RENEWING REDWOOD PARK

by Sandra L. Keith

Is this matchless natural resource truly renewable? The answer may lie in an ambitious land-rehabilitation project, largest ever undertaken in a National Park

Almost from the onset of Pacific settlement, people sought protection for some of the coast redwoods—though in the beginning few rallied to the cause. After all, there were nearly two million acres of the giants, and, as it took two experienced axmen at least five days to fell one, who would ever be able to cut them all? Why bother to preserve what would obviously last forever?

But the cause would not die, and in 1902 the San Jose Sempervirens Club persuaded a balky California state legislature to appropriate $250,000 for the purchase of Big Basin, one of the last remaining virgin redwood stands in the Santa Cruz Mountains.

Another victory came in 1908 when President Theodore Roosevelt established Muir Woods National Monument, a small redwood grove just north of San Francisco. And though prolific legislation was introduced between 1920 and 1930, federal action on a national redwood park was literally at a halt.

But logging was not. Newer and more efficient tree-felling operations were on the upswing, and between 1900 and 1929 the coast's "red gold" crashed to earth with ever greater frequency. More and more sawmills ran at full capacity; the redwood forests continued to dwindle.

Purposeful federal action did not come until 1963, when the National Park Service, funded by a National Geographic Society grant, undertook a comprehensive study of the redwood preservation already accomplished (largely due to the continued efforts of the privately funded Save The Redwoods League), and to determine whether further preservation was needed.

During the year-long review, a combined team of NPS and Geographic personnel discovered the world's three tallest trees on private property along Redwood Creek. However, their report stated that, except on a few small subdrainages near Orick, the opportunity to set aside complete watersheds of virgin redwoods no longer existed.

It appeared that if a national redwood park was ever to be established, it would have to be done quickly. Working out the complex details took four years, and during that time logging continued in the Redwood Creek basin. The park was finally established in 1968.

Ten years later, with land rehabilitation a top priority in the long-range protection of the Tall Trees Grove, 48,000 acres were added along the park's southern section—39,010 of which were upslope clearcuts along Redwood Creek.

Today, Redwood National Park's 106,000 acres wears the unprecedented price tag of almost $700 million (with the final settlement still pending), making it our most expensive national parkland. And though it may not be the national redwood park envisioned by nearly a century of conservationists, it is still an imperial domain of such stature that in 1980 UNESCO declared it a World Heritage Site "especially worthy of preservation for the good of mankind." Ironic that an international legacy should have come so close to being lost. Or cost so much to preserve.

ONCE A DESIGNATED area comes under the stewardship of the National Park Service, policy dictates that the landscape remain virtually unchanged—a legacy for future generations. But Redwood National Park (RNP) in northern California functions under a special mandate.

This is a park in transition and a legacy in renewal—for RNP is the site of the largest land-rehabilitation project ever undertaken on National Park property. And though tons of heavy equipment grind along its steep, mountainous terrain, the aim is not to destroy but to create anew as the more than 39,000 clearcut acres added to the park in 1978 are systematically recontoured and replanted.

"In rehab, our top priority is to control the erosion," said geologist Danny Hagans as he took me along on a ride through the RNP backcountry. "That's the main reason we have eight geologists on our team. Most national parks would consider themselves fortunate to have one resident scientist, but then most national parks are dealing with pristine acreage. At RNP we're contending with a host of cutover lands, most of which were acquired in a devastated condition."

Overleaf: view from the air shows effects of logging on land above Tall Trees Grove on Redwood Creek. **Inset:** Lee Purkerson stops for a snack of huckleberries in naturally revegetated area of Redwood Park

David Van de Mark

Inset: Sandra Keith

His appraisal seemed accurate. The paved road we had started on had long ago disappeared, and our truck was bumping along what had probably once been a decent logging road. Now, however, it was little more than a series of chuckholes across stump-strewn hills. As we drove, Hagans capsulized the events that had led to the 1978 land acquisition and the Congressionally authorized $33 million for a 15-year rehabilitation program.

Prior to the 1978 park expansion, timber harvesting and related road construction had adversely affected the entire Redwood Creek basin—an area which even under natural conditions is considered one of the most highly erodible in the United States.

Now it was even more so. Ninety percent of the basin's forests had been harvested, and thousands of miles of haul roads and tractor trails webbed the already unstable slopes. With winter storms pummeling the coastline with 80 to 100 inches of rain in a six-month period, erosion intensified.

Miles of inboard ditches concentrated heavy surface runoff, eventually diverting it onto denuded slopes with deflected drainage patterns. Gullies formed; slopes failed; rills developed in cutbanks. Landslides were common and earthflows crept toward major stream channels.

As the land continued to move, sediment transport within the 278-square-mile watershed became an even greater problem. Redwood Creek's mean annual erosion rate of 1,000 to 2,000 tons of sediment per square mile rose to more than 8,000 tons per square mile.

As the increased sediment filled the creek's main channel, overbank flooding took its toll on streamside vegetation; anadromous fish-spawning and rearing habitats aggraded and disappeared. To further complicate matters, the ever-rising water table caused the demise of a number of upstream Douglas-firs and posed a real threat to the downstream forest containing the world's tallest trees.

By 1977, with park expansion and related land rehabilitation on the horizon, the Department of the In-

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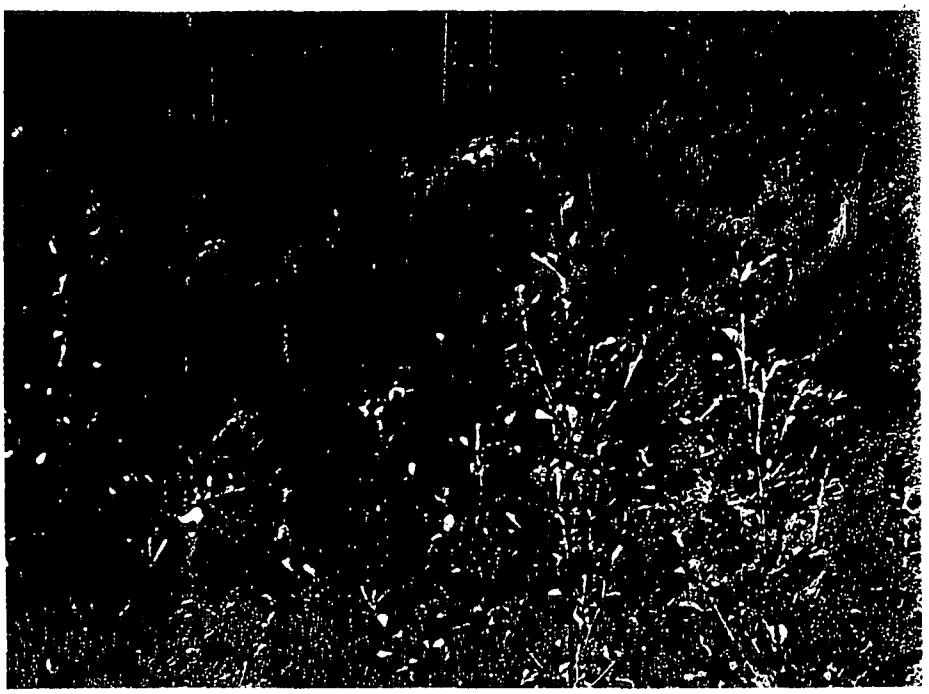


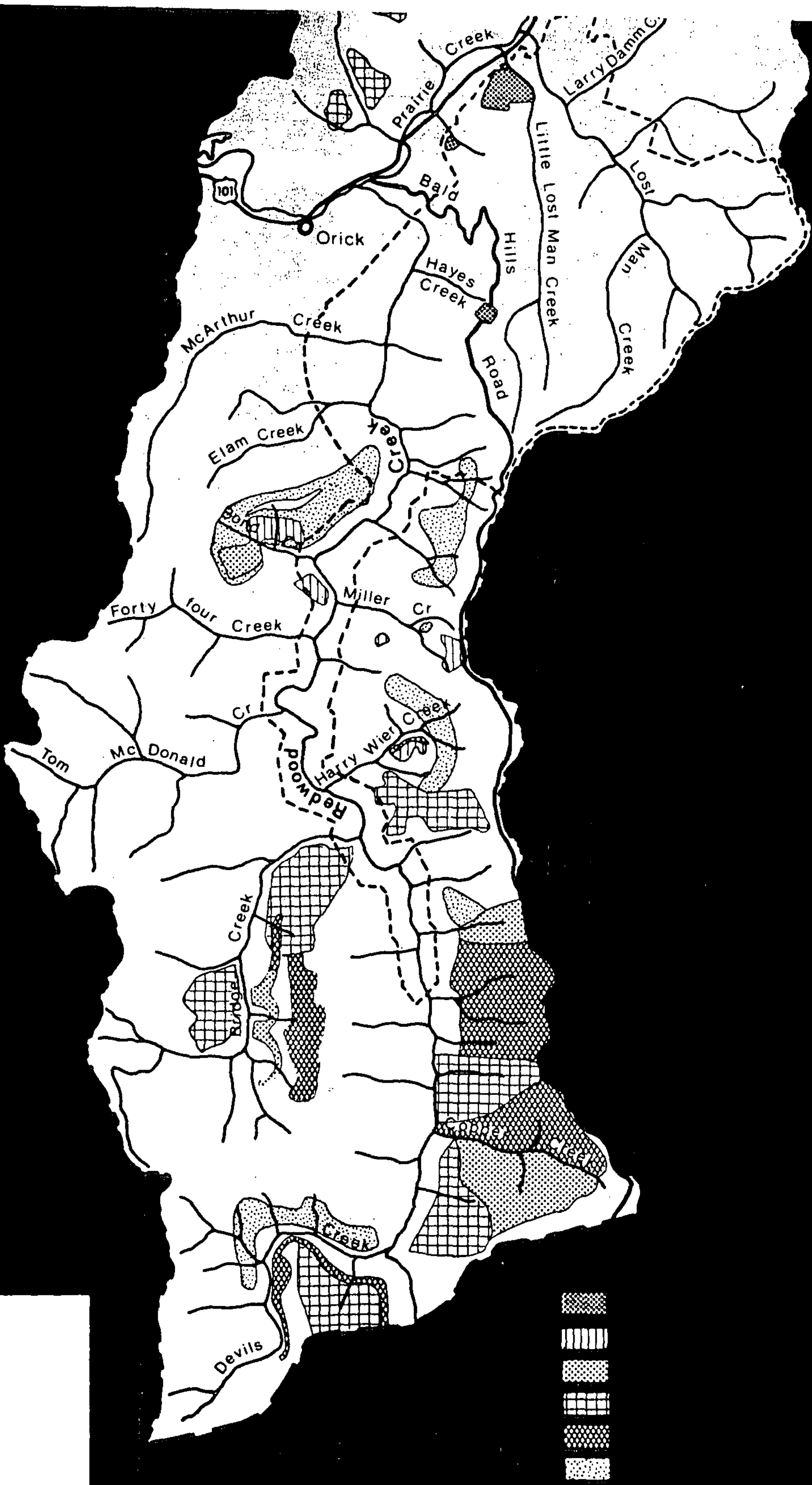
Lee Purkerson

Top: June 1979 photo shows area on McArthur Creek that was cable-logged in 1967. Debris was not removed

Above: the same area in October 1981. Profuse stand of alders helps revegetation process on western slopes of watershed

Redwood National Park

Right: outplanting is usually a labor-intensive activity. Nursery contracts are awarded to the lowest bidder, and stipulations govern how many plants must be available, what size containers they must be in, and on what date they must be ready. Rooted stock used here was from the Simpson Timber nursery at Korbel



Prairie
Creek
Larry Damm Cr
Little Lost Man Creek
Lost
Man
Creek
101
Bald
Hills
Road
Orick
Hayes
Creek
McArthur Creek
Elam Creek
Creek
Forty four Creek
Miller Cr
Tom Mc Donald Cr
Harry Wier Creek
Redwood
Creek
Bridge
Creek
Devils

terior directed RNP to institute some sort of pilot program whereby an estimate of costs might be attained.

The newly formed rehab team consisted of four or five, and the four projects that year constituted less than 40 acres each. With the program's formal inception in 1978, the staff began growing and today includes about 70 professional, technical, and administrative people. And rather than a few small sites per year, the team averages five 400-acre units per season, each overseen by an on-site hydrologist or geologist.

"Our aim," said Hagans, "is to stabilize the watershed and speed the ecosystem recovery by controlling erosion, removing all roads not needed for rehab access or park management, revegetating those areas unlikely to come back on their own, and restoring altered stream channels."

The road we'd been jostling along ended abruptly, and Hagans made a sweeping motion with his hand. "This is Dolason Prairie," he said. "We took out more than two miles of road here last year; I'd like to show you the results."

As we walked along the slope, Hagans explained that the park's 2,000 prairie-acres had been part of the 1978 acquisition. Their expanses are interlaced with a network of old logging and ranch roads, and many of the prairie areas are deeply gullied because the roads altered natural drainage patterns by diverting runoff.

To reverse this trend, all unnecessary roads are reshaped so that they no longer intercept surface drainage —an end achieved by using bulldozers and hydraulic excavators to scoop the sidecast fill from outside the road prism and redeposit it on the inside road bench. In the process, the inboard ditch is buried.

Removing prairie roads is relatively simple; gullies are harder to hide. Only on occasion are the yawning chasms excavated and the channels rock-lined to prevent further downcutting. For the most part, the gully-creating stream is redirected to its historical origin and the newly dewatered abyss filled in. And even though the gully's jagged edges are rounded off and either partly or completely recontoured, a bit of a swale is sometimes left behind.

Once the heavy-equipment phase ends, labor crews top-dress all reshaped surfaces with a thick layer of straw and thereby minimize erosion, disperse runoff, and reduce evaporation. And with water now able to spread over either an uninterrupted or a stabilized surface, erosion problems are greatly diminished.

By the time Hagans and I had traipsed a couple of prairie ridgetops I was duly impressed. For even though he more than once stopped to pinpoint where old access roads had crisscrossed the now flawless expanse, it took several minutes and a lot of imagination to envision their ever having been there at all.

We left the grasslands and set off over yet another complex of bone-jarring roads. After about 20 minutes, Hagans pulled alongside a bank and shut down the engine. "We

Redwood National Park

Top: 1976 picture shows the W-line logging road across Dolason Prairie. Note the extensive sidecast near the switchbacks and the old prairie ranch-road that intersected the logging road at midpicture

Above: the same scene in 1980 after rehabilitation. A bulldozer and hydraulic excavator were used to redistribute the sidecast and road-fill material. Straw mulch and grass seed were spread on bare soil to protect disturbed areas from erosion. As of fall 1981, the former road alignment could no longer be discerned on the ground

Heavy equipment reshapes land on the W-line. Hand-planted redwoods and Doug-firs were put into this area. Tall trees in background will provide shade and additional seed

Redwood National Park

Meneze Prairie sits on the east side of the Redwood Creek drainage. This picture, taken near the ridgetop in August 1981, shows area before heavy-equipment phase

Photo taken a year later of the same area shows effects of reshaping, seeding, and straw mulching. Road has been eliminated, and mulching will stabilize soil

Lee Purkerson

Numerous problems exist in the Park Protection Zone. This log jam is known as the Lacks Creek champion

rock-armored, a creekbed over here," he said. "And just a way down slope are a series of check-dams and a ripped road."

The ripped road was a surprise. Though I hadn't known just what to expect, it surely had not been this long stretch of dry and clumpy gray clay. What's more, the few conifer seedlings still standing appeared almost jaundiced.

Hagans bent over and propped a small rock against a struggling seedling, shading its roots from the heat of the day. "Our vegetation people are even more selective now in choosing their conifer sites," he said. "In places like this—where there's little water, no shade, and not an ounce of topsoil—they're looking around to see what's growing nearby. Then they plant or seed-in similar vegetation, and after a while those pioneer species take hold, provide shade, and eventually put down enough duff so the conifers are able to come back on their own. When that happens, the Doug-firs are generally the first ones in. The redwoods will follow."

Reestablishing the redwood forest is the rehab team's ultimate objective. And to escalate the initial seeding-in process, hundreds of miles of concrete-like haul roads are being "ripped" or decompacted as bulldozers drag hydraulically activated ripper teeth through the hard surface, plowing to a depth of about 18 inches.

All culverts are removed; watercourses and swales are excavated of road fill and organic debris. Bulldozers reshape the road, giving it the downhill-dip that will allow water to run across, rather than down, the old alignment.

By the time each season's rehab units are completed, winter storms are lashing the coast, sending volumes of water into transient, intermittent, and perennial stream channels. The erosion-control devices that looked so good during the warm, dry months are now called upon to perform at peak efficiency —and are often severely tested.

RNP monitoring crews maintain a close watch on each of the sites rehabed since the program's inception, and should they discover an erosion-control device that has ceased to function, immediate repairs are undertaken. Sediment flows are constantly measured and recorded; erosion-control techniques are evaluated as to their technical efficiency and cost-effectiveness; vegetation prescriptions are examined.

Reports are compiled and the rehab team is called together. Success stories are studied and failures evaluated. New ideas are set forth and old theories examined. The complex program is taken apart, assessed, then put back together in such a way that it will function next year even better than last year. And always, there is the question from the peer-review board: why do you do what you do when you do it?

"You have to be thick-skinned," says Hagans, "because someone's always taking potshots at your methods. But as a result, we've come up with improved techniques and some really innovative procedures."

"We were forced to be creative," says L. Lee (Purk) Purkerson, RNP Chief of Technical Services. "We've had to deal with unprecedented erosion problems in this project."

He said that though the program's first two years could be considered experimental, what has evolved is now standard procedure. "We discovered early on that tried and true methods weren't always the best answer," he said. "And sometimes they didn't work at all—not here. So we've had to be imaginative in order to get this land back on track so it will heal, perpetuate, and maintain itself without further manipulation."

To accomplish that, the rehab team is forced to disturb an already altered ecosystem. Engineering geologist Bill Weaver admits that some rehab projects do result in a short-term sediment increase. "But that's only because we've had to bare some soil in order to deal with a larger problem," he adds. "In the long run, the ultimate good far outweighs the initial impact. And over the past five years what we've experienced most often has been an immediate and dramatic decline in sediment yields."

So what has the land gained?

"Conservatively speaking, probably 25 to 50 years," says supervisory plant ecologist Mary Hektner. "There are logging roads and skid trails out there that are so heavily compacted or rocked or both that it would take dozens of years for conifers to become well established. Yet within a year after rehab we're seeing some of these roads dotted with thousands of seedlings."

I asked to see such a site; within a half hour Purk, Mary, and I were shoulder to shoulder in a park pickup.

The road they called "W-Line" looked far from parklike, but even my untrained eyes could see that the surrounding areas were beginning to make a comeback. The straw mulch had mellowed to an undistinguished gray; the hand-planted redwood and Doug-fir seedlings were holding their own. Better yet, all up and down that plowed ribbon of earth were miniscule splotches of green—countless shrubs, alders, and Doug-firs freckling that which a short time ago had been impermeable soil.

Mary explained that this particular site had flourished largely because ground disturbance had been minimal, bits of topsoil remained, and the roadbed, though it had been thoroughly compacted, had not been heavily rocked. But more important, this was a narrow corridor with tall trees on either side—ample seed sources that shaded their progeny for part of each day. "Sites like this are easier to rehabilitate," she said. "But even here mortality will be high. Only the strongest will survive."

It was becoming increasingly clear that there were no blanket prescriptions when it came to reclaiming a watershed. Everything was site-specific; what worked in one instance did not necessarily work in another. Then, too, there were problems that had not been dealt with at all. And when I asked to see such a problem, we were off again.

McArthur Creek lies along Redwood Creek's western edge where ample shade and moisture effect an almost jungle-like vegetation. The site had been clearcut in 1967 and, by the time of the park expansion, had reforested in a profuse stand of alders.

"This place is still a mess," Purk said. "There's logging debris everywhere, but it's so well revegetated we won't go back in to clean it up." He explained that many of these western slopes had revegetated well, stabilized naturally, and would be left alone. "Anyway," he added, "we're fast approaching the point where our net return in sediment reduction won't always balance the loss in vegetation."

With the rehab program in its fifth year, all but one of the most critical

sites have been treated. That exception is the high-priority Klamath and Korbel (K&K) Road, a major haul road for Simpson Timber's logging operations.

Twelve miles of the K&K traverse Redwood Creek's eastern border, right through some of the most unstable and erosive terrain in the park. An alternative route is on the planning board, and once it becomes a reality the K&K will be removed—and the last major erosion hazard within RNP borders will have been eliminated.

Yet even as the rehab team downshifts from high-priority erosion control to lower-priority erosion prevention, no one is claiming a victory. Seventy-five percent of the park's cutover acreage is yet to be treated, and about 250 miles of haul road remain potential erosion sources. Then, too, there are problems in the upper watershed—particularly those 30,000 adjoining acres set aside in 1978 as the Park Protection Zone (PPZ).

The Congressionally established PPZ is a buffer wherein all logging and land-use activities are closely monitored by RNP personnel. Timber-harvest plans are reviewed and recommendations to minimize erosion are noted and forwarded to both the landowner and the California Department of Forestry. "We want to help private landowners get their timber out and still protect the park's downstream resources," says Bill Weaver. "So we try to work out equitable solutions."

If the terrain within the park is considered extremely erosive, that within the PPZ is worse. Prior to 1973 and the stringent Z'Berg-Nejedly Forest Practice Act, a combination of careless logging practices and a series of unusually severe storms took a heavy toll on upstream acreage. "There are tons of debris and sediment still perched up there," says Purk. "And if it breaks loose, it's all going to come roaring down Redwood Creek."

Bill Weaver says the staff is currently conducting a detailed inventory of existing and potential erosion sources in the PPZ. "Some of the upstream landowners have expressed an interest in stabilizing their holdings," he says. "So we work in conjunction with them, hoping to keep some of that stored sediment out of Redwood Creek."

But the PPZ landowners are not the only ones turning to RNP experts for advice on successful and cost-effective erosion-control techniques. According to Purk, the interest is across the board. "We have a real communication network with people from all over who want information on our work," he says.

Requests come from the private sector as well as state, national, and international agencies: individuals and professionals alike write for cost data. The California Departments of Forestry, Fish and Game, and Transportation request specifics on erosion control and revegetation prescriptions. The U.S. Forest Service and the BLM want information on a wide spectrum of rehabilitation topics.

Visiting scientists from around the world ask permission to tour the rehab projects. The British Columbia Ministry of Forestry sends a team to study RNP's program on road removal, landslide control, and erosion prevention. New Zealand asks that some of the staff participate in an in-depth symposium on erosion control in steep, mountainous watersheds.

"There's a growing interest in ecosystem restoration," says Purk. "And it doesn't seem to matter whether the cause is a prairie, a marsh, or a forest. People are beginning to realize that some of our ecosystems have been terribly disturbed. They want to know how to be able to help put them back together again."

Perhaps with the help of experts like those on the RNP rehabilitation team, that end will come. And whether we label the process ecosystem recovery or land restoration or global renewal, the legacy left to our children and our children's children will be the same: a stabilized and more productive earth. Could it be that we are witness to a new beginning? ■

Author's note: *Individuals or professional organizations involved in land rehabilitation may request information by writing to L. Lee Purkerson, Chief of Technical Services Division, Redwood National Park, P.O. Box SS, Arcata, CA 95521. Group tours of the rehab sites are scheduled periodically, and those wishing information should contact Superintendent Douglas Warnock, Redwood National Park, 1111 Second Street, Crescent City, CA 95531, or L. Lee Purkerson at the Arcata office.*

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