RIPARIAN ECOSYSTEM NARRATIVE

What are the riparian processes in the watershed?

Stream Types

The character of a riparian area is inseparable from the character of the water body it surrounds. In this section of the Rogue River, streams are the dominant type of water body. Streams can be grouped, based on the surface flow regime, into three broad categories: ephemeral, intermittent and perennial streams. Likewise, riparian processes and functions can be grouped along the same lines.

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An intermittent channel is defined by the ROD (USDA and USDI, 1994) as "any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition" (ROD, B-14). This definition includes both "ephemeral" channels and "intermittent" channels. Ephemeral channels carry only stormflow, while intermittent channels are supplied by groundwater during part of the year (Reid and Ziemer, 1994).

Most ephemeral channels contain water for only a few days of the year and may not support riparian vegetation, so they are unlikely to have much direct significance for riparian-dependant species. Their major role is their influence on downstream channels. They supply sediment, water, and organic materials. Depending on the contrast between the ephemeral channels and the surrounding upland areas, they may or may not be significant migration corridors or unique wildlife habitat. (Reid and Ziemer, 1994).

Intermittent channels are important as seasonal sources of water, sediment, allochthonous material, and large wood. Because intermittent channels can form a high proportion of the entire channel system in a watershed, they contribute significantly to downstream reaches (Reid and Ziemer, 1994). It is therefore important to maintain their function of allochthonous material sources. These small streams are easily influenced by forest management activities and manipulations of the canopy or streambank vegetation can influence the stream's energy supply (Chamberlain et al., 1991). Because they do not have surface flow during late summer, intermittent streams are not a source of warm water to the summer stream network.

Intermittent channels can be important to those amphibian species which do not need open water throughout the year. These streams may be particularly important as nursery areas for amphibians because these sites support fewer aquatic predators than perennial channels (Reid and Ziemer, 1994).

The more different a riparian area is from its surrounding upland - in structure, humidity, thermal regime or nutrient availability - the more important the riparian area is for riparian-dependant species. When riparian areas are distinct from surrounding uplands, they can function as travel corridors and provide microclimatic refuge for riparian-dependant species (Reid and Ziemer, 1994). The distinctive vegetation and higher moisture content of these sites can also modify fire behavior, so their distribution can affect the patchiness of large burns. Since the watershed does not experience long, cold winters, riparian areas here are not critical for providing thermal protection from winter extremes.

Intermittent channels and their riparian zones are highly variable in their ability to provide habitat that is different from the surrounding uplands. Some riparian areas around intermittent channels are identical to the surrounding upland and some have a vastly different character.

Perennial streams, because they have surface flow throughout the year, generally support a riparian area quite distinct from the surrounding upland. The continually wet habitat they provide allows the fuller development of riparian-dependant plant and animal communities. During late summer and early autumn, when the surrounding uplands are typically quite hot and dry in the section of the Rogue River above Lobster Creek, riparian areas along perennial streams become especially important for riparian-dependant species. Organisms, which were previously dispersed into the riparian areas along intermittent streams or into upland areas, congregate along perennial streams to find suitable conditions.

Nutrient Routing

There are two sources of the nutrients necessary to support riparian-dependent species: **autochthonous sources** (produced on site, usually from photosynthesis), and **allochthonous sources** (produced off-site and transported into the area). Aquatic and riparian ecosystems increase in complexity with the progression from headwater tributaries downstream to the mouths of the mainstem rivers. Allochthonous sources dominate in the upper reaches of the watershed and the availability of autochthonous sources increases further downstream.

Autochthonous sources of energy are affected by stream size, gradient, and exposure to sunlight. Allochthonous sources of energy contribute organic matter to the stream by four main pathways: litterfall from streamside vegetation; groundwater seepage; soil erosion; and fluvial transport from upstream. Organic matter from these sources differs in when and how it enters the stream, how it decays, and where it predominates (Murphy and Meehan, 1991).

Most animals require food with a Carbon to Nitrogen ratio (C:N) less than 17:1. Almost all forms of allochthonous organic matter have higher C:N ratios, so they require microbial processing to enhance food quality. The quality of various forms of organic matter varies widely, as measured by the C:N ratio. At the low nutritional end of the spectrum are woody debris and conifer needles (wood has a C:N ratio of 1,343:1); at the high end of nutritional quality are periphyton, macrophytes, and fast-decaying deciduous leaves (macrophytes 8:1 and alder leaves 23:1) (Murphy and Meehan, 1991).

What are the vegetative types of riparian areas in the watershed?

Riparian zones in this section of the Rogue River can be stratified into four distinct categories based on vegetative characteristics. These are conifer forest, hardwood forest, meadows, and riparian areas on soils developed in serpentinite and peridotite (ultramafic soils). Each category has its own processes for sediment delivery, channel formation, hydrologic regime, susceptibility and response to change, microclimate qualities, flora, fauna, and migration habitat qualities.

Conifer Forest Riparian

The most abundant riparian type in the Rogue River watershed below Agness is the conifer forest riparian. It is generally located on soils with high to moderate productivity, where water supply is not limiting growth and topography tends to exclude frequent or intense fire. Abundant, tall

conifers dominate these riparian areas. Douglas-fir is by far the most common overstory conifer, with Port-Orford-cedar often present. Pacific yew has very scattered distribution.

The stand canopy is closed in these areas and many stands have multi-layered canopies. Hardwood trees are often an important mid-layer component. Conifers, with the exception of cedars, create more acidic soils through litterfall than hardwoods. The evapotranspiration associated with the numerous large trees is high. Air temperatures are cool and diurnal fluctuations are moderated throughout the year. These riparian ecosystems maintain important microclimates.

The stands are generally very stable. Tanoak seldom reaches climax condition due to the time-span required for this succession and the longevity of dominant conifers (200 to 300 years). Fire does not start or carry well in most of these stands. Light disturbance from windthrow, land movement, wind or snow damage leads to continual recruitment of conifers. In the event of large-scale disturbances these riparian stands are slow to recover to a mature state. Where Port-Orford-cedar is present in the riparian zone, roads and streams are important conduits for *Phytophthora lateralis* (Port-Orford-cedar root disease).

Conifer stands often have a higher percentage of perennial streams than other vegetation types. Root strength and often-dense undergrowth contribute to generally stable stream banks. However, riparian conifer stands can develop on earthflows, and exhibit features of deep-seated instability. Earthflows can be important sources of structure for stream channels by providing boulders and large wood. Throughout conifer riparian areas, large wood in the form of limbs and boles is continuously delivered to and incorporated into the channels. Stream temperatures tend to be cool throughout the year. Tall trees can shade even moderately wide channels in summer.

Where coniferous riparian areas are surrounded by similar upland stands, they are important water sources for interior habitat-dependent wildlife. When they are dissimilar to the surrounding upland habitat, they are important uphill-downhill dispersal corridors for interior species. Stable air temperatures make them valuable thermal refugia in extreme weather for many wildlife species. These riparian stands can be important habitat for spotted owls.

Conifer riparian areas can have a moist microclimate and be important to organisms requiring cold, wet environments. For example, Pacific giant salamanders utilize headwater streams to lay their eggs (Stebbins, 1966), and talus habitat in these moist areas can be important for Del Norte salamanders. Meadow and hardwood riparian areas usually receive more solar energy and favor species adapted to more sunlight, lower humidity and warmer temperatures.

Riparian stands of red alder are generally an early to mid-seral stage of the riparian conifer forest. These stands were usually created by stand replacement events such as timber harvest, debris flows, inner gorge landslides, and floods. In some areas red alder is an important component of a mature conifer riparian ecosystem. These alder stands can be important habitat for white-footed voles, and alder leaves are a good source of nutrients for the aquatic ecosystem.

Because of its abundance and high value wood production, more land use activities have occurred in conifer riparian stands than in any of the other riparian types. Therefore, conifer riparian stands are most likely to be candidates for restoration.

Hardwood Forest Riparian

Hardwood-forested riparian stands tend to replace conifer-forested riparian stands where water is limiting or where a regime of either frequent low intensity or high intensity fires has disturbed the riparian zone. Hardwood riparian stands are usually dominated by tanoak trees, with madrone, myrtle, chinquapin, knobcone and sugar pines often present. Scattered conifers such as Douglas-fir will grow directly out of the stream channel, where there is more water, but they are anomalies in these stands.

Although the canopy is closed, the single-storied structure does not have the insulating qualities of the conifer forest. Humidity is much lower and air temperatures vary a great deal with the seasons. The microclimate differs little from surrounding upland. Fire will both start and carry well in the riparian stands. These stands have low resistance to change from fire and wind and snow damage. Yet their closed canopy, single-storied structure is quick to regenerate. Ground cover is usually low, leading to more surface erosion than conifer riparian stands, but their characteristic stump sprouting after disturbance leads to consistent bank stability.

Hardwood riparian stands are generally similar to their upland surroundings, making them valuable watering sites for local wildlife. They are less important for thermal cover and migration corridors than coniferous riparian stands. Their acorn crop makes them important foraging areas for mast-dependent wildlife.

The economic value of the hardwoods is much lower than conifers, so far less timber harvest has occurred in these riparian areas. As a result, restoration opportunities in this riparian type are few.

Meadow Riparian

The majority of meadow riparian areas are open canopy areas. As a result, these types of riparian areas receive high amounts of solar radiation; have high diurnal temperature fluctuations, little microclimate differences, and a narrow range of influence beyond the active channel. Fire will start and carry very rapidly through meadow riparian areas. They are dependent upon frequent fire for maintaining their open canopy characteristics.

Light vegetative covering makes easily destabilized banks prone to downcutting and headwall erosion following disturbance. Water temperatures show a strong diurnal fluctuation, similar to air temperatures. On-site diversity in these areas is low, yet may include highly specialized or unique species. Downstream aquatic diversity is increased because of the different types of production occurring at these sites.

Riparian areas bordering meadows provide important water sites for meadow-dependent wildlife species. Their location along the edge of the forest/meadow ecotone increases the on-site diversity of terrestrial species. The meadow riparian areas provide connection corridors for meadow-dependent species.

Ultramafic Riparian

At these sites high levels of magnesium relative to calcium, high levels of nickel and chromium, and low levels of available soil water limit plant species to those tolerant of these conditions. These specialized communities contribute to the overall biological diversity of the watershed.

Most stands have an open to moderately closed canopy (20 to 70 percent). Understory vegetation cover varies from open to dense. The typically unstable slopes of ultramafic derived soils create high disturbance frequency, contributing to the sparseness of the canopy. Because of the more open canopy, seasonal and diurnal temperatures fluctuate more than in other riparian stands. However, ultramafic riparian stands provide a cooler, contrasting microclimate to the harsh upland ultramafic areas often dominated by open Jeffrey pine stands.

Port-Orford-cedar is often the primary overstory component in riparian areas. Port-Orford-cedar grows slowly on these sites, generally reaching 30 inches in diameter in 400 years on seasonal streams and 30 inches in 200 to 300 years in perennial wet sites. It will remain standing long after it dies. While Port-Orford-cedar has a slow decomposition rate, the sparse vegetative cover on ultramafics creates a low fuel load. This, in turn, results in low intensity fires when fire occurs.

Phytophthora lateralis is an introduced pathogen that kills Port-Orford-cedar, reducing shade and concentrating the delivery of large wood. Mortality rates in well-established disease sites are generally higher in the flat, wet sites and lower on steeper stream sections where spores cannot catch on to roots as easily. The rate at which Port-Orford-cedar dies from the introduced root disease could likely cause the population size to fall outside the range of natural variability.

Ultramafic rocks weather to produce landforms with unique topography and hydrology, often prone to mass wasting and erosion in areas with heavy precipitation. The highly sheared structure and low water permeability of the ultramafic rocks result in frequent springs and bogs, flashy flows, inner gorge landslides, and highly erodible stream channels which are sensitive to ground disturbance. The interaction of stream flow with large boulders and resistant outcrops can result in diverse channel morphology. Because ultramafic riparian areas have fewer trees than conifer or hardwood riparian, there is less large wood providing structure in the stream channel. However, when large Port-Orford-cedar is delivered to the channel, it decomposes slowly and functions as structure for a longer period of time than a similar piece of Douglas-fir. Because of the open canopy, stream temperatures are usually much warmer than in streams bordered by dense conifer or hardwood forest. The soil chemistry results in naturally higher pH water than in streams that flow through other soil types.

Although plant diversity is high, terrestrial vertebrate diversity and abundance is low. This is a result of the low thermal cover and low availability of forage. Most use by terrestrial vertebrates is seasonal. Riparian areas are important both as water sources and as travel corridors.

Restoration and enhancement attempts in sparsely vegetated ultramafic areas have had limited success. Development of disease-resistant Port-Orford-cedar and five-needle pine species could improve the success of revegetation in disturbed ultramafic riparian areas.

What is the present vegetative condition of Riparian Reserves in the watershed?

Vegetation within the 300 to 600 foot wide zone of consideration specified by the Northwest Forest Plan (ROD, 1994) includes the sizes and species found throughout the watershed (see Map 12, Riparian Reserves, and page 45, Vegetative Characterization). These species and ages have been affected by both natural processes and human activities. In Table 8 below, the percent Mature and Old Growth is calculated from satellite imagery (PMR vegetation data), interpreted and mapped in GIS and grouped the same as for wildlife habitat analysis in the Terrestrial section of this document. The percent harvested is calculated from managed stands (previously harvested areas) mapped in GIS. Comparing these two columns gives an indication of the degree to which harvest activities have directly affected the riparian condition. Indirect effects from timber harvest and road construction can include channel widening resulting from increases in peak flow or sediment delivery."

Table 1. Riparian Condition (National Forest lands)

Subwatershed	Name	Percent Mature and Old Growth	Percent Harvested
19F01W	Jim Hunt	36	7
19F02W	Kimball	46	14
19F03F		32	1
19F04F		34	9
19Q	Quosatana	36	18
21L01F		23	6
21L02W	Silver	11	37
21L03W	Bradford	42	35
21L04W	Bill Moore	61	4
21L05W	Wakeup Rilea	35	40
21L06W		30	23
21L07W	Tom East	31	16
21U01W	Nail Keg	56	24
21U02F		43	15
21U03W	Bridge	27	17
21U04W	Stonehouse	42	2
21U05W	Painted Rock	44	11
21U06F		24	10
21U07W	Tom Fry	41	20
21U08W	Rilea	43	0

Note: Percentages are calculated by dividing the acres of mature and old growth (or acres of managed stands) on National Forest lands within the riparian zone of the subwatershed by the total acres of National Forest land within the same riparian zone.

Some of these subwatersheds had as much as 40 percent of their riparian areas harvested. Most of this harvest was more than 20 years ago, and some riparian areas are now well shaded by hardwoods and small conifers. Individual assessment of stream channels would be needed to determine the current shade condition. Some discussion of historic vegetative condition is included with channel morphology, pages 25-29.

Information Needs: There is a need to conduct site-specific analysis and surveys to support management activities within Riparian Reserves, as described in the Record of Decision for

Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA and USDI, 1994). There is a need to determine whether previous riparian buffers were effective in protecting riparian processes.

Management Opportunities: There is an opportunity to implement management activities within Riparian Reserves that preserve the critical riparian processes and meet the objectives of the Aquatic Conservation Strategy; and to restore riparian processes where they are not properly functioning.

Specifically:

Fire suppression policies have allowed conifers to encroach on meadows altering riparian function. Riparian ecosystem processes that have been described above should be maintained during restoration efforts.

Riparian thinning and/or planting in existing managed stands are possible management opportunities. Silvicultural practices should be used in these riparian areas to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.