RIPARIAN SYSTEMS AND FOREST MANAGEMENT—CHANGES IN HARVESTING TECHNIQUES AND THEIR EFFECTS ON DECOMPOSED GRANITIC SOILS[1]

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Abstract: In the 1950s, timber on steep granitic terrain in Trinity County, California was harvested by using the logging techniques of the time. After Trinity Dam was built in the 1960s, it became evident these techniques were not suited to quality riparian habitat and healthy anadromous fisheries. Since adoption of the Z'berg-Nejedly Forest Practice Act in 1973, efforts have been expended to repair damage that has been done to riparian vegetation, and find forest practices compatible with granitic soils.

Early logging practices having a major effect on riparian ecosystems included skidding and hauling logs down the creekbeds, harvesting all merchantable trees in the riparian zone, and leaving slash and debris in the creekbeds. There are others, but these are the most identifiable.

California passed legislation to regulate forest practices on private land in 1945. A State Board of Forestry was also established at that time. California Forest Practice Rules, created from the legislation, were approved for administration in 1947 (Arvola 1976). Initially there were four foresters assigned to the program as the inspecting cadre. As expected, a few things fell through the cracks. Unfortunately no mention was made of riparian or stream protection zones in these early forest practice rules. By the mid-1960's rules were adopted to protect streams from overzealous construction, substantial diversion, excessive log jams or debris accumulation, and pollution deleterious to fish, plants, or bird life. But pesticides were not named specifically.

Contributing to the problem were the remaining attitudes of the earlier timber landowners. One example was the old "cut and get out" philosophy of cutting all of the possible timber in a tract and then moving on to new parcels in other states. Another attitude was exemplified in the belief that a piece of ground would recover soon after it is cut over if it were just left alone. This attitude was left over from operators who were familiar with timber operations in the East. There, where precipitation is plentiful, a piece of land will begin to come back to forest within 5 years if left undisturbed. here, in the arid West, this is not true as witnessed by the many brushfields scattered amongst our existing timberstands.

Effects of Early Logging

Early logging practices were not as regulated as today. Although California's forest practice regulations have always been the most stringent in the nation (Arvola 1976), they have evolved over the years. An example of the evolutionary process is contained in [paragraph 914(c) Logging Practices-Tractor Yarding] in the 1953 edition of the California Forest Practice Rules. Paragraph 914(c), titled "Logging Practices-Tractor Yarding," states in part, "Tractor roads shall be so constructed and left after logging that water flow thereon shall not contribute to undue or excessive erosion of the soils by gullying. Water breaks shall be installed at intervals of not more than three hundred (300) feet or at each natural water course where such courses are less than three hundred (300) feet, on all tractor roads having a gradient greater than ten percent; such water breaks are to be installed immediately following conclusion of use of tractor roads for logging and prior to removal of equipment (State of California 1953)." No mention is made of keeping equipment out of creekbeds. By 1988, the topic of waterbreaks has its own chapter-(Paragraph #934.60), and takes up more than two pages of the California Administrative Code (State of California 1988).

Silvicultural practices have evolved in a similar way. Earlier, there was concern about the adequate number of healthy seed trees left to restock the stand (State of California 1953). By 1988 Silvicultural Methods are covered in a separate article (Article #3), spanning ten pages (State of California 1988). No mention is made of clearcutting in the early rules. In 1988, clearcutting is discussed in great detail, including size, shape, width of buffer strips, and successive cutting within the buffers (State of California 1988).

Property taxes have also evolved over the years. Earlier, the property tax was levied on the assessed value of the land and the value of the timber. Once a tract of timber had been logged and 70 percent of the volume had been removed, the tract was taxed as

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"cutover timberland" for the next 40 years (State of California 1964).

This method of taxation tended to determine the selected silvicultural system, rather than have that decision based on solid silvicultural principles. In 1977, the State of California adopted a yield tax on forest land (State of California 1987) which taxes the value of the timber yield. Payment is made only at the time of harvest. Yield taxes separate the value of the land from the value of the timber. Land is taxed annually under the property tax while the tax on the timber value is deferred until harvest (Society of American Foresters 1984).

Recent Forest Practice Legislation

The Z'berg-Nejedly Forest Practice Act of 1973 and its amendments, are the most significant pieces of legislation affecting California's forest resources to date. The riparian resources, considered an integral part of the forest, are also included. In October 1983, new lake and watercourse classification and protection rules took effect. The new rules involved a major change in the procedures for classifying and protecting the waters of the State. Provisions of these rules include clear identification of watercourse and lake protection zones. The width of the protection zones varies with the stream classification and slope class of the adjacent land. There are also rules governing the amount of overstory and understory vegetation that must be left within the protection zone after timber operations (State of California 1983). Although water quality is the primary beneficiary of the watercourse and lake protection rules, the riparian ecosystem is also given major protection (State of California 1988).

The rules dealing with erosion control, logging roads and landings, and silvicultural methods, all indirectly enhance the riparian ecosystem. Erosion control serves to keep sediment out of streams and lakes, in addition to keeping soil on the hillside where it belongs. Roads and landings are to be located so that they give adequate protection to water quality and fish and wildlife habitat. Silvicultural methods limit the size of clearcuts and set standards for the use of shelterwood, seed tree, and selection systems; they therefore enhance the riparian ecosystem. These methods help provide or achieve built-in checks for proper forest land management in the form of erosion control, water infiltration enhancement, and maintenance of adjacent non-riparian habitat.

Effects on Granitic Soils

Back in the forties and fifties, logging practices previously described were the same on the granitic soils as those on all other soils. No thought was given to the impact logging operations might have on the granitics. It had not been discovered that granitics react differently to disturbance than do most other soils. The granitic soils are highly erosive. Once they are disturbed, they are extremely difficult to stabilize. Disturbing the stream channel and the adjacent vegetation with equipment for any purpose can cause damage to the riparian zone. This kind of damage in the granitics can be almost impossible to repair.

In 1976, the Soil Conservation Service became involved in an emergency erosion and sediment control program in the Grass Valley Creek Watershed (GVC) in Trinity County. GVC is a watershed having about 75 percent granitic soils. Most of the land in the watershed is commercial forest land. The physiography is characterized by steep mountain slopes and narrow valley floors. GVC was managed like other watersheds in the area, but it was different due to the granitic soils. The impact of disturbance started coming to the attention of local officials and residents after the Trinity Dam was constructed in 1963. The dam controlled the peak flows that had ravaged the Trinity River in the past. With the peak flows controlled, the annual spring floods no longer removed the sand deposits in the river. A very large sand bar developed below the mouth of Grass Valley Creek. The Trinity River Task Force, formed in 1973, determined by 1976 that the erosion occurring in GVC was the primary source of the sediment.

Part of the erosion control program in GVC has to deal with the riparian zone. The most effective practice appears to be the use of rock rip-rap on the outside bends. This practice is combined with willow plantings to make the project ecologically more sound. Treating streambanks is not the total solution to the problem. Erosion of the roads, landings, and skid trails also contributes to the deterioration of the ecological quality of the stream. Erosion control on these disturbed areas has consisted of the installation of waterbars at a closer than normal spacing; surfacing all permanent roads with rock; down drains and energy dissipaters installed at outlets of drainage ditches and culverts; stream crossings located to minimize disturbance of stream channels and stream flow; and seed, fertilizer, and mulch applied to all fill slopes.

Revision of the lake and watercourse classification and protection forest practice rules, adopted in 1983, has made it much easier to prevent additional degradation of the watercourse and lake protection zones (WLPZ).

This is true of all soil types, both granitics and others (State of California, 1983).

In April 1986, the California Department of Forestry and Fire Protection (CDF) formed a team to develop mitigation measures associated with timber harvesting on decomposed granitic soils in Grass Valley Creek. This team consisted of industrial and agency personnel which met for two days to examine soil erosion problems in decomposed granitic soils associated with timber harvesting. Also, the team was asked to upgrade mitigation measures which go beyond those already contained in the California Forest Practice rules for reducing, to the extent possible, soil erosion associated with timber harvesting on decomposed granitic soils. It drafted nine pages of mitigation measures. Those measures that affect the riparian zone, in this case identical to the WLPZ, are as follows:

1. No new roads will be constructed in the WLPZ unless such locations are explained and justified; and these locations will result in less hazard to the watercourse.

2. Fill slopes that contact stream flow will be armored with competent rock or alternative material that will provide equal or better protection; this shall include the approaches to removed temporary crossings.

3. Permanent culverts will not be used unless the road will be maintained at least annually. Culverts will be sized to a 50-year storm and oversized when streambed conditions indicate. Woody slash and debris must be cleared out for a minimum of 30 feet above the inlet to a culvert. Minimum permanent culvert size is 18 inches in diameter. Use a backhoe for culvert installations and removals except where other methods are justified. Decomposed granitic soils must be compacted in a moist condition when used as fill material around culverts.

4. Place logging slash from road right-of-way along the toe of all fill slopes.

5. Locate landings away from watercourses and outside the WLPZ unless otherwise explained, justified, and approved by the Director of CDF. Flag all watercourse protection zones (WPZ) and equipment exclusion zones (EEZ) prior to harvesting activities. WLPZ width shall be a minimum of 100 feet on all Class I and II watercourses.

6. Increase WPZ and EEZ widths (by at least 50 percent) as necessary to prevent erosion when the following conditions are present: (a) adjacent slopes exceed 50 percent; (b) areas of instability are present; (c) sparse vegetation exists or is projected either prior to or after the operation; (d) excessive natural or human-caused erosion is present; and (e) the watercourse or nearby downstream channels support fisheries.

8. Seed, straw, and fertilize all of the following areas of exposed soil within the WPZ: (a) road (unless rocked), landing, and skid trail running surfaces including sidecast; and (b) temporary crossing approaches. Use brow logs, where needed, to minimize sidecast within the WPZs.

The following recommended mitigation measures applying to permanent crossings follow:

1. Minimize excavation by using a backhoe when necessary.

2. Rip-rap inlets and/or install flared inlets.

3. Insofar as is practical, cross watercourses at right angles.

4. Install culverts at the natural channel grade, and control the direction discharge to the grade and center of the stream channel.

Temporary crossings had the following recommended mitigation measures:

1. Evaluate the use of metal pipe versus the use of a Humboldt crossing (made of wood) in the Timber Harvest Plan, and explain the reasons for the choice.

2. Cross drainages at right angles, minimize excavations and plan ahead for removal.

3. If a culvert is used, (a) use a backhoe, where practical, for installation and removal; (b) use culverts 18 inches or larger; and (c) use washed rock as fill material if available.

4. If a Humboldt crossing is used, (a) use sound logs just long enough to facilitate skidding or transporting logs, and maximize the number of logs to minimize the amount of fill; (b) when possible, install and remove logs with a front-end loader; (c) preattach chokers prior to installation, or provide for choker attachment upon removal when access restricts using a front-end loader; (d) minimize ground disturbance during installation and removal; (e) keep fill depth to a minimum; and (f) use brow logs on skid crossings where necessary.

In conclusion, great strides have been made in protection of riparian vegetation in the eighties. It would be naive to think that by winning a few battles, the war is won. Forty years ago many of the environmental blunders could be charged off to lack of awareness. This is not true any more. Today, all natural resource managers are aware of the impacts management operations have on the resource.

The challenge still before us is how to develop mitigation measures that protect the resource, and at the same time, are economically feasible for the operator.

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