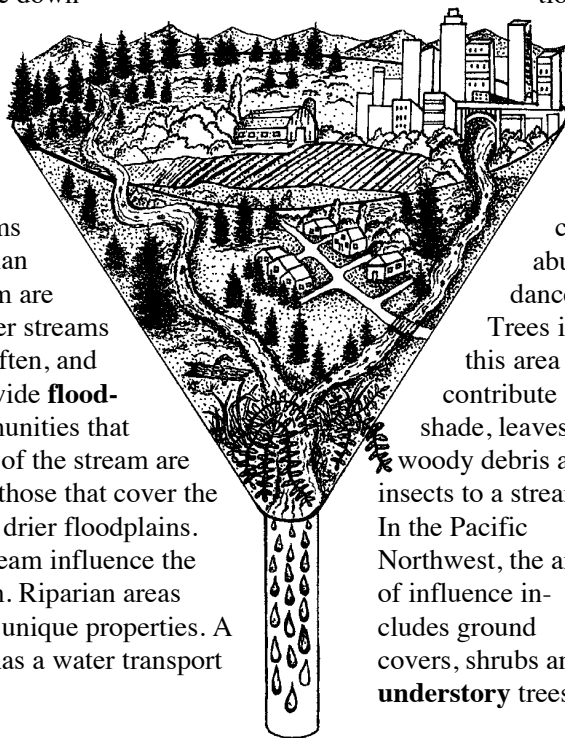
**Aquatic area:** The aquatic area of streams, lakes and wetlands is generally wet. During dry periods, aquatic areas have little or no water flow. Any side channels or oxbows containing freshwater ponds are included in this area.

**Riparian area:** The riparian area is a terrestrial zone where annual and intermittent water, a high water table, and wet soils influence vegetation and microclimate.

**Area of influence:** This is a transition area between a riparian area and upland cover. An area of influence has soil moisture and is characterized by a noticeable change in plant composition and

abundance.

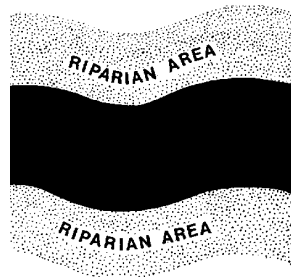
Trees in this area contribute shade, leaves, woody debris and insects to a stream. In the Pacific Northwest, the area of influence includes ground covers, shrubs and **understory trees**



## Vocabulary

aquatic area  
aquifer  
area of influence  
edge effect  
floodplains  
Oregon Forest  
Practices Act  
riparian area  
riparian management  
areas  
understory

(usually deciduous) on the floodplains, and canopy trees (usually coniferous) on hillsides. This stair-stepping of vegetation provides a variety of wildlife habitat.



Stream food chains depend on organic debris for nutrients. In small headwater streams, 99% of the energy for organisms comes from the vegetation along the stream, and only 1% from photosynthesis. The leaves, needles, cones, twigs, wood, and bark dropped into a stream are a storehouse of readily available organic material that is processed by aquatic organisms and returned to the system as nutrients and energy.

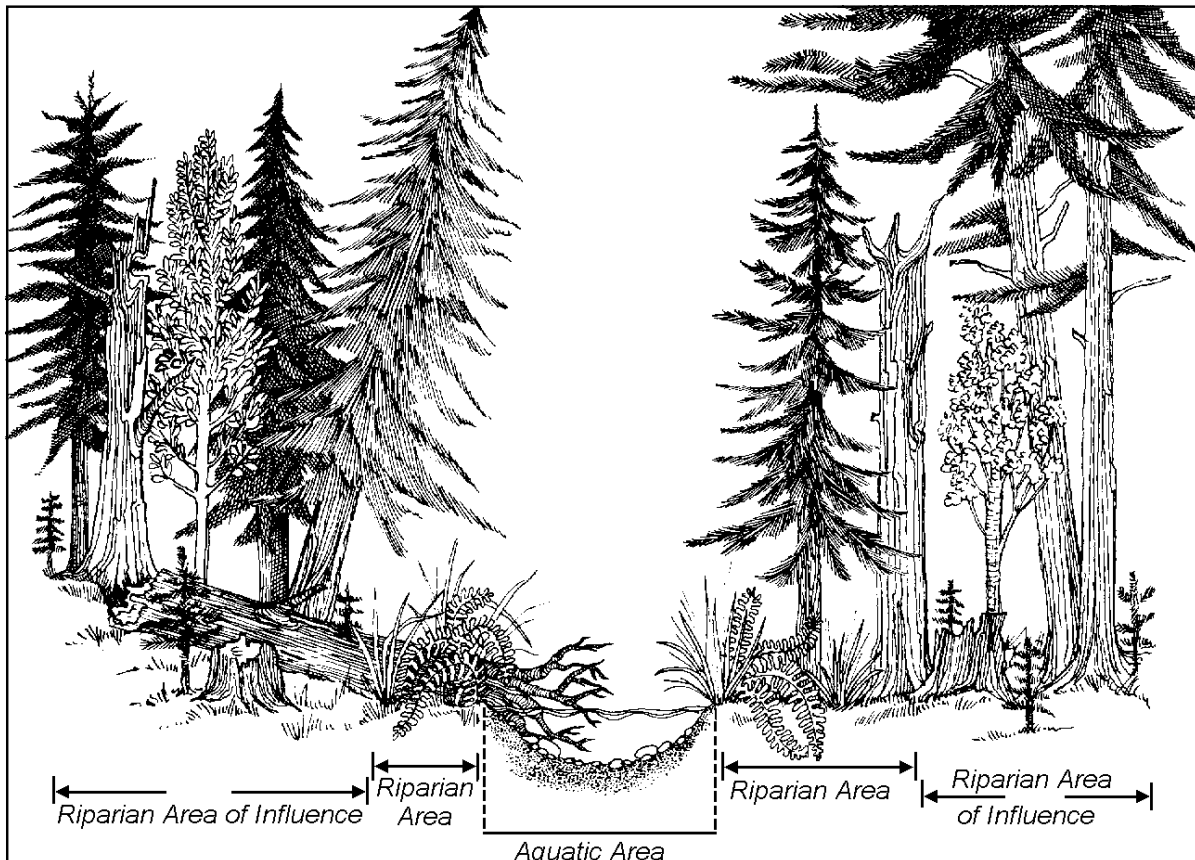
A diverse population of insects depends on this varied food base. Between 60% and 70% of the debris is retained and processed in the headwaters by bacteria, fungi, insects, and abrasion, with very little leaving the system until it has been at least partially processed.

Riparian areas have a high number of edges (habitat transitions) within a very small area. The large number of plant and animal species found in these areas reflects habitat diversity. Since they follow streams, riparian areas are linear,

## Role of riparian vegetation

Riparian plant communities (Table 1) provide cover for aquatic and terrestrial animals. Shade created by the riparian vegetation moderates water and air temperatures. This vegetation limits water contamination, slows water velocities and filters and collects large amounts of sediment and debris. Uncontrolled sediments can kill fish and destroy spawning areas.

**Figure 6. Riparian Habitat**



increasing the amount and importance of **edge effect**. Extensive edge and resulting habitat diversity yield an abundance of food and support a greater diversity of wildlife than nearly any other terrestrial habitat.

## Floodplains

Floodplains are an important part of a riparian area. Floodplain vegetation that shades or directly contributes material to a stream is considered part of the riparian area.

---

*Flooding is critical to the exchange of nutrients and energy between stream and riparian area.*

---

Stream channels rely on natural flooding patterns. Frequency of flooding and groundwater supply are the major factors controlling the growth of floodplain trees. Floodplains and

backwaters act as reservoirs to hold surplus runoff until peak floods are past. This controls and reduces downstream flooding. Floodplains also spread the impact of a flood over a larger area as vegetation helps collect debris and sediment.

Composition of riparian plant communities depends on the water pattern (fast or slow moving or dry or wet periods). Both wet and dry phases are necessary in this area to complete the stream's nutrient cycle and food chain. Flooding is critical to the exchange of nutrients and energy between the stream and the riparian area.

When healthy, vegetated banks in the riparian area act as natural sponges. They help maintain soil structure, allow increased infiltration, and reduce bank erosion.

Vegetated streambanks also contribute to aquifer (groundwater) recharge. Precipitation is filtered through the riparian soils and enters underground reservoirs called **aquifers**. Good cover slows the flow and increases percolation into underground aquifers. Stored water is then available during drier periods to maintain and improve minimum flow levels. A major benefit of this aquifer recharge is maintenance of year-round streamflow.

**Table 1. Functions of Riparian Vegetation As They Relate to Aquatic Ecosystems**

<b>Riparian Vegetation</b>		
<b>Site</b>	<b>Component</b>	<b>Function</b>
Above ground- above channel	Canopy and stems	<ul style="list-style-type: none"> <li>• Shade—controls temperature and instream photosynthetic productivity</li> <li>• Source of large and fine plant detritus</li> <li>• Source of terrestrial insects</li> </ul>
In channel	Large debris derived from riparian vegetation	<ul style="list-style-type: none"> <li>• Control routing of water and sediment</li> <li>• Shape habitat—pools, riffles, cover</li> <li>• Substrate for biological activity</li> </ul>
Streambanks	Roots	<ul style="list-style-type: none"> <li>• Increase bank stability</li> <li>• Create overhanging banks—cover</li> </ul>
Floodplain	Streams and low-lying canopy	<ul style="list-style-type: none"> <li>• Retard movement of sediment, water and floated organic debris in flood flows.</li> </ul>

Source: William Meehan et al., *Influences of Riparian Vegetation on Aquatic Ecosystems With Particular References to Salmonid Fishes and Their Food Supply*, 1977, p. 137.

Riparian vegetation uses large amounts of water in transpiration. Often, vegetation needs the most water during the period of lowest streamflow. At these times, vegetation may actually reduce streamflow.

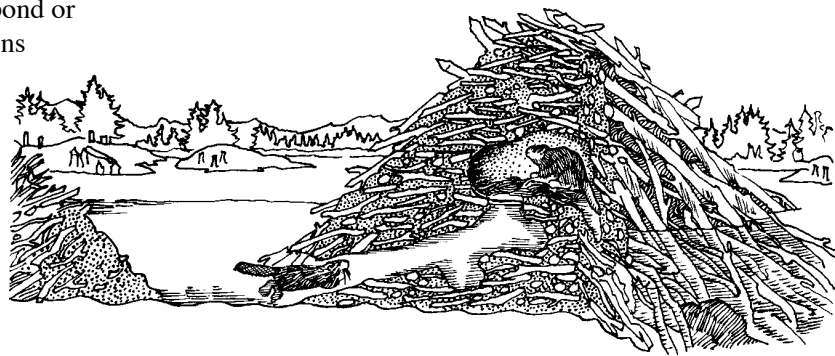
## Wildlife in riparian areas

Riparian ecosystems provide the essentials of wildlife habitat: food, water and cover. In general, the area within 200 yards of a stream is used most heavily by wildlife. In western Oregon, of 414 known species of wildlife, 359 use riparian ecosystems extensively and 29 species are tied exclusively to this area. While riparian areas cover less than 1% of the land in eastern Oregon, 280 of 379 species use this area extensively.

Riparian areas provide migration routes and corridors between habitats for many animals. Woody plant communities in the riparian area provide cover, roosting, nesting and feeding areas for birds; shelter and food for mammals; and increased humidity and shade (thermal cover) for all animals.

Birds are the most common and conspicuous form of wildlife in a riparian ecosystem. In this important breeding habitat, as many as 550 breeding pairs have been found per 100 acres. Bird density is just one indicator of the productivity of a riparian area.

Mammals of all sizes are found in riparian areas. Many rodents are parts of various food chains. Some, such as beaver, may modify riparian communities. The effects of beavers on a watershed can be both positive and negative. Their actions change watershed hydrology as well as damage cover. A beaver dam changes energy flow in its immediate area by turning part of a stream environment into a pond or swamp. If high beaver populations coincide with heavy livestock use, the results can be devastating to streams. On the other hand, their dams can be beneficial as sediment traps and fish habitat. Water held behind a beaver dam is released more slowly over a longer period.



Amphibians and reptiles are another indicator of riparian quality. Nearly all amphibians depend on aquatic habitats for reproduction and overwintering. Certain turtles, snakes, and lizards also prefer riparian ecosystems.

Animal populations in riparian areas are affected by the size and diversity of available

---

*Amphibians and reptiles are another indicator of riparian quality.*

---

habitat. Adjacent land-use activities may have a direct effect on wildlife population size within a riparian area.

Fish populations can be an indicator of watershed and riparian ecosystem health. Large woody materials, such as fallen trees and limbs, create pools and protective cover, which are necessary components of fish habitat. This woody debris also increases the diversity of invertebrates, which are a basic part of the food chain on which fish depend.

## People in riparian areas

Since the land along streambanks and floodplains is often fairly flat, riparian areas are attractive locations for roads. Roadbuilding may increase sedimentation, which can adversely affect aquatic life, especially fish. Runoff from roads can carry oil, antifreeze, and other contaminants

into the stream. Road construction can also damage valuable wildlife habitat. Traffic, a hazard in itself, may disturb or displace many wildlife species.

Roads probably have a greater and longer-lasting impact on riparian areas than any other human activity. Routes should be selected and designed with careful consideration of potential long-term effects.

Riparian vegetation is often cleared for farming purposes. This often weakens bank structure, making it more susceptible to erosion and a contributor to sediment deposition downstream. Landowners who convert riparian areas to farmland for short-term gains in agricultural production may lose in the long run. The loss of vegetation on stabilized banks could cause the stream to wash away that same valuable land during periods of high flow.

Livestock, like wildlife, are attracted to shade, water and forage in riparian areas. If mismanaged—allowing the area to be grazed excessively or at the wrong time—livestock can severely affect the riparian area's value. Livestock can compact the soil near the water, reducing its infiltration capabilities. When riparian vegetation is damaged—either by trampling or overgrazing—shading is reduced, erosion potential is increased as streambanks slough away, water tables are lowered, and water quality is affected. Animal wastes may also threaten water quality.



Livestock can be managed. The impact of livestock can be reduced by controlling access and grazing levels along streambanks.

Residential and commercial development has occurred near riparian areas throughout history. Development in these sites has generally degraded the value of the resources. Degradation

---

*Roads probably have a greater and longer-lasting impact on riparian areas than any other human activity.*

---

has included filling and altering of stream channels, removing vegetation for building construction, and paving large amounts of land for roadways.

Some problems associated with development can be avoided by good planning and site design. Residential communities can be planned with riparian area values in mind. Construction sites can avoid steep slopes, wetlands, and sensitive biological sites. Areas that offer the amenities of a relatively healthy riparian area often have an increased real estate value.

Construction of campgrounds and recreation sites in riparian areas encourages use by anglers, birdwatchers, hikers, boaters, and others. This

use, especially irresponsible acts like littering or erosion caused by improper use of off-road vehicles, may conflict with the welfare of wildlife and reduce water quality.

Streams and their riparian areas are the source of domestic water for many cities. High water quality is important for these uses. To maintain it, riparian areas must be carefully managed.

Mining in and near streams has severe impacts on riparian ecosystems. Mining

often increases sedimentation and disrupts spawning areas by moving large amounts of gravel, rock and soil. In addition, mining may introduce poisonous heavy metals into streams.

## Timber harvest in riparian areas

Timber harvest in riparian areas requires careful management and consideration for possible effects on fish and wildlife habitat. Prior to the Oregon Forest Practices Act in 1971, timber harvest was largely uncontrolled along streams, lakes, wetlands, or other waters. Clearcuts commonly extended to the edges of these waters, and most trees and understory brush were either removed or damaged. Removal of this vegetation eliminated future sources of large woody debris and reduced the shade that prevented increased water temperatures. Early logging practices also caused severe damage to stream habitat. For example, dragging and decking logs in stream channels and using splash dams to move logs down streams with man-made floods caused direct damage to spawning areas. Where and how early roads were built caused indirect damage by removing trees along the stream, increasing the amount of sediments in streams, and reducing the stream's ability to move across its floodplain.

Modern forest management requires the retention of vegetation within riparian areas along streams, lakes, wetlands, and other waters. **Riparian management areas (RMAs)** are required by the **Oregon Forest Practices Act** to protect resources such as fish habitat, water quality, and domestic water supplies. The Forest Practices Act is administered and enforced by the Oregon Department of Forestry. It applies to all

commercial forest management activities on state and private lands. On federal lands the management of these zones is guided by other regulations and management plans, but the requirements of the Oregon Forest Practices Act must always be met or exceeded.

The width of riparian management areas under the Forest Practices Act varies from 50 feet to 100 feet along fish-bearing waters de-

---

*Some problems with development  
can be avoided with good  
planning and site design.*

---

pending on the size of the stream. These areas are established along both sides of streams. The actual width of a riparian management area varies according to the amount of trees and other vegetation that must be maintained. The width of RMAs can be varied to adapt to features of the terrain or to address other concerns or sensitive sites encountered at the timber harvest operation.

Within riparian management areas, landowners are required to maintain vegetation (including trees) to achieve desired amounts of shade and cover. Activities are controlled to minimize negative effects on fish habitat and water quality. On fish-bearing streams, vegetation is managed to achieve a mature forest over time. Along some non-fish bearing streams, vegetation is maintained to protect water quality. There are also a number of streams without fish where no vegetation retention is required.



Besides maintaining vegetation, there are a number of other requirements for the management of riparian areas along fish-bearing streams. For example, all downed trees in aquatic habitats and within the riparian management area must remain. This assures that large woody debris in streams or on the ground is available as habitat for fish and wildlife. All snags not considered a safety hazard must be left in the riparian area. These dead trees serve as a source of future downed wood and, for as long as they are standing, provide foraging and nesting sites for birds and other wildlife.

The current “water protection rules” of the Forest Practices Act also include incentives for landowners to actively enhance stream habitat. One major factor that currently limits fish pro-

---

*Modern forest management  
requires the retention of  
vegetation within riparian  
areas along streams.*

---

duction in Oregon streams is a lack of large woody debris in streams. This is a result of historic logging practices that failed to keep trees as a source of large wood along streams. Cleaning stream channels by removing large wood to make transporting logs and fish migration easier also contributed to the current lack of woody debris. It could take centuries for enough stream-side trees to fall into streams naturally to remedy this problem. To address the shortage of large woody debris in streams in a timely manner, the rules include an incentive for landowners to place large woody debris, or complete other needed restoration projects, in conjunction with nearby timber harvest operations. Landowners who complete enhancement projects to provide immediate benefits to fish habitat are allowed to remove a few additional trees from the riparian zone. The number of trees that can be removed is still limited, however, so a mature forest condition will eventually develop.

Other forest management activities are also regulated to protect resources such as riparian areas. Those activities include road building and maintenance, chemical use, and prescribed burning, among others. These activities must be planned and implemented carefully to prevent damage to waters and other forest resources.

The Oregon Forest Practices Act, and its associated rules, are continually reviewed and adjusted. The current rules for protection of Oregon waterways include a commitment by the Oregon Department of Forestry to conduct monitoring to evaluate the rules and to report findings to the Board of Forestry for appropriate rule changes. In addition, other processes, such as the recent Endangered Species Act listings of coho salmon and steelhead, often trigger reviews and adjustments. Since the rules can change periodically, contact the local office of the Oregon Department of Forestry to determine the current requirements for forest management near riparian areas.

