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ALTERNATIVES FOR EROSION CONTROL AND DISTURBED LANDS RESTORATION WITHIN REDWOOD NATIONAL AND STATE PARKS

A Summary Presented to the California Coastal PIEC/PAC

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BACKGROUND

One of the primary resource management goals of Redwood National and State Parks (RNSP) is to reduce erosion and sedimentation within the Redwood Creek watershed in order to protect streamside redwood groves and aquatic habitat. Most of the watershed, including much of the national park, has been logged. Research has shown that haul roads and skid trails produced most of the sediment related to logging. A program of watershed restoration, directed primarily at treating or removing roads, began in 1977 and has continued to the present under a plan and Environmental Assessment developed in 1981.

In 1994, park staff began work on a new plan that will guide the program over the next five to ten years. Although the high-priority roads considered under the 1981 plan have been treated, deterioration of drainage structures and fills has increased the erosion potential of remaining roads. RNSP geologists completed an inventory of erosion problems along park roads in 1996. The results of this inventory are being used, in conjunction with information on park resources, to plan and prioritize future work. A draft plan is scheduled to be distributed for public comment at the end of January, 1997.

This briefing statement outlines the alternatives of the draft plan. The plan includes three implementation (road removal) alternatives and four maintenance alternatives. The purpose of this presentation is to solicit comments and suggestions from the PAC before or during the public comment period.

ROAD MAINTENANCE ALTERNATIVES

1. No action—continue current level of road maintenance, including grading, brushing, culvert cleaning, maintenance of water bars, rolling dips, and shoulder drains, replacement of failing culverts, and wet season storm patrols.

2. Abandon maintenance program except for storm patrols.

3. Same as Alternative 1, except that culverts would be replaced before failure.

4. Same as Alternative 3, except that all undersized and all damaged (plugged, rusted, crushed) culverts would be replaced.

IMPLEMENTATION (ROAD REMOVAL) ALTERNATIVES

1. No action--continue with existing program. A range of treatment intensities would be used based on the resource values and degree of past disturbance of the areas treated. Roads and some skid trails in areas with high-value resources and little disturbance would be completely recontoured, and topsoil and organic material would be recovered from fills and spread over the finished surface (an example of this type of work is the Ah Pah Road project that the PAC visited last summer). Treatment intensity would be reduced in areas with lower resource values and higher levels of disturbance. In areas with relatively low resource values and substantial disturbance, only fill material in road-stream crossings (hereafter, "crossings"), or fill likely to fail into a stream would be excavated.

2. Erosion control--only fill material in crossings or fill likely to fail into a stream would be excavated. Intervening road benches would be left to gradually erode over time. Topsoil would not be retrieved.

3. Landform restoration--All roads not needed for park administration and some skid trails would be completely recontoured. Topsoil and organic material would be recovered from fills and spread over the finished surface.

ELEMENTS COMMON TO ALL ALTERNATIVES

Treatment of diversion potentials at crossings--

All crossings on driveable roads within the park will be treated with "rolling dips" to remove diversion potential. Streamflow diversions at crossings cause far more erosion than failures of the crossings themselves (see USGS Professional Paper 1454 for studies in the Redwood Creek watershed). "Rolling dips" are relatively inexpensive treatments that are designed to leave roads driveable, and therefore do not preclude subsequent more intensive treatments. "Rolling dips" are expected to be completed on all park roads by 2001.

Cooperative erosion control upstream of the park within the Redwood Creek watershed--

Road mileage upstream of the park is roughly several times greater than road mileage within the park. Hence, road-related erosion on upstream lands can be expected to exceed road-related erosion in the park by a significant amount. RNSP have signed Memorandums of Understanding (MOUs) with all major industrial landowners that provide for cooperative and voluntary efforts to locate and correct erosional problems on upstream lands. Since the

MOUs were signed, two erosion control projects and two erosion inventories have been undertaken. The PAC visited one project area on the Stover Ranch on the field trip last summer.

Treatment level in relation to funding--

If program funding increases to the point that an acceptable rate of progress in reducing erosion potential could be realized under any of the alternatives, Alternative 3 will be implemented.

Restoration work on state park lands--

The treatment level for projects on state park lands will be determined by state park policies.

Prioritization of treatment areas--

Prioritization will be based on existing quality of aquatic and riparian habitat within tributary watersheds, erosion threat, proximity to alluvial redwood groves, and cultural and scenic resources.

ALTERNATIVES CONSIDERED BUT REJECTED

1. Abandon the program.

2. Eliminate diversion potentials and then abandon the program.

EFFECTS OF IMPLEMENTATION ALTERNATIVES ON REDUCTION OF EROSION POTENTIAL

The alternatives presented in this plan differ by the intensity with which they treat road fill material. At a minimum, crossings and unstable road benches near streams would be completely excavated, and the fill material removed to stable locations (Alternative 2, Erosion Control). Alternative 1 (No Action) would include complete restoration of selected roads in high-value resource or visitor use areas. Complete restoration includes excavation and transport of fill material that is stable or unlikely to enter a stream channel, in addition to crossings and unstable benches near streams. Alternative 3 (Landform Restoration) would provide for complete restoration on all roads.

The treatment intensity determines the cost of completing the restoration work under each alternative. If funding for the program remains stable, then treatment intensity also determines the time required to complete the work. The more intensive treatments (Alternatives 1 and 3) require more money, and hence more time, than the minimal treatment (Alternative 2).

The time required to complete the restoration work, or to achieve a significant reduction in erosion potential, is of significance because the probability of a damaging storm increases with time. Most of the resource damage that led to the creation and expansion of the national park occurred during the major storms of 1953-75. These storms produced floods with recurrence intervals of 25 to 50 years. Many crossings failed or diverted streamflow during those storms.

Any crossings or unstable road benches that are untreated when the next major storm arrives are likely to fail and contribute to downstream sedimentation. Road benches that presently appear stable, however, may eventually fail if untreated, and add to long-term erosion. The timing of future storms, as well as the selection of a preferred alternative, will therefore greatly influence the ultimate success of the restoration program in reducing sedimentation in Redwood Creek and its tributaries.

The alternatives of this plan represent a "tradeoff" between the number of crossings and unstable road benches that can be treated before a major storm strikes and the reduction of long-term erosion from potentially unstable road benches. Because we can't predict when the next storm will occur, we can't determine with certainty which alternative will be the most effective in protecting aquatic and riparian resources. For planning purposes, therefore, we selected two points in time to compare the relative progress of the alternatives: the year 2002, when the probability of major storm recurrence reaches 0.67 (2:1 odds in favor of a storm), and 2028, when the program under Alternative 2 would be completed and storm probability would be 0.88.

To compare the relative effectiveness of the alternatives, we estimated the annual reductions of erosion potential (EP) under Alternatives 2 and 3. EP reduction for Alternative 1 is more difficult to predict, but the rate of EP reduction for Alternative 1 can safely be assumed to lie between the rates for Alternatives 2 and 3. For the purposes of these calculations, we assumed that all potential diversions at crossings had been eliminated with "rolling dips", and that erosion would be confined to the crossings or fill failures.

By 2002, Alternative 2 would reduce EP from the present (1996) 761,000 cubic yards to 634,000 cubic yards. Alternative 3 would leave 673,000 cubic yards of EP by 2002. The difference in EP reduction between the two alternatives is therefore 39,000 cubic yards, equal to 5% of the present-day EP within park boundaries.

The difference in EP reduction for the two alternatives increases with time after 2002 until 2028, when Alternative 2 would be completed and the difference in EP remaining would reach its maximum. At that time, the EP remaining under Alternative 2 would be 0 cubic yards and the EP remaining under Alternative 3 would be 214,000 cubic yards, equal to 28% of the present-day EP. If work continued under Alternative 3 after 2028, the difference would again decrease until completion of the program in 2041.

A realistic assessment of the differences in EP reduction for the plan alternatives requires consideration of sediment sources at the watershed scale. Road mileage within the Redwood Creek

watershed upstream of the park is greater than the remaining mileage within the park by a factor of roughly 4.5. If the EP per mile upstream of the park is similar to EP per mile within the park, the upstream road-related EP can be estimated as 4.5 times the present-day park EP of 761,000 cubic yards, or 3,424,000 cubic yards. Total road-related EP can therefore be estimated as the sum of the park and upstream EP volumes, or 4,185,000 cubic yards. The 39,000 cubic yard difference between Alternatives 2 and 3 in 2002 represents less than 1% of this total, and the 214,000 cubic yard difference in 2028 represents 5% of this total. The overall impact of implementing either Alternatives 2 or 3 on watershed-scale sedimentation will therefore be small relative to total road-related erosion in the next large storm. Comparisons to average annual sediment discharge in Redwood Creek at Orick (approximately equivalent to 1,000,000 cubic yards) or to the volume of sediment deposited in Redwood Creek during the large storms of 1953-75 (roughly 7,350,000 cubic yards) also suggests that differences in EP reduction between Alternatives 2 and 3 are not significant in the perspective of basin-wide erosion, deposition, and sediment transport during periods with major storms.

The high probability of a major storm in the next few years and the limited reductions in EP that can be accomplished under any of this plan's alternatives highlight the need to aggressively pursue the removal of diversion potentials within and upstream of the park. We cannot quantify the reduction in EP that diversion treatments would provide, but based on past studies (see USGS Professional Paper 1454) such treatments would address well over half of total road-related erosion. Correction of diversion potentials is also the only approach to reducing EP that could reasonably be completed before the probability of a major storm reaches our planning threshold of 0.67.