3.5 Summary of Current Status and Health of Oregon's Riparian Areas

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Report Card

- Riparian areas make up about 15% of the total area in the state
- Trends in riparian condition along the upper mainstem Willamette River have shown a loss of more than half the historical channel complexity and reduction of more than 85% of the total riparian forest area since the 1850s
- Riparian areas in eastern and southern Oregon have been altered extensively as a result of livestock grazing, agricultural activities, and associated water diversion projects
- Urbanization and residential development impact a much smaller portion of Oregon's land base (less than 10%) but reduce riparian functions to a much greater degree with little potential for recovery
- Non-native plants make up more than 50% of the riparian species along the mainstem Willamette
- Satellite remote sensing is one of the most powerful and cost-effective tools for tracking Oregon's riparian resources, as well as other elements of the environment

Key Indicator

1. The amount of intact or functional riparian vegetation found along streams and rivers.

Introduction

Riparian areas—transition zones between aquatic and terrestrial ecosystems—are exceptionally important components of Oregon's landscape because of their importance for aquatic ecosystems, terrestrial ecosystems, and water quality. These corridors along streams, rivers, wetlands, lake margins, and estuaries are easily altered by land use practices (Gregory and Bisson 1996) and recovery can require decades to centuries. The status of riparian areas is one of the most important indicators of the health of aquatic ecosystems throughout Oregon. Restoration of the structure and function of riparian areas is one of the primary goals of the Oregon Plan for Salmon and Watersheds and has been one of the major activities of watershed councils throughout the state.

Definition of a healthy riparian ecosystem

The perspective of ecosystem health most relevant to a discussion of riparian resources is "naturally functioning landscapes that function much as they would have without intensive land use and land conversion over the last two hundred years". Evaluation of the economic role of these landscape features is needed in the future. Riparian areas contain potentially important commodities or human uses, and their higher value in the real estate market illustrates their economic importance.

Riparian areas provide critical ecological functions and high biological diversity because they contain components of both terrestrial and aquatic ecosystems and exhibit strong gradients of environmental conditions (Gregory et al. 1991). As interfaces between land and water, riparian areas are important for both terrestrial and aquatic biota. Ecological functions of riparian areas in the Pacific Northwest have been reviewed thoroughly, but comprehensive information on the status of riparian areas is lacking (Spence et al. 1996). Riparian vegetation shades streams, contributes leaves and large wood to streams, takes up nutrients, and stabilizes streambank and floodplain soils. These streamside corridors strongly influence water quality, including stream temperature, nutrient loading, sedimentation, and contaminants from terrestrial sources. Food webs in stream ecosystems depend on terrestrial vegetation as a source of food (such as leaves, needles, wood) and habitat structure (such as large wood, pool forma-

tion, bank stabilization). Birds, mammals, amphibians and other terrestrial animals depend on riparian areas for a variety of habitat, cover, and food sources in close proximity to water. Riparian areas also serve as important corridors for the movement of terrestrial animals and plants across the landscape.

Indicators

The most critical indicator of riparian resources for the state of Oregon is the proportion of intact or functional riparian vegetation. Remote sensing can determine area and composition of riparian forests and adjacent land uses for large areas, and ground-based surveys can validate these estimates. New satellite systems permit 5-meter (16-foot) resolution for future measurement, and existing satellite data provide analysis of trends in riparian condition from 1972 to the present. Current conditions can be compared to estimates of historical or functional riparian vegetation. Historical riparian conditions could be determined for each ecoregion from 1850 General Land Office surveys and judgment of experts in the state. Experts also could identify functional communities that would be considered healthy (e.g., hybrid cottonwood plantations, parks). The proposed measure of health is the proportion of the number of miles of riparian vegetation that are consistent with designated functional plant communities, as defined by ecologists and land-use experts. This indicator simply measures the fraction of Oregon's riparian areas composed of native vegetation types that are considered ecologically appropriate for their location. In addition, several other indicators could be derived from the same data, including number of large native trees in riparian areas, total area of riparian forests, and wet community types. The Pacific Northwest Ecosystem Research Consortium is currently conducting a pilot study for the Willamette basin and could be expanded statewide.

Current conditions and trends

Oregon contains approximately 184,633 kilometers (114,475 miles) of rivers and streams (Oregon Water Resources Department). Even based on an overly simple measure of riparian areas as 100-meter (330-foot) bands on either side of the stream, the estimated total area of riparian habitat for flowing waters in Oregon is 36,927 km2, or about 15 % of the total area in the state. However, this percentage does not include the riparian areas along the vast networks of small headwater streams throughout the state that flow during only part of the year. Additionally, a 100-meter buffer may be less than the actual riparian zone for the floodplains and low flow channels of large rivers, so this estimate of total riparian area is extremely conservative. Though riparian areas may represent a lower proportion of the land base in the dry, less dissected basins of eastern Oregon, their ecological significance may be greater than their area alone would suggest in portions of the state where the climate is hot and water is scarce.

Most studies of riparian resources have focused on documenting effects of land-use practices for specific sites or short reaches of stream. Large-scale or regional assessments of the status of riparian plant communities are scarce. Classification of satellite spectral data is an important tool with outstanding potential for analysis of riparian resources of the state. In this report, we illustrate its application through an analysis of riparian areas within 100 meters of streams (1:100,000 scale) in western Cascades, Willamette Valley, Coast Range, and Klamath Mountains, based on data from Purnell (1994), H.J. Andrews Long-Term Ecological Research Program, and the CLAMS Project.

Riparian areas on privately-owned forest lands are dominated by early-successional vegetation with relatively few large conifers, as a result of timber harvest. Riparian areas in public lands have greater area of mature conifers (**Figure 3.5-1**). Old coniferous forests comprised approximately 20% of the riparian areas in the Cascades in contrast to only 3% in the Coast Range. The Klamath Mountain ecoregion exhibits a more even distribution of stand types, reflecting the drier landscape and more patchy plant communities. Timber harvest was the dominant land use type in riparian areas of the Cascades, Coast Range, and Klamath Mountains, but agriculture was the dominant land use in the Willamette Valley (**Figure 3.5-2**).

Land use activities frequently reduce 1) numbers of large trees, 2) amounts of closed-canopy stands, and 3) proportion of older forests or late successional stages. In agricultural lands and the drier regions of eastern Oregon, woody riparian vegetation is likely to be eliminated completely, with little or no regeneration of young broadleaf tree species, especially in the presence of grazing by livestock (Quigley and Arbelbide, 1997).

In western Oregon, riparian plant communities have been altered along almost all streams and rivers. In managed and reference sites throughout the Coast Range, number of large conifers is a useful indicator of human impacts on riparian condition in forested ecosystems, and is consistently higher in relatively unaltered reference sites (Oregon Plan for Salmon and Watersheds, 1999). In some streams within the Coast Range, landslides and debris flows knock down riparian stands along valley bottoms so that young vegetation cannot shade streams and maintain lower stream temperatures (Ryan and Grant, 1991). Trends in riparian condition along the upper mainstem Willamette River have shown a 50% reduction in channel complexity and reduction of more than 85% of the total riparian forest area since the 1850s (Sedell and Froggatt. 1984; Benner and Sedell, 1994; Hulse 1998). Downstream portions of the Willamette experienced little channel change, but lost almost 85% of the historical riparian forest. Late-suc-

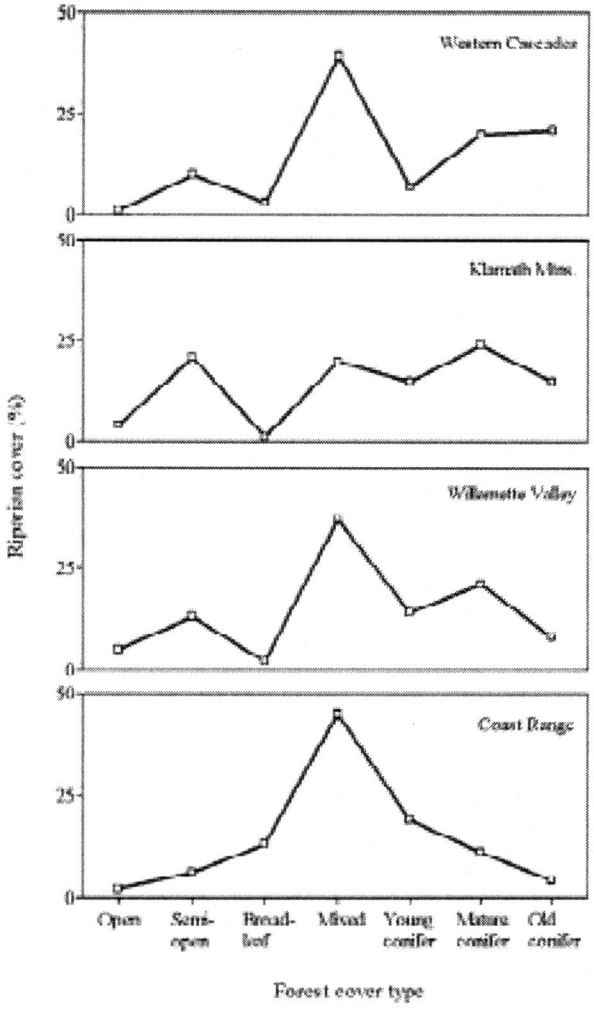
cessional forests historically occurred along most of the length of the McKenzie River but now account for less than 15% of its riparian forest (Minear, 1995).

Riparian areas in eastern and southern Oregon have been altered even more extensively as a result of livestock grazing, agricultural activities, and associated water diversion projects (Kauffman and Krueger, 1984; Kovalchik, 1992; Skovlin and Thomas, 1995). Very little of the once extensive shoreline vegetation exists to maintain water quality and provide habitat for threatened fish species (Matthews and Barnard, 1996). Dams have affected flow, sediment, and gravel patterns, which in turn have diminished the regeneration and natural succession of riparian vegetation along downstream rivers. Diversity and productivity of riparian landscapes of eastern Oregon have led to their exploitation and alteration since the early 1800s (Wissmar et al., 1994). Riparian conditions remain degraded throughout the region, particularly in the middle and lower reaches of large river valleys such as the Grande Ronde, John Day, and Umatilla rivers (Oregon Water Resources Department, 1986; Wissmar et al., 1994; Lichatowich and Mobrand, 1995). In many eastside basins, the only riparian areas that are not highly altered are those situated in steep, narrow valleys inaccessible to cattle (Evenden, 1990).

Threats to riparian resources

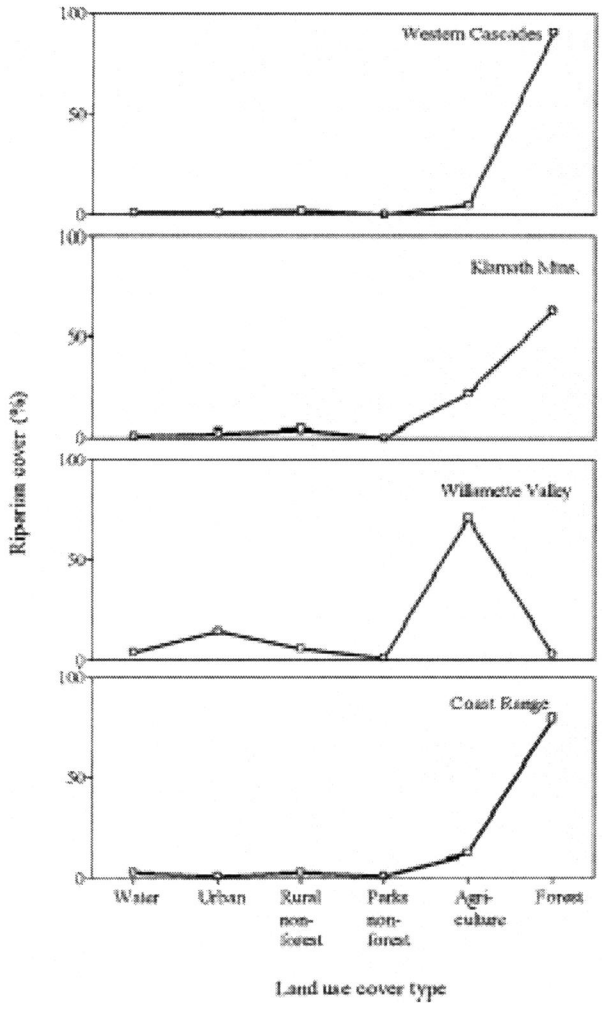
Human settlement, land development, and resource use have altered riparian areas in Oregon. Human activities have focused on riparian areas because of their proximity to water, productivity in natural resources, utility for transportation as

Figure 3.5-1. Percent of riparian area in major vegetation classes for the western Cascades, Klamath Mountians, Willamette Valley, and Coast Range of Oregon.



Estimates were calculated by Christian Torgeson from Purnell 1994 and spatial data provid by Warren Cohen.

Figure 3.5-2. Percent of riparian area in major land use classes for the western Cascades, Klamath Mountians, Willamette Valley, and Coast Range of Oregon.



Estimates were calculated by Christian Torgeson from Purnell 1994 and spatial data provid by Warren Cohen.

waterways and sites for railways and highways, as well as their aesthetic appeal (Gregory and Bisson, 1998; Hulse 1998). This intensive use diminishes the capacity of riparian areas to perform important ecological functions that originally made riparian areas attractive for human settlement and exploitation. As human pressures on natural landscapes of Oregon increase, riparian conditions and management become increasingly important to the public and regional decision makers.

Riparian resources have been reduced or altered by a host of land uses, including timber harvest, livestock grazing, agriculture, water withdrawal, flow modification, channelization, mining, urbanization, and residential development. Several of these land use practices—timber harvest, livestock grazing, water withdrawal, flow modification, mining—alter the composition, age and size, and distribution of the riparian plant communities but allow for some form of revegetation by natural communities. Other land uses—agriculture, urbanization, residential development—either eliminate or convert riparian plant communities to structure and composition that differ greatly from native plant communities. Timber harvest, livestock grazing, and agriculture affect a large proportion of the state's riparian areas, but provide for some periods of recovery or partial function. Urbanization and residential development impact a much smaller portion of Oregon's land base (less than 10%) but reduce riparian functions to a much greater degree with little potential for recovery (Booth, 1991).

Exotic plant species represent another major threat to future riparian resources in Oregon. Although there have been no documented extinctions of native riparian species from competition with introduced species, invasive species—Himalayan blackberry, reed canary grass, and scotch broom—dominate many riparian sites and locally reduce the diversity of native species. In a transect from the upper McKenzie River to the mid-section of the Willamette River, non-native species increased from 10% of the observed species in headwater riparian zones to more than 50% of the riparian species in the mainstem riparian forest (Tabacchi et al., 1996).

Strengths of riparian resources

Two basic strengths of riparian resources offer potential for recovery in the 21st century; they are the intact remnants of historical riparian forests on public lands and the rapid regeneration processes in riparian plants. Recovery of riparian communities is more likely if 1) human impacts are eliminated or reduced, 2) natural disturbance processes are reestablished, 3) natural hydrologic regimes are restored, and 4) processes that create and maintain river channels and floodplains are protected or reestablished. Conservation or restoration strategies can build on intact remnants of historical riparian corridors in many rivers of the state.

The Oregon Plan and many watershed councils are working to improve land uses and riparian conditions for river basins and regional landscapes. Through the Oregon Plan for Salmon and Watersheds, funds are available to local groups through the Oregon Watershed Enhancement Board. Forest practices on private lands are being strengthened to provide greater protection of riparian resources. Senate Bill 1010 calls for the Department of Agriculture to work with farmers and ranchers to develop basin plans to improve water quality in impaired streams. The Natural Resources Conservation Service is providing both technical and financial assistance to landowners through a variety of Farm Bill programs. The Bureau of Land Management, Forest Service, and Natural Resource Conservation Service are developing demonstration areas throughout the west, such as the Trout Creek Mountains in southeast Oregon, to illustrate successful approaches. These efforts under the Oregon Plan include a mix of voluntary and regulatory approaches, and future conditions of riparian resources in Oregon will depend on their collective success.

What data are available and how complete are they?

Detailed maps of current riparian conditions have been constructed from aerial photographs for individual sections of streams in selected basins throughout Oregon. Specific stream sections for which riparian data have been collected are useful as reference areas to which future riparian conditions may be compared. The U.S. Fish and Wildlife Service has mapped riparian vegetation structure in selected reaches in the Willamette and the Grande Ronde basins of western and eastern Oregon through the National Wetlands Inventory program. Other more extensive assessments of historic and current riparian conditions have been conducted on national forest lands throughout the state of Oregon as part of the Forest Service Watershed Analysis Program. Researchers in the Pacific Northwest Ecosystem Research Consortium are documenting changes in the historical channels and riparian vegetation for the Willamette River and its tributaries. Case studies of riparian status and trends in stream reaches on agricultural and other private lands have been conducted by researchers and watershed councils throughout Oregon. These studies of riparian conditions provide a preliminary assessment of the status of Oregon's resources, but a more extensive and credible assessment of riparian conditions is essential for effective analysis of the state of the environment.

What more do we need to understand?

A complete assessment of the condition of riparian areas has never been conducted for the state of Oregon. This lack of comprehensive information makes it difficult to determine

quantitatively the extent to which riparian areas have changed throughout the state as a whole. Information on status and trends of riparian condition is available only as qualitative reports for selected river reaches or watersheds. More comprehensive assessments of riparian condition are needed to determine statewide status and trends.

One of the most powerful and cost-effective tools for tracking Oregon's environment and resources—satellite remote sensing—has emerged within the last decade. Satellite imagery has made it possible to assess vegetation type and extent over large areas in Oregon. Extensive data provided by satellite images can be used both to examine current status of forest resources and to identify trends in vegetation change through time. Satellite imagery has been classified into vegetation types for most of western Oregon (Cohen et al., 1995a; Cohen et al. 1995b). Techniques for using satellite imagery to analyze riparian condition are still in development and are currently limited by the coarse resolution of the imagery (25-meter pixel size) and the coarse scale of river and stream maps (1:100,000 scale) used to locate riparian areas (Congalton et al. 1999). However, this imagery constitutes the only extensive data set on riparian condition over large areas of the state and may prove effective for interpreting large-scale change over time. New satellite technology will provide fine resolution (less than 5-meter pixel size), and new digital maps of the state (1:24,000 scale) will provide accurate locations of streams.

Important riparian characteristics such as canopy closure and vegetation structure can be quantified for streamside buffers over large areas and analyzed as baseline information in estimating trends in resource condition. The Oregon GAP Project of Oregon Department of Fish and Wildlife is currently using satellite imagery from 1991-1993 to develop vegetation classifications for the entire state. Resolution of this state-wide vegetation inventory (200-meter pixel size) will not be sufficient for assessing status and trends in riparian vegetation but will allow resource managers to identify areas that require more detailed assessment of riparian conditions. Future development of finer scale remote sensing data will greatly enhance Oregon's ability to determine the status and trends of its riparian resources.

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