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Riparian Management of Coastal Pacific Ecosystems¹

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Abstract.—The Siskiyou National Forest in Oregon manages riparian areas along the Pacific coast where high value conifers stand near streams bearing salmonid fisheries. Riparian areas are managed by setting objectives which allows for limited timber harvest along with stream protection. The annual timber sale quantity from the Forest is reduced by 13 percent to protect riparian areas and the fishery resource.

INTRODUCTION

Riparian areas on National Forest lands present a sizable management challenge. They are the focus of resource values and uses which often conflict. The President, Congress and other policy makers recognized the importance of riparian areas and have produced numerous Federal and State Laws, Executive Orders and agency direction which must be followed by the land manager. Scientists have studied and written profusely on the importance, values and uniqueness of riparian ecosystems (Johnson and Jones 1977; Karr and Schlosser 1978; Johnson and McCormick 1978). Today scientists are beginning to understand riparian ecosystem structure, function and the complex interactions that occur at this land-water interface (Swanson et. al. 1982)

By comparison, little has been written on the process of managing these physically complex, high value ecosystems. The management problem is compounded by divergent views held by the public and among land managers about the highest and best use of these lands. The objective of this paper is to report on the operational techniques used on the Siskiyou National Forest to lessen conflict and to best manage coastal riparian ecosystems.

FOREST SETTING

The Siskiyou National Forest totals 1.1 million acres in southwestern Oregon and northern

California (fig. 1). The Forest is located dominantly in the Klamath Mountain Province but extends into the Coast Range on the north. As shown in figure 2, the Klamath Mountain Province is characterized by rugged, youthful topography with 2000 to 5000 feet of relief (Baldwin 1955). The mountains are comprised of rock formations which are heavily folded, faulted and intruded by ultramafic rocks and other intrusive rocks. Large areas of the Forest are underlain by relatively impervious rock which results in low infiltration rates and high runoff efficiencies (Ramp and Peterson 1979; Dott 1971).



Figure 1.—Vicinity map showing location of Siskiyou National Forest.

Average annual precipitation ranges from 40 inches on the east side to more than 160 inches on the west side of the Forest (Oregon State Extension Service 1982). Unofficial records indicate that annual rainfalls exceeding 200 inches are common in the mountains near the coast.

This steep and relatively impervious bedrock combined with heavy rainfall has produced a landscape replete with streams and rivers.

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Drainage densities on the Forest average 3.7 miles of perennial stream per square mile of land surface³, exceeding by two-fold the average stream density in the United States (Gregory and Walling 1973).

RIPARIAN MANAGEMENT

Historical Perspective

For this reason, the Siskiyou N. F. manages many acres of near stream riparian habitats—187,000 acres in all. Slightly less than 100,000 acres are within the commercial forest land base where timber is cut. The remaining 87,000 acres are either in wilderness or in areas unsuitable for timber production. Two billion board feet of old-growth Douglas-fir, Port-Orford-cedar, and other high value conifers stand within 100 feet of the streams eligible for harvest.

In contrast to arid areas, a distinct vegetative separation between riparian areas and upland areas is not evident⁴. As a result, there are few floral species which are unique to riparian zones in this area (fig. 2).



Figure 2.—The rugged terrain of the Klamath Mountains in southwestern Oregon.

These same areas are the natural hatcheries of chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon, steelhead (*Salmo gairdnerii*) and cutthroat trout (*Salmo clarkii*). The Siskiyou boasts one of the largest remaining wild stocks of these fish in the continental United States. The anadromous and resident fisheries on the Forest are valued at several million dollars annually⁵.

Prior to the 1970's, riparian areas were clearcut and roaded with little regard for the environment, particularly along perennial, nonfish-bearing streams. During this exploitive phase in resource management, the balance of resource uses was tipped heavily to timber. In addition to extracting maximum timber volume, and disturbing the sites, the streams were used as receptacles for logging debris. By the early 1970's, as our concern for the environment grew, our first attempts to protect riparian areas were simply stream cleanout of logging debris. Little attempt was made to protect riparian vegetation initially or to prevent the entry of debris into the stream.

Once these first efforts were accepted, riparian protection progressed rapidly. Soon, aided by direction from the Chief of the Forest Service (1978), standing timber was being left in riparian zones. Defective trees at first, then standing merchantable conifers were left for the protection of stream bank stability, stream temperatures, water quality, fish habitat and wildlife habitat. Managers unwilling to risk any stream disturbance, soon were laying out extensive no harvest buffers. Today riparian areas are managed more objectively, taking or leaving trees based on their contribution to the stated objectives and the ecosystem as a whole. In a period of a decade, riparian management has progressed from exploitation to complete protection and now to whole ecosystem management by setting objectives.

Forest Planning

The National Forest Planning Act (NFMA) requires the preparation of a comprehensive land management plan for each National Forest in the country. NFMA and its implementing regulations also require that special consideration be given to a minimum of 100 feet each side of all perennial streams. For the purpose of planning, riparian areas are defined in the Siskiyou Plan as 150 feet each side of Class I and II streams⁶ and 100 feet each side of Class III streams. By this definition, the Forest has identified 98,053 acres of riparian and wetland areas as distinct management areas with unique timber yield tables and management direction⁷. Several alternative ways of

³Anderson, M. T. 1981. Data on file. See footnote 2 for address.

⁴Atzet, T. 1985. Personal conversation. See footnote 2 for address.

⁵King, D. N. 1985. Numerous Computations of Forest Fish Populations and Values. Unpublished report. See footnote 2 for address.

⁶Streams are classified in USDA Forest Service Region 6 based on beneficial uses (Forest Service Manual 2526, Supp. 42). Class I and II streams are domestic water supplies or support salmonid fish. Class III streams are perennial nonfish-bearing streams.

⁷Process records for Forest planning [n.d] See footnote 2 for address.

*~4.5% of
Sis. NF land
based w/50'
ea side*

managing riparian areas were evaluated in the plan ranging from clearcut harvest (i.e. treating riparian areas like all other commercial forest land) to complete protection or no harvest. Table 1 presents the allowable timber harvest in riparian areas in terms of a percent of existing basal area by stream class. The effect of these

Table 1.--Allowable Basal Area reductions in riparian areas modeled in the Forest Plan. Prescription (Rx B) is designed to maintain riparian ecosystems and represents current riparian practice. Prescription (Rx C) is designed to improve conditions especially in degraded watersheds.

	Allowable Basal Area Reductions (percent)	
	Rx B	Rx C
Class I & II ¹	30	10
Class III	50	30

¹See footnote 6.

alternatives on the annual sale quantity (ASQ) is shown in figure 3. The ASQ for the Forest is reduced by 28 MMBF (13 percent) annually when riparian prescription B is applied and an additional 3 MMBF (2 percent) when prescription C is applied. These stated reductions are measured from the alternative which clearcut harvests all riparian areas.

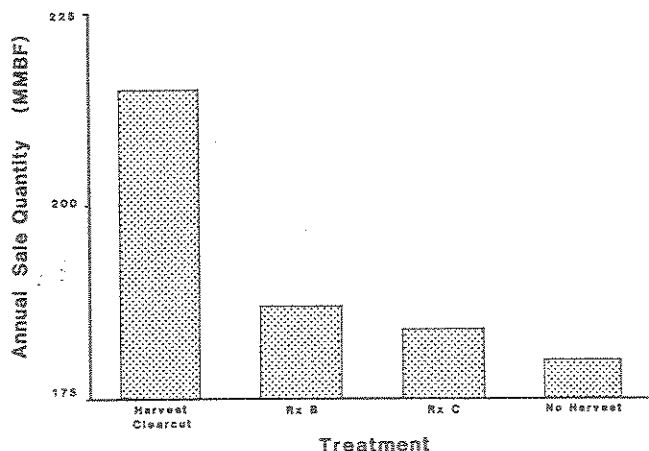


Figure 3.--The effect of several riparian management alternatives on the annual sale quantity from the Siskiyou National Forest in millions of board feet (MMBF). See Table 1 for description of Rx B and Rx C.

Project Planning and Implementation

Project planning and implementation involves several steps which may require five to ten years from start to finish. The challenge of every

project is to accomplish on the ground, the broad objective of maintaining the integrity of the riparian ecosystem. Present riparian policy on the Siskiyou is guided by the Forest Service Manual (2520.3 Sisk. Supp. 1). The process of riparian management can logically be described by following the Timber Sale Planning Process (Forest Service Manual 2431.2). This process provides for a series of activities leading to control points called "gates." This gate system permits an orderly input of data, analysis and achievement of project work.

Gate 1

Gate 1 is the position statement where a project is given life. The project area is located and all existing information is pulled together. Stream classes, timber volumes, transportation system needs, downstream values and concerns, enhancement opportunities are all tentatively identified. A key role of the unit manager at this step is the proper selection of resource disciplines and scheduling of tasks. The involvement of the public is also solicited.

Gate 2

Gate 2 is the environmental analysis. This is the most interactive step of the process and must be done in an interdisciplinary mode. When properly conducted, this interaction of disciplines will produce a superior product. The Siskiyou promotes a project "core" team concept of two or three individuals with other skills brought in as needed. Communication between the unit manager and the interdisciplinary (ID) team leader is essential to ensure the proper use of disciplines, the development of alternatives that are cost-effective and responsive the major issues and concerns, and completion of the project on schedule.

Because each riparian ecosystem is unique, extensive field work by the ID team is necessary to accurately describe the resources and to specifically identify concerns and opportunities (IOOs). The ID team must be mindful of all the complex ecological interactions between vegetation, hillslope processes, climate, nutrient cycles and habitat needs for wildlife and fish. Therefore, a key element in successful riparian management is education and cross-training for the entire workforce. Also, implied here is a close cooperation with research to transfer the latest findings and technological developments.

⁸Stubblefield, T. C. 1984. Integrating Timber Sale Planning With Riparian Area Management. Unpublished report. See footnote 2 for address.

Once all available information is gathered about the ecosystem and the ICOs, the objectives must be set. This step is critical because the objectives will drive the entire remaining process. Any resource value may become the primary objective depending on the inherent characteristics of the ecosystem and the ICOs. For example, wildlife habitat, fish habitat, streambank stability, water temperature or timber production may be the primary objective. Herein lies the point of resolution - an informed discussion that examines the resource and the concerns until the objectives are shared by the ID team, management and the public.

With the objectives set, the management prescription can now be written. The prescription delineates how the objective(s) will be met. For example, specific direction will be included for: the boundaries of the riparian zone, stand management and harvest system, logging method, layout and marking guidelines, fuels disposal, reforestation. Also, a Sale Area Improvement Plan is written which programs any resource enhancement work.

Gate 3

The project implementation and layout occurs in Gate 3. Boundaries of the riparian zone are physically located on the ground on the basis of the objectives, terrain features and ecosystem function. The marking crew with the prescription in mind, decides whether each tree, within this newly delineated streamside zone, contributes to the primary objective or not. This technique has been applied on over 150 timber sales over the last four years. The commercial timber volume removed ranges from 0 to 75 percent of the existing stands. Typically, 40 to 50 percent of the commercial volume was removed along perennial, nonfish-bearing streams and 0 to 10 percent along streams that support fish.

Gate 4, 5 and 6

Gate 4 involves the preparation of the preliminary contract and advertisement of the timber sale. The timber sale contract is another important instrument for successful riparian management. Protection measures such as directional felling, yarding over the riparian canopy, and control of logging debris must be written into the contract. An example showing the potential of this process when all the factors work together is shown in figure 4. Gates 5 and 6 are the bid opening and award of the timber sale, but have no special significance to riparian management.

⁹Greenup, M. 1981. Silvicultural Prescription for Unit 4 of the Briggs Ridge Timber Sale. Unpublished report. See footnote 2 for address.



Figure 4.--A riparian area along a perennial nonfish-bearing stream after timber harvest.

Monitoring

Monitoring is the control point and corrective step in the process. The environmental consequences and the management process are monitored either after project layout or upon project completion. Management field reviews are conducted to check for compliance with Forest and Manual direction, and to compare the riparian objectives and the prescription to the finished product on the ground.

Selected riparian areas are monitored to determine the extent of conifer removal and any physical impacts to the residual vegetation or the stream. Stream water temperatures warmed by direct solar radiation after timber harvest is a common concern on the Forest. A solar charting device is used when needed to monitor shade producing vegetation before and after harvest¹⁰.

CONCLUSION

The Siskiyou National Forest manages nearly 100,000 acres of near stream riparian habitat where highly valued timber and fish production are in conflict. This paper describes the operational process of managing these areas - a subject which rarely appears in the published literature.

¹⁰Amaranthus, M. P. 1981. Identification of Shade Producing Vegetation: The Solar Chart. Unpublished report. See footnote 2 for address.

Successful riparian management depends upon a well informed workforce that shares a common objectives for each project. The annual sale quantity from the Forest is reduced by about 13 percent to protect riparian areas and fishery resources. Typically, timber harvest will remove 40 to 50 percent of the standing timber volume within our nonfish-bearing riparian areas and 0 to 10 percent along streams that support fish.

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