Redwood National Park - Redwood Creek Watershed
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NATIONAL PARK SERVICE

WESTERN REGION

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IN REPLY REFER TO:

November 10, 1975

REPORT TO THE STATE OF CALIFORNIA CONCERNING SEDIMENTATION PROBLEMS IN THE REDWOOD CREEK WATERSHED, AND THEIR IMPACT ON PARK RESOURCES

The National Park Service administers several thousand acres in the lower portion of the Redwood Creek watershed. This southern tip of Redwood National Park includes a narrow, eight-mile long corridor along the creek that contains several of the world's tallest known trees. The purpose of the park is to preserve significant examples of the primeval coastal redwood forests and the streams and seashores with which they are associated for public inspiration, enjoyment, and scientific study. The act that created the park (Public Law 90-545) recognized that land uses adjacent to the park might adversely affect the timber, soil, and streams within the park. We are before the State Board of Forestry to encourage further regulation of forest practices that will minimize such adverse impacts.

The Secretary of the Interior was authorized by section 3(e) of Public Law 90-545 to acquire interests in land from, and to enter into contracts and cooperative agreements with, the owners of land on the periphery of the park, in order to protect the park. This Federal decisionmaking process is now in progress, and we have described four options and their environmental impacts in the Environmental Assessment, Management Options for Redwood Creek, Redwood National Park. This assessment is currently available for public review, and comments are solicited until December 5, 1975. The information and recommendations contained herein concern the option of State regulation. Vigorous enforcement of forest practice regulations on lands adjacent to the park is an element in the current Federal decisionmaking process.

There is damage now occurring to the resources of Redwood National Park in Redwood Creek from past and present land use practices, primarily logging and roadbuilding. Certain processes have been set in motion that are causing current adverse impacts, and through forest practice regulation, some of these impacts can be mitigated. Detailed specific descriptions of the sources of erosion, the location of erosion prone areas, and the physical and biological damage in the park are contained in the U.S. Geological Survey open-file report, "Watershed Conditions in the Drainage Basin of Redwood

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Redwood Creek WATERSHED

Creek, Humboldt County, California, as of 1973," and "Recent Man-Induced Modifications of the Physical Resources of the Redwood Creek Unit of Redwood National Park, California, and the Processes Responsible for Those Modifications." The description of damage presented here is intended to supplement and summarize the material in these reports.

Modification of park resources occurs when damaging inputs enter the park at various locations. Such inputs can enter the park along the main channel of Redwood Creek at the southern park boundary, along tributary streams that enter the park upslope from the main channel, and along hillslopes well away from the stream channels. To date, the damage along the main channel and tributaries has far exceeded that along the hillslopes.

The resource problems associated with Redwood Creek and its tributaries relate to increased intensity and frequency of bedload transport, channel aggradation, and a decrease in bed-material particle size. Fish-rearing pools have been filled, and along most of the main channel, significant aggradation has occurred in recent years. Outside of the park, recent fill since 1952 has locally exceeded 15 feet, and near the Tall Trees flat, fill over the same period is at least 5 feet. The channel aggradation has caused shifting of the water channel, or thalweg, and the frequent shifting of the stream-bed material tends to destroy benthic organisms, fish eggs, and alevins. Fine sediment on stream bottoms has the effect of reducing intragravel oxygen that can result in mortality of aquatic organisms. The magnitude of recent channel modifications is somewhat less along the tributaries than along the main channel of Redwood Creek; significant changes have nonetheless taken place.

Some bank erosion has occurred in the park, and riparian environments have also been altered by deposition of massive berms of sandy gravel. These deposits have killed riparian trees, including redwoods. Coarse organic debris transported by Redwood Creek also affects riparian environments, battering and sometimes toppling riparian trees. Much of this debris consists of logs with sawed ends or cable scars. Occasionally, tires, battered culverts, and cables protrude from alluvial deposits along parkland reaches of Redwood Creek.

Timber harvesting directly adjacent to the park boundary has caused less damage than is present in park tributaries and the main channel of Redwood Creek. Damage has largely been confined to minor penetrations of accelerated erosion and deposition along small ephemeral streams. However, other principal causes of concern associated with future harvesting up to the park boundary include fire, slope wash, windfall, and microclimatic "edge effects." In addition, the critical factor of "summation of minor impacts" can be expected to exert itself as logging activity continues around the park.

The harvest operations up to the park boundary have occurred under interim harvesting guidelines developed between the companies and the park staff. Such harvesting represents several practices in excess of current State

regulation, including cable yarding, absence of roads, a small vegetal strip, and small patch cuts. However, as discussed later, even these improved practices need further refinement to provide adequate protection to the park boundary. Away from the so-called "buffer zone", the massive use of tractor yarding over wide areas has caused sediment and water concentration which eventually result in downstream damage.

The park protection problems reflect the cumulative sum of many small problems associated with timber harvest activity, much of which occurs at some distance from the park boundary. Many of the erosion problems involve fluvial and fluvial-induced mass movement processes along pre-existing stream channels, as well as along skid trails, at landings, along roadside ditches, and at fill and culvert stream crossings. The bulk of these problems begin with obliteration of the finer details of the natural drainage pattern, and the concentration of runoff in a limited number of pre-existing channels. Increased peak storm discharges and storm runoff volumes above levels on undisturbed slopes also help to initiate processes that result in downstream damage.

Protection of the resources of Redwood National Park depends on adequate regulation of forest practices, not only at the park boundary, but in all watersheds that drain into the park. The present forest practice rules for the Coast Forest District, effective September 24, 1975, represent a major improvement over the practices of the last 25 years. Notwithstanding this, however, in and of themselves they are clearly inadequate to provide sufficient protection to park resources. The probable impacts on the park from enforcement of the current forest practice rules are discussed in detail in the Environmental Assessment, Management Options for the Redwood Creek Corridor, Redwood National Park. Rather than devote more space to our concern for the adequacy of the present rules, which are fully discussed in the assessment, we feel it is more productive to outline concepts and practices that would improve State regulation as an additional tool to be used to protect the resources of Redwood National Park.

The application of the Z'Berg-Nejedly Forest Practice Act of 1973 is generally done through the preparation, review, and approval of individual Timber Harvesting Plans. These plans should be reviewed not only for what they propose on a specific site, but how they interact with other cutting units in the watershed. The review should include an analysis of the cumulative impacts of several Timber Harvesting Plans in the same watershed, with the recognition that certain areas of the watershed should be allowed to recover before other areas are cut. As a general rule, we would suggest that not more than 30 percent of any tributary watershed draining into Redwood Creek be harvested in any given decade. In application to the Redwood Creek watershed, this would defer cutting in several tributary watersheds around the park, including Wier Creek, Miller Creek, Cloquet Creek, and in the near future, Bridge Creek, in order to allow partial recovery before further cutting is allowed.

The review process for Timber Harvesting Plans is presently conducted by a review team consisting of representatives of the Division of Forestry, Department of Fish and Game, and the Regional Water Quality Control Board. In several instances (THP's 345 and 980, among these) the Department of Fish and Game and the Regional Water Quality Control Board representatives have voted against approval, yet the plan was approved. Apparently their input is advisory only and has no definite authority in the review process. We suggest that review of the timber harvesting process involves multi-disciplinary input, and to have that input effectively applied to the land, a share of the decisionmaking process should be delegated to the Department of Fish and Game and the North Coast Regional Water Quality Board. We suggest that a representative from the Division of Mines and Geology with geological expertise be added to the review team. We further suggest that a representative of the National Park Service be added as a member of the timber harvest review team for all plans being considered in the Redwood Creek watershed. These people would provide further multidisciplinary input into the review of Timber Harvesting Plans. Many of our concerns associated with degradation of park resources would be more effectively addressed if specific harvesting and mitigation measures suggested by related State agencies and the National Park Service were incorporated into the Timber Harvesting Plans.

The most critical concept that must be addressed in an improved set of forest practice rules is the realization that in certain limited areas timber harvesting should not be allowed. While the extent of such no cutting zones might not be widespread, there is no feasible alternative in some streamside zones and special treatment areas (as defined by the forest practice rules at 912.22). Effective mitigation of park boundary inputs such as concentrations of runoff and associated sediment in ephemeral streams, slope wash, and windfall is best achieved by an uncut buffer. Along streams, uncut streamside zones can absorb upslope impacts and prevent significant increases in stream bedload, which in turn prevents increased downstream slides. The width of these zones should vary depending on land slope and geology. These factors are considered in Erosion Hazard Ratings, and as a general rule, the width of the uncut zone should increase as the Erosion Hazard Rating increases.

Our recommendation for improved forest practices are divided into two categories: those for the boundary zone of 800 feet around the park corridor, and those for the tributary watersheds draining into Redwood Creek south to and including Lacks Creek and Panther Creek. Recommendations for areas further upstream recognize the largely cutover nature of this portion of the watershed, and are limited to a strict enforcement of present regulations coupled with rehabilitation work discussed under our concluding remarks.

Boundary recommendations are applicable to the first 800 feet upslope from the park boundary, and include:

1. A 150 foot wide buffer zone of no cutting, in order to absorb overland inputs of soil and water, potential mass movement, and prevent windthrow in the park.

2. Within a 100 foot wide zone upslope from the no cutting buffer zone, tractors shall be prohibited. Layouts and tractor-built firebreaks shall be prohibited, and no slash burning shall be allowed. Some slash shall be left to absorb surface erosion, and only commercial coniferous vegetation shall be extracted. Excess concentrations of slash shall be yarded upslope for possible disposal out of this zone.

3. Patch-cuts shall generally be limited to 15 acres maximum within the 800 foot zone, recognizing the total cutting unit may be larger when the yarding distance to the first road is considered, when the lay of the land would allow a slightly larger unit, or to accommodate the harvesting of presently isolated blocks that are 20-25 acres in size.

4. Adjacent (sideslope, downslope or upslope) areas to present or planned patch cuts shall not be harvested within 7 to 10 years (adjacent is defined as within 300 feet).

5. All harvesting shall be restricted to cable yarding with the exception of the areas presently marked acceptable for tractor yarding on maps accompanying the present cooperative agreements negotiated between the companies and the park staff.

6. All cableways (and all tractor skid trails in the few allowable tractor yarded areas) shall be intensively waterbarred at 50 to 100 feet intervals. Maintenance shall occur each fall and, if needed, several times per winter for a minimum of 5 years after the end of disturbance.

7. Residual debris in draws shall sometimes be left to trap sediment. The decision should be specifically justified for each draw in the Timber Harvesting Plan.

Recommendations for tributary watersheds include those for streamside zones and those for hillslope areas outside of streamside zones:

1. Streamside zones - The newly revised cutting and logging methods in the Stream and Lake Protection Zone provide protection against water temperature increases and will reduce sediment input. However, to additionally reduce sediment and especially bedload additions, the following practices should be employed:

   (a) Along each side of all streams, as defined by current regulations, and commencing at the Stream and Lake Transition Line, an uncut buffer shall be left, the width of which shall be defined by the Erosion Hazard Rating:

Erosion Hazard Rating	Buffer Width
Less than 100	75
101 - 200	100
More than 200	125

Where an area of active mass movement is present and borders the Stream and Lake Transition Line, the uncut buffer shall begin around the crown of the mass movement zones.

(b) Adjacent to the uncut buffer, a 75 foot zone of modified harvesting practices shall be established, wherein:

(1) no tractor-built layouts or firebreaks are allowed,
(2) no slash burning is done,
(3) commercial conifers only to be removed.

(c) The last yarding level, and in no case less than 400 feet slope distance adjacent to a stream, shall be cable yarded.

2. Roads

(a) Roads shall be located at least 75 feet slope distance away from stream banks except at stream crossing.

(b) If a slide zone must be traversed, engineering standards designed to minimize the impact ofsuch roads on the land will be followed. Such practices shall include but are not limited to narrow road widths, extra drainage structures, the use of riprap or retaining walls, reshaping slide crown areas and angling gradient of the road up into and down out of the zone.

(c) Road surfaces on grades steeper than 6 percent shall be rocked.

(d) All raw slopes shall be revegetated.

(e) No woody material shall be incorporated into fill slopes and landings.

(f) Place at least a 24 inch culvert in all natural drainages. Place at least one 24 inch culvert per 800 feet of roadway as a minimum standard to cope with the high intensity storms prevalent in the area.

(g) Road design shall include culvert placement to prevent an area increase of more than 40 percent in any drainage.

(h) Culverts shall be designed to accommodate a 50 year flood capacity. In drainages more than 30 percent logged within the last ten years, increase culvert size one or two sizes above the calculated size.

(i) Culverts shall be placed in the natural stream channel and/or installed with a securely fastened elbow with transition at the lower end to carry water below the toe of fill to a non-erodible base. Riprap or energy dissipators shall be installed where necessary to prevent downslope erosion.

(j) Trash racks shall be installed to insure against culvert failure, and where past culvert plugging has occurred or is reasonably likely to occur, additional structures shall be placed upstream to catch debris.

(k) Temporary roads and skid trails (planned use for one dry season only) shall be closed out annually by the effective installation of control devices that will minimize road surface and downstream, downslope erosion. This will include but not be limited to water bars, cross drains and the prompt removal of drainage structures or temporary obstructions to drainage channels.

(l) Winterization shall be completed annually by October 1 for permanent roads and for all others will be commenced annually by a date so that it is reasonably expected to be completed before winter rains reach a level that further road work would result in any significant damage.

(m) On steep slopes, excess dirt should be endhauled rather than deposited as sidecast. In general, this shall apply where roads are built on slopes exceeding 40 percent or crossing streams.

3. Clearcut size shall be limited to a 40 acre maximum, with a limit of 25 acres in the first yarding distance away from a streamside buffer, and 15 acres in areas with extreme erosion hazard or identified as "critical" or "special" zones in the present form of the cooperative agreements developed between the companies and the park staff.

4. Adjacent areas (sideslope, downslope, or upslope) to present or planned patch cuts shall not be harvested until 7 to 10 years following slash disposal. (adjacent is defined as within 300 feet).

5. Cable systems shall be employed on all slopes steeper than 30 percent.

6. Where tractor logging occurs, all skid roads shall be pre-built, with post-logging drainage incorporated into the design.

All specific harvesting recommendations are subject to the application of the condition that no Timber Harvesting Plan be considered in any tributary watershed that has been harvested in excess of 30 percent in the previous 10 years. The specific rules are not objectives unto themselves. Rather, they define practices which will prevent damage to the park boundary, and to tributary streams where excessive sediment and water inputs would cause downstream damage in the park.

The National Park Service requested a voluntary 18 month moratorium on further timber cutting in certain areas of the Redwood Creek watershed from

the three companies operating on lands in the vicinity of the park. The moratorium was designed to address our concerns with the current rate of harvesting on lands surrounding the park in view of our responsibility to report to the Congress on available management options. In our judgment further cutting (1) adjacent to the park boundary, (2) in critical areas jointly defined by the companies and the park staff, (3) in some areas of high and extreme erosion hazard, and (4) in tributary watersheds recently harvested in excess of 30 percent would preclude other actions that could mitigate impacts in the drainage.

The moratorium has been expressly requested of the companies on a voluntary basis, and we have not received responses from all three companies. It was requested as an interim measure leading to that time when other practices could be implemented. The suggested improvements in State regulation are one means of achieving these practices.

The concept of a rehabilitation program in the Redwood Creek watershed is sound, and was proposed in August 1975, by the State of California's multidisciplinary study team in a report, "Rehabilitating the Redwood Creek Watershed." The recommendations for channel clearance, roads, landslides, and disturbed areas should be implemented under the guidance of a Land Management Committee. The National Park Service will assume responsibility for rehabilitation on park lands. In this regard, we would like to expand upon the rehabilitation efforts we have implemented in the park.

The study team report recommended two specific actions to protect the Tall Trees Grove: (1) removal of the old M-line bridge at the mouth of Tom McDonald Creek across from the grove, and (2) installation of riprap along upstream and downstream sections of the Tall Trees alluvial flat. The staff of Redwood National Park, with the help of Louisiana-Pacific Corporation, removed the M-line bridge during September 1975, and eliminated this man-induced problem near the Tall Trees flat. We have recommended against the use of riprap at the Tall Trees flat for several reasons. Riprap offers little or no protection against aggradation problems, which most significantly threaten the grove. Experience with revetments of active channels, although a widespread practice, causes deposition or erosion downstream that cannot be forecast. Riprap may increase erosion problems between the riprapped areas as well as downstream. Further man-induced erosion problems could cause installation of more riprap, and might eventually require channelization for miles downstream, a very costly and esthetically displeasing action. If the stream got behind the riprap, it would increase bank erosion from prevent levels, and completely negate the use of artificial bank protection. Present bank erosion, incidentally, is confined only to the downstream edge of the grove.

The study team organized by the State of California was itself divided on the issue of bank protection, recommending it as a majority position in contract to the unanimous suggestion for removal of the M-line bridge. The

questionable effectiveness of riprap and the additional perturbations it will introduce into the system are the reasons why the National Park Service has recommended against its use at the Tall Trees Grove.

The leadership for rehabilitation efforts on private lands should come from the California Resources Agency, and we would be willing to provide representation from the National Park Service if desired. Our position regarding remedial measures on private lands was first stated in the 1973 report by the Department of the Interior, "Resource Management Actions Affecting Redwood Creek Corridor--Options Paper," and remains that such measures are the responsibility of those State agencies charged with regulating forest practices and maintaining water quality standards. The means by which such measures are carried out are in the domain of the State of California.

The National Park Service appreciates the opportunity to outline for the State Board of Forestry concepts and practices that will improve the option of State regulation in the protection of the resources of Redwood National Park.