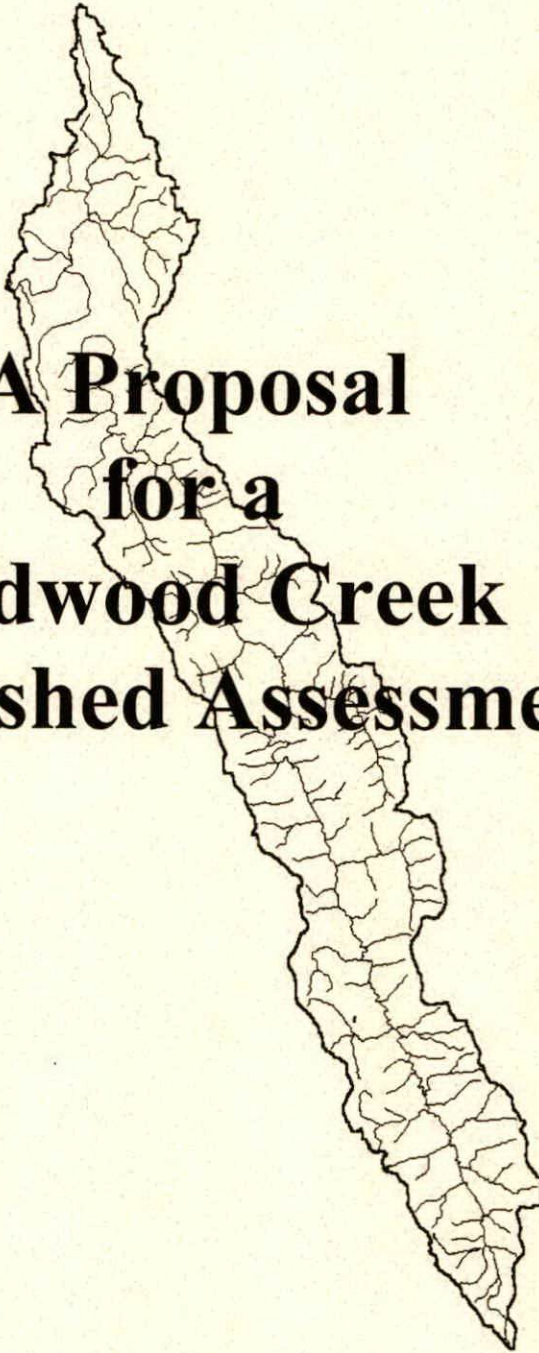




A Proposal for a Redwood Creek Watershed Assessment

Prepared for the California Resources Agency and Department of
Fish and Game meeting with Redwood Creek Landowners and
Redwood National and State Parks,
January 12, 2001.



A Redwood Creek Watershed Assessment Proposal

Presented to
California Resources Agency and Department of Fish and Game
by
Redwood Creek Landowners and Redwood National and State Parks

January 12, 2001
Redwood National and State Parks
Mad River Business Park
1655 Heindon Road, Arcata, California
8:00 am – 12:00 pm

- | | |
|---|-------------------------------|
| I. Welcome and Introductions | Andy Ringgold, Terry Hofstra |
| II. Overview of the Watershed Assessment Program | Bob McCallister, Scott Downie |
| III. Redwood Creek Watershed | |
| A. Size, geology, land use and ownership | Gary Rynearson |
| B. Park establishment, expansion and
unique legislation | Darci Short |
| IV. Studies and Issues | |
| A. Geomorphic: water discharge, sediment transport,
channel trends and slope stability | Mary Ann Madej |
| B. Aquatics: fish and flood-control levees | Dave Anderson |
| C. Levee modifications | Randy Klein |
| V. Partnerships in Redwood Creek | |
| A. Cooperative relationships through General
Agreements | Bernie Bush |
| B. Current accomplishments: THPs, erosion control,
road assessments, new studies | Greg Bundros |
| VI. Opportunities for Cooperation to Develop a
Watershed Assessment for Redwood Creek | Terry Hofstra |
| VII. Discussions and Wrap Up | All |

A Proposal for a Redwood Creek Watershed Assessment
Meeting with California Resources Agency, Department of Fish and Game,
Redwood Creek Landowners and Redwood National and State Parks
January 12, 2001, Arcata, Ca

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Preface

The private landowners of Redwood Creek and Redwood National and State Parks support the California North Coast Watershed Assessment Program, and look forward to participating in the watershed assessment for Redwood Creek. Our presentation will demonstrate how we as land managers of Redwood Creek are addressing watershed resource issues. It will also demonstrate how our efforts, in synergy with the State's watershed assessment program, will ensure a successful outcome for Redwood Creek.

The cooperative relationship that has been formed between the private landowners and Redwood National and State Parks is unique. We have worked together for the past five years, in a voluntary, non-regulatory framework, to address resource issues in Redwood Creek. Because of our unique situation, we would like to maintain the momentum that we have established, and be key players in the State's watershed assessment for Redwood Creek.

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Common Goal and Objectives of Our Cooperative Efforts

The common goal of the National Park Service and the Redwood Creek Landowners is "...to identify, prioritize, and correct, where economically feasible, potential sediment sources within the Redwood Creek basin".

We have agreed that: "Cooperative efforts between the service and landowner can provide increased protection to park resources and economic stability to the timber industry."

The Service's objective is to protect park resources from the potential impacts associated with large storms and timber harvest activities, such as road construction.

The Landowner's objective is to ensure long-term timber production from private lands and other management goals without additional state regulation.

From: "General Agreement between National Park Service Redwood National Park and Private Landowners Redwood Creek Basin"
... originally signed in 1995, renewed 2000.

A Watershed Assessment for the Redwood Creek Basin

November 29, 2000

Study

The private landowners of Redwood Creek and Redwood National and State Parks wish to cooperate in a study that assesses fisheries and watershed conditions in the Redwood Creek basin. The purpose of the study is to strengthen our understanding of watershed conditions and processes to determine whether existing watershed protection is adequate to: 1) achieve habitat conditions that can sustain healthy populations of salmonid species, and 2) protect the aquatic and riparian resources in Redwood National and State Parks (RNSP).

Methods

A group of interdisciplinary scientists would conduct the assessment in cooperation with private landowners and RNSP. Together, this group would:

- Prepare an initial report that summarizes all available biological and physical information on the historic and current conditions of the fish populations, habitat and watershed,
- Articulate a study design, with hypotheses to be tested, that describes the presence of fish species, age classes, population abundance, distribution and trends, biological and physical habitat conditions that might be limiting salmonid populations, and the effects of land use,
- Conduct a risk assessment that determines whether watershed conditions can sustain healthy fish populations and provide the necessary park resource protection following future floods and droughts,
- Implement the assessment collecting new data, as needed, interpreting results and synthesizing all available information into a final report. The final report would describe the biological and physical linkages between natural watershed processes, land use, and salmonid populations and park resources, and place these linkages in the context of a risk assessment. It would also provide guidance for future restoration activities, and recommendations for research, monitoring and improved BMPs, if results suggest they are needed,
- Design a long-term in-channel trend monitoring program for habitat conditions, salmonid populations and park resource health that supports adaptive management,
- Design a long-term hillslope monitoring program that evaluates the effectiveness of erosion control treatments and BMPs, and supports adaptive management, and
- Seek funding and cooperation from state and federal agencies.

Guidelines

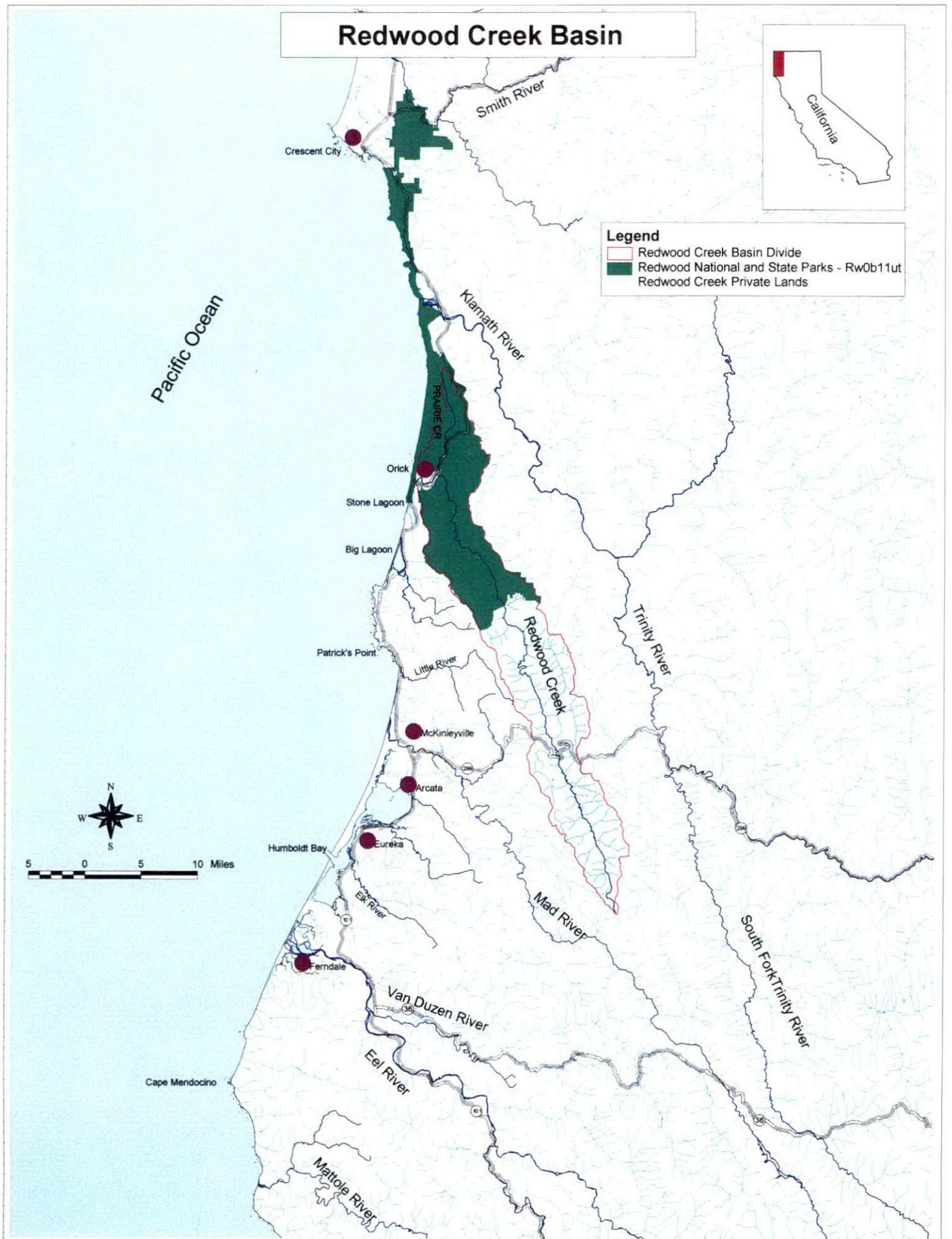
To provide results that can be accepted by all parties and that are recognized by other agencies:

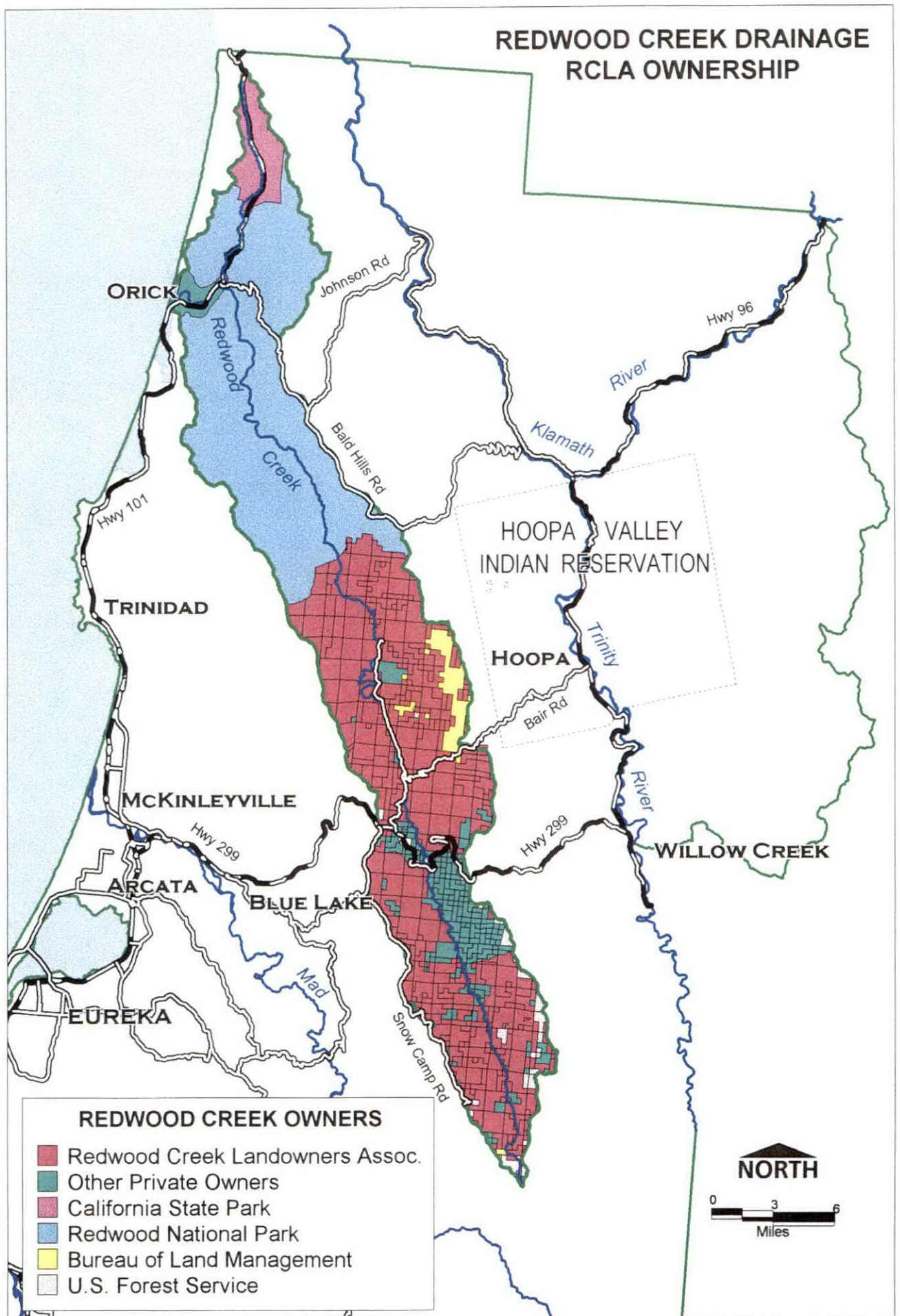
- Redwood Creek landowners and RNSP both must: 1) be involved through the entire study, and 2) agree on the group of scientists that performs the study,
- Provide for a scientific peer review of all reports and recommendations, and
- Ensure other agencies are involved from the beginning so that they recognize the credibility of the study when it is completed.

Redwood Creek Basin



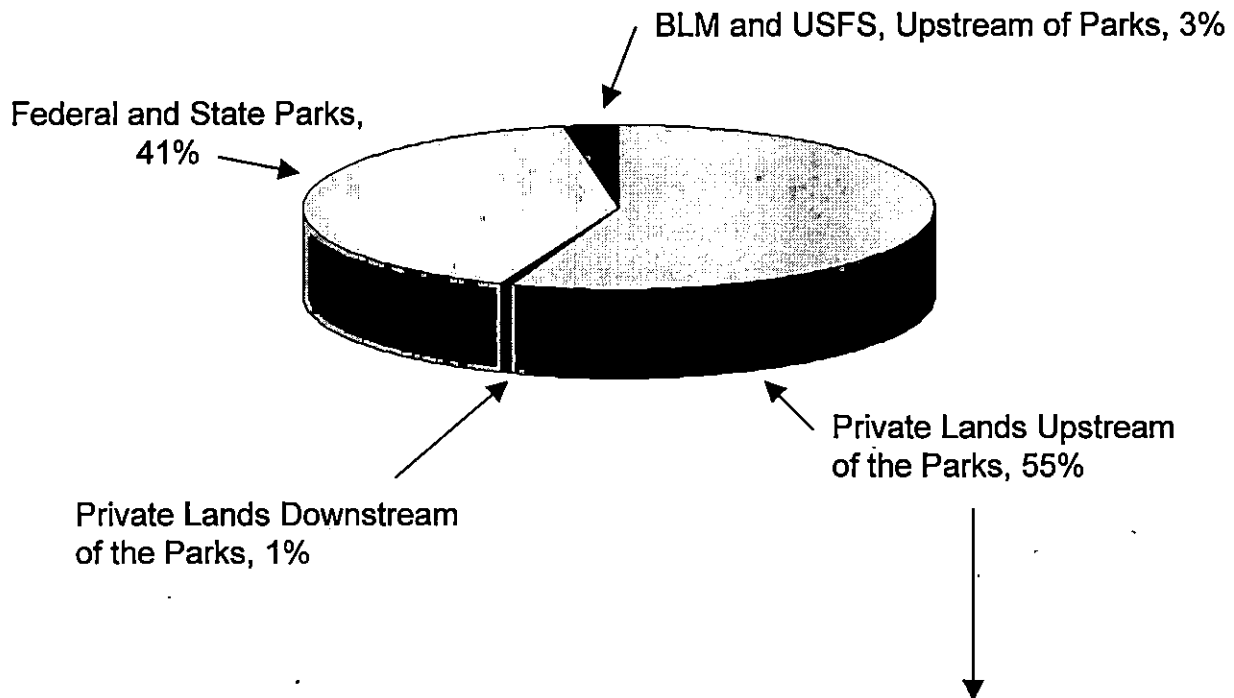
- Legend**
- Redwood Creek Basin Divide
 - Redwood National and State Parks - Rw0b11ut
 - Redwood Creek Private Lands



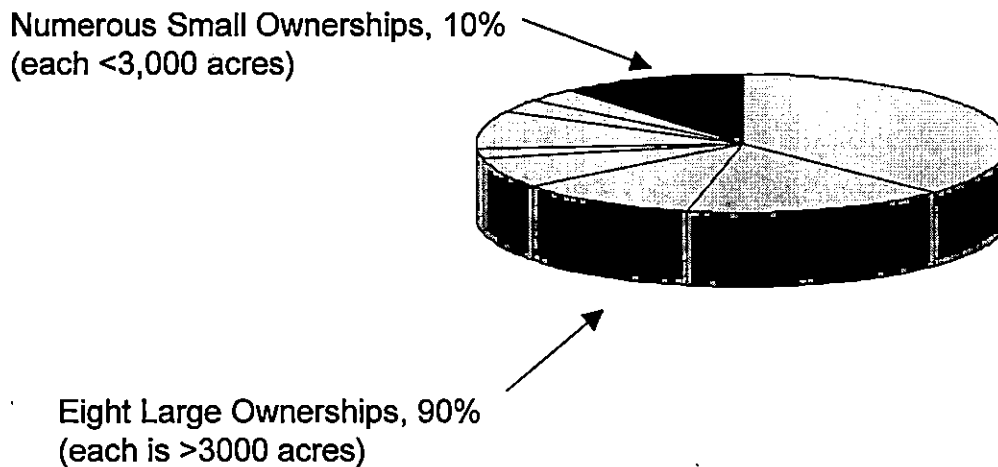


Land Ownership in the Redwood Creek Watershed

Total Watershed Area 180,000 acres



Private Lands Upstream of the Parks 100,000 acres



Park History and Legislation

Creation and Expansion

Redwood National Park was established in 1968 (PL 90-545):

"... to preserve significant examples of the primeval coastal redwood (Sequoia sempervirens) forests and the streams and seashores with which they are associated for purposes of public inspiration, enjoyment, and scientific study...."

Congress expanded the park in 1978 (PL 95-250), in part:

"... to provide a land base sufficient to insure preservation of significant examples of the coastal redwood in accordance with the original intent of Congress, and to establish a more meaningful Redwood National Park for the use and enjoyment of visitors."

The expansion area included 48,000 acres of private timber lands, of which 36,000 acres had been previously harvested and roaded. The legislation authorized \$33 million for rehabilitation work on parklands.

Unique Legislation for a National Park:

The 1978 expansion legislation was unique for its time. It recognized that erosion from timber harvest activities, primarily from logging roads, can be a significant source of sediment to Redwood Creek and an *external* threat to park's resources. The legislation authorized the park to enter into contracts or cooperative agreements, and work outside of its boundary.

*"The Secretary [of Interior] ... is further authorized, pursuant to contracts and cooperative agreements with agencies of the Federal Executive, the State of California, any political or governmental subdivision thereof, any corporation, not-for-profit corporation, private entity or person, to initiate, provide funds, equipment, and personnel for the development and implementation of a program for the rehabilitation of areas within and *upstream from* the park contributing significant sedimentation ... to reduce risk of damage to streamside areas adjacent to Redwood Creek..." (P.L. 95-250).*

Pacific
Ocean

Map of Existing Roads in the Redwood Creek Watershed, 1992

Redwood National
and
State Parks

-  Redwood National
and State Parks
-  Watershed Divide
-  Existing Road Network
-  Redwood Creek



0 5 10 15 20
Kilometers

HISTORY OF ROAD CONSTRUCTION Redwood Creek Watershed Upstream of Redwood National Park

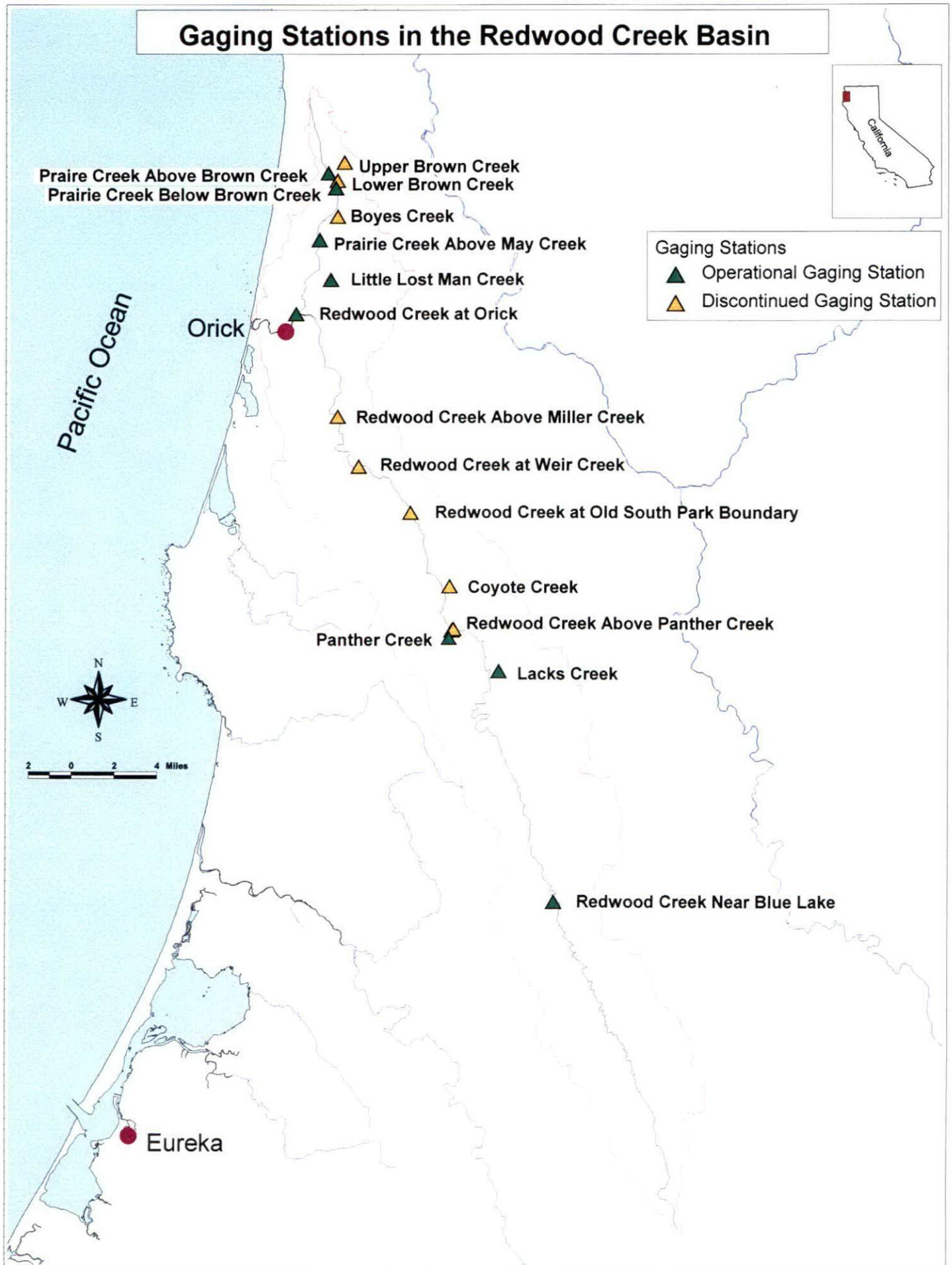
- LEGEND**
- Roads
 - Redwood Creek
 - Upper Basin Watershed Divide
 - Redwood National Park

0 5 10 15 20
Kilometers

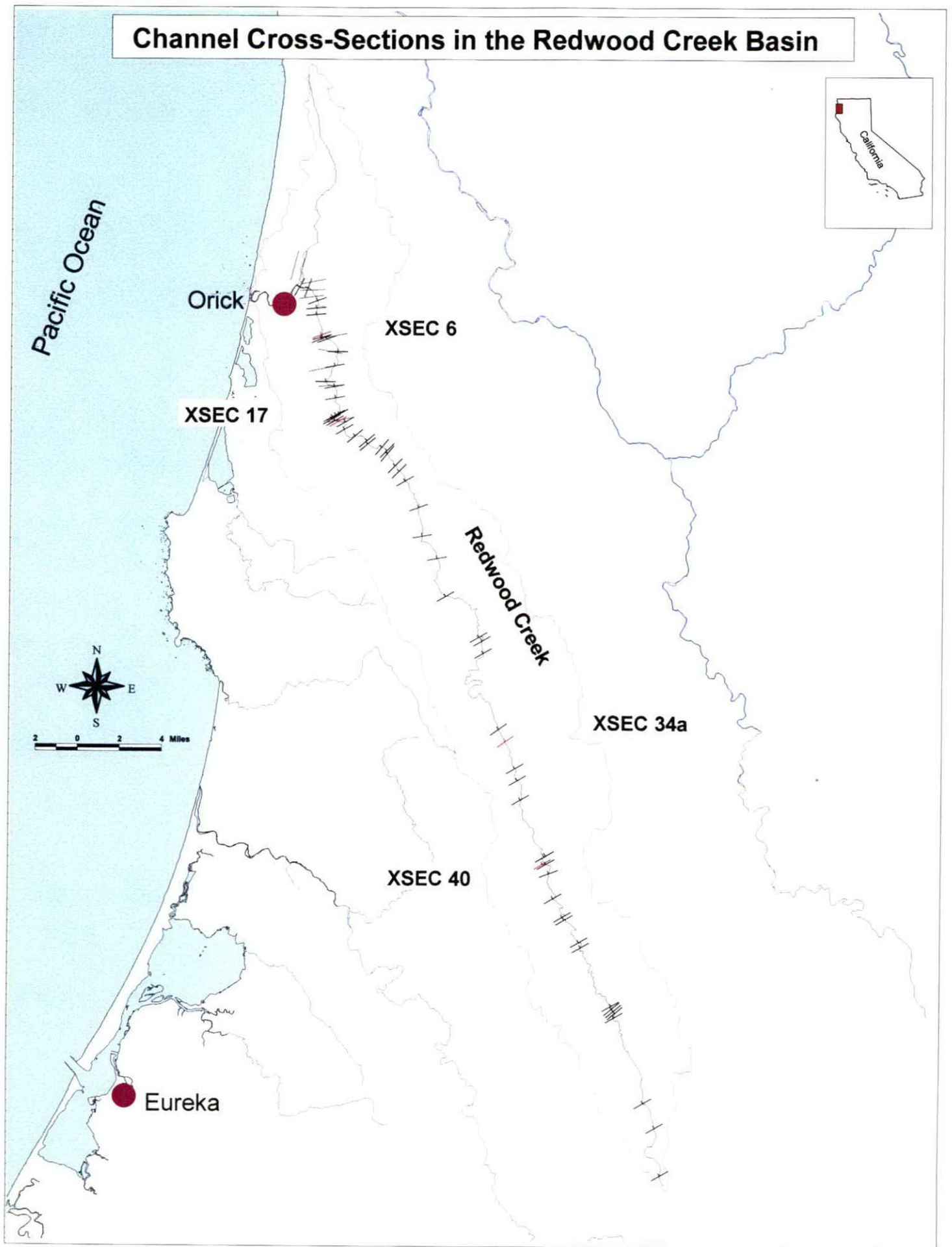


CONSTRUCTED: (A) PRIOR TO 1964 (66%) (B) 1964 - 1978 (14%) (C) 1978 - 1992 (20%)

Gaging Stations in the Redwood Creek Basin



Channel Cross-Sections in the Redwood Creek Basin



REDWOOD CREEK – WATERSHED STUDIES

(Partial list) – DATE

HILLSLOPE STUDIES

	REFERENCE / Project Status
<u>Geologic Map of Redwood Creek</u>	Harden, et. al, 1981
<u>Geology of Redwood Creek Basin</u>	Cashman, et. al, 1995
<u>Landslides</u>	
- History of Mass Movement Process Redwood Creek	Colman, 1973, and Harden, et al, 1995
- Erosional Landforms Map 1947-74	Nolan et. al, 1976
- Streamside landslides in mainstem	Kelsey, 1982 and Kelsey, et al, 1995
- Streamside landslide in tributaries	Pitlick, 1995
- Landslide history 1947-1997	Curren, in progress
- SHALSTAB Modeling	Hare, in progress
- Monitoring Movement on deep-seated slides, 1975-82	Nolan & Janda, 1995
- Groundwater monitoring on road related debris slides	Amen, 1989
<u>Gully inventories:</u>	
- Prairie	Walter, 1984
- Magnitude and Causes of Gully Erosion in Lower Redwood Creek	Weaver, and others, 1995
- Role of Fluvial Hillslope Erosion & Road Construction, Garret Creek	Best, 1995
<u>Road Inventory and Assessment</u>	
- Parklands	Completed 1996;
- Redwood Ck private lands (targeting 100% of 1000 mi., 90% funded)	1995-Present, anticipate completion 2003
<u>Soil Surveys</u>	
- Parklands mapped at 1:12,000; NRCS commenced entire basin 2000	Popenoe, 1998; NRCS, begin 2000
<u>Precipitation Monitoring and Database</u>	on-going;
<u>Timber Harvest Plans (THP's)</u>	
- History of Timber Harvest in Redwood Creek Basin (1936-1978)	Best, 1995
- THP Database	Current, on-going;
- THP reviews	Ongoing;
<u>Watershed Rehabilitation Evaluation</u>	
- Rehab Monitoring Overview	Best, 1991
- Erosion & sediment delivery following road removal	Madej, 1999 2001
- Response to 1997 storm	Bloom, 1999

MAINSTEM STUDIES

	REFERENCE / project status
Water and Sediment Discharge Monitoring USGS & RNSP	1953 - present, on-going;
Mainstem Stream Temperature Monitoring	1995 - present, ongoing;
Cross section network to evaluate long-term channel change	1973 - present, on-going, Madej & Ozaki, 1996
Temporal and Spatial Variability in Thalweg Profiles	Madej, 1999
Development of Channel Structure Following Sediment Pulses	Madej, 1999
Quantify Streambank Erosion	1986
Gravel Extraction Effects & Gravel Replenishment Rates	Ozaki & Best, 1991
Changes in the Channel Geometry of Redwood Creek, 1926-82	Nolan and Marron, 1995
Changes in Channel Stored Sediment, Redwood Creek	Madej, 1995; Kelsey, et.al 1986
Impacts of Logging on Sediment Discharge in Redwood Ck	Nolan and Janda, 1995
Riparian Disturbance - History of Main Channel	Urner, in progress
Formation of Cold Pools	Ozaki, 1987
Summer Cold Pools in Redwood Creek Near Orick	Keller, et al, 1995
Water Resources Management Plan	RNSP, 1985
<u>Water Quality</u>	
- Smith, Klamath and Redwood Creek	USGS, 1970's
<u>Groundwater-Stream Interactions</u>	
- Alluvial Groves	McFadden, 1980
- Streambank and bed	USGS, 1970's

REDWOOD CREEK – WATERSHED STUDIES

(Cont'd)

TRIBUTARY STUDIES

	REFERENCE / Project status
Water and sediment discharge monitoring in the Park Protection Zone	1973 – present, on-going
Tributary Stream Temperature Monitoring	1995 – present, on-going;
Prairie Creek Tributary Amphibian Studies Related to Bypass Impacts	Welsh & Ollivier, 1992
Sediment Routing in Tributaries	Pitlick, 1995
Effects of Large Organic Debris on Tributary Channels	Keller, et al, 1995
Development of Channel Structure Following Sediment Pulses	Madej, 1999
Prairie Creek	
- HWY 101 Bypass fine sediment monitoring	1990 – present, on-going
- Tributary – Invertebrate inventory	Kavam, 1988
Bridge Creek	
✓ - Monitor (effects of log jam on) channel stability	1983 – present, on-going
- Monitor impacts of 1996 floods	On-going
- Bridge Creek habitat restoration, modification of log jam	1985 – 1997
Lost Man Creek – evaluate effects of dam removal	1989 – present, on-going;
Large Woody Debris Inventories	
✓ - Habitat and wood Debris Inventory in Bridge Creek	Smith and Barnard, 1990
- Bridge Creek	Kramer & Klein, 2000; 1989;
- Prairie Creek	Kramer & Klein, 2000; 1997, 1999;

FISHERIES STUDIES

	REFERENCE / Project status
Aquatic Biology of the Redwood Creek Basin	Averett & Iwatsubo, 1995
Juvenile Salmonid Habitat in Redwood Creek	Anderson, 1988
Fish Scale Studies	1980- present, in progress:
Cutthroat Trout Genetics	Neillands, 1990
Benthic Invertebrates	Strange, 1989; Harrington, 1982
Physical Rearing Habitat for Anadromous Salmonids	Brown, 1988
Summer Steelhead Surveys	RNSP; 1981 – present, ongoing,
Fisheries Summary for Bridge Creek	Meyer and others, 1994; 1980 – 1994;
Nutrient research, Prairie Creek Tributaries	Warren, 1988
Pipe trap data for Lost Man Creek	Manning, 1995
Downstream Migration and Growth Conditions of Juvenile Fall Chinook	McKeon, 1985
Effects of Fine Sediment on Stream Gravels in Prairie Creek	1989-1994, Klein, in-progress
Survival of Coho Salmon	Calif. Coop Fish Unit; Jan, 2000;
Anadromous Escapement in Prairie Creek	Roelofs & others, 1996, 97, 98; mid 90's;
Anadromous Escapement in Lost Man and Bridge Creek	RNSP ongoing.

ESTUARY STUDIES

	REFERENCE / Project status
Fish Biology within the Estuary	Larson, 1987 & Salamunovich, 1987
Effects of Channelization on Sediment Distribution & Aquatic Habitat	Ricks, 1983, 1985 & 1995
Water Quality, Circulation, Sedimentation, Temperature	Gregory, 1982, & RNSP ongoing
Salmonid growth and populations	RNSP, 1979 – present, ongoing;
Estuary restoration plans	RNSP, 1983 & 2001 (in-progress);

SELECTED REFERENCES:

- Geomorphic Processes and Aquatic Habitat in the Redwood Creek Basin, Northwestern California. 1995. U.S. Geological Survey. Professional Paper 1454. Contains 22 separate research papers on Redwood Creek Basin.
- Redwood Creek Watershed Analysis. 1997. Redwood National and State Parks. Arcata, CA. 81 pp.
- Total Maximum Daily Load for Sediment, Redwood Creek, California. 1999. U.S. Environmental Protection Agency. Region 9. 78 pp.
- Another partial list of references may be found at the National Park Service's Natural Resource Bibliography web site at: <http://www.nature.nps.gov/nrbib/>

Redwood Creek Estuary



Levee construction, completed in 1968 in response to the 1953, 1955 and 1964 floods, channelized the lower reach of Redwood Creek and cut off the last downstream meander. The levees altered the physical and biological functions of the estuary and adjacent wetlands.

The estuary is a critical element in the life cycle of anadromous salmonids. Historically it provided juvenile fish with optimal habitat for growth and marine acclimation, which affect their initial ocean survival and ultimately their return as adult spawners. In its present condition, the estuary is a severe bottleneck in the reproductive cycle of salmonids in Redwood Creek.

GENERAL AGREEMENT
between
NATIONAL PARK SERVICE
REDWOOD NATIONAL PARK
and
PRIVATE LANDOWNERS
REDWOOD CREEK BASIN
to
provide a framework for cooperative
erosion control in the Redwood Creek basin

Article I. Background and Objectives

The National Park Service (hereinafter the SERVICE) administers Redwood National Park, established as a unit of the National Park System, United States Department of the Interior, pursuant to Public Law 90-545, as amended (16 USC 79). Established in 1968 to preserve significant examples of primeval coastal redwood forest and the streams and seashore with which they are associated, the park now occupies the lower-third of the Redwood Creek basin. Lands upstream from the park are primarily industrial timberlands managed by private landowners (hereinafter the LANDOWNER) for long-term timber production and ranching.

Timber operations on private lands are regulated by the State of California and the Z'berg-Nejedly Forest Practice Act of 1973. Since passage of this Act, timber harvest rules have been shaped by new state and federal laws, and court decisions. Critics of the forest practice rules suggest the rules fall short of adequate resource protection, while private landowners believe the rules have grown exceedingly complex and burdensome.

Cooperative efforts between the SERVICE and LANDOWNER can provide increased protection to park resources and economic stability to the timber industry. The SERVICE'S objective is to protect park resources from the potential impacts associated with large storms and timber harvest activities, like road construction. The LANDOWNER'S objective is to ensure long-term timber production from private lands and other management goals without additional state regulation. These objectives can be reached through cooperative efforts.

Section 101(a)(6) of Public Law 95-250 (16 USC 79c(e)) authorizes the National Park Service to enter into cooperative agreements with private landowners in the Redwood Creek basin for implementing a program for the rehabilitation of areas upstream from Redwood National Park contributing significant sedimentation.

Section 101(a)(6) of Public Law 95-250 (16 USC 79c(e)) also directs the National Park Service to undertake and publish studies on erosion and sedimentation originating within the

hydrographic basin of Redwood Creek.

Both parties therefore understand and agree as follows:

Article II. Statement of Work

The SERVICE and LANDOWNER shall voluntarily cooperate to identify, prioritize, and correct, where economically feasible, potential sediment sources within the Redwood Creek basin.

This General Agreement shall not be construed as a grant of permanent access to or interest in LANDOWNER lands or roads. Written permission shall be obtained from the LANDOWNER prior to entry.

The SERVICE shall summarize annual accomplishments as related to this General Agreement and distribute it to the LANDOWNER by January 31 of each year.

Article III. Term of Agreement

This General Agreement shall terminate December 31, 2005, at noon, California time, unless prior thereto it is relinquished, abandoned, or otherwise terminated pursuant to the provisions of this agreement or of any applicable Federal law or regulation. This General Agreement may be renewed or otherwise amended by the mutual written agreement of the parties. The effective date of the Agreement shall be the date of its execution by the Director (or his/her delegate).

Article IV. Key Officials

Superintendent
Redwood National Park
1111 Second Street
Crescent City, California 95531

Title
Company
Address

Article V. Property Utilization

Not applicable

Article VI. Prior Approval

Not applicable

Article VII. Reports

The Service shall provide data, maps and summaries of conditions to the LANDOWNER when inventories for potential sediment sources are performed by the SERVICE, or its cooperator, at the request, or by permission, of the LANDOWNER.

Article VIII. Termination

Either party may terminate this General Agreement prior to the expiration of its term by providing sixty (60) days written notice to the other.

Article IX. Required Compliance

During the performance of this General Agreement, the participants agree to abide by the items of Executive Order 11246 on nondiscrimination and will not discriminate in employment opportunities against any person because of race, color, religion, sex or national origin. The participant will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex or national origin.

No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this General Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

IN WITNESS WHEREOF, the Superintendent of Redwood National Park acting on behalf of the United States, in the exercise of the delegated authority from the Secretary of the Department of the Interior, has caused this Agreement to be executed this ____ day of _____, 2000.

NATIONAL PARK SERVICE
Redwood National Park

LANDOWNER/COMPANY

Superintendent

NAME
TITLE

Agreement Officer

Agreements and Funding Sources for Erosion Control / Prevention Projects

Agreements

- General Agreements between National Park Service and Private Landowners for cooperative erosion control / prevention work.
- Cooperative Agreement between National Park Service and Humboldt County Resource Conservation District for contracting with private landowners.
- Memorandum of Agreement between National Park Service and Pacific Coast Fish Wildlife and Wetlands Restoration Association (PCFWWRA, a non-profit corporation) for road inventories and assessments, road decommissioning, road upgrades and habitat restoration work.

Funding Sources:

- U.S. Fish and Wildlife Service, Jobs-In-The-Woods Program
- California S.B. 271
- California Coastal Salmon Recovery Program (CCSRP)
- California Costa-Machado Water Act of 2000 - Proposition 13

Completed and Planned Erosion Control / Prevention Projects in the Upper Redwood Creek Basin

Table 1. Implementation Projects; 1995 – Present.

Miles Upgraded	27.3	
Miles Decommissioned	15.4	
Funding:		
Landowner	\$ 205,261	26%
JITW	299,262	38%
SB 271	195,461	25%
NPS Cash	31,000	4%
<u>NPS In-Kind</u>	55,300	7%
TOTAL	\$ 786,284	100%

Values are minimums and reflect data maintained by RNSP. Some landowners have implemented upgrades and decommissions that are not included in this table. RNSP is making efforts to document all improvement work in the upper basin.

Table 2. Road Assessment Projects; 1996 - Present.

Acres	94,000	
Miles	851	
Funding:		
Landowner	\$ 23,000	3%
JITW	60,180	9%
SB 271	384,916	55%
CCSRP	58,709	8%
NPS Cash	90,000	13%
<u>NPS In-Kind</u>	86,000	12%
Total	\$ 702,805	100%

Status of Road Assessments in the Redwood Creek Basin

Legend

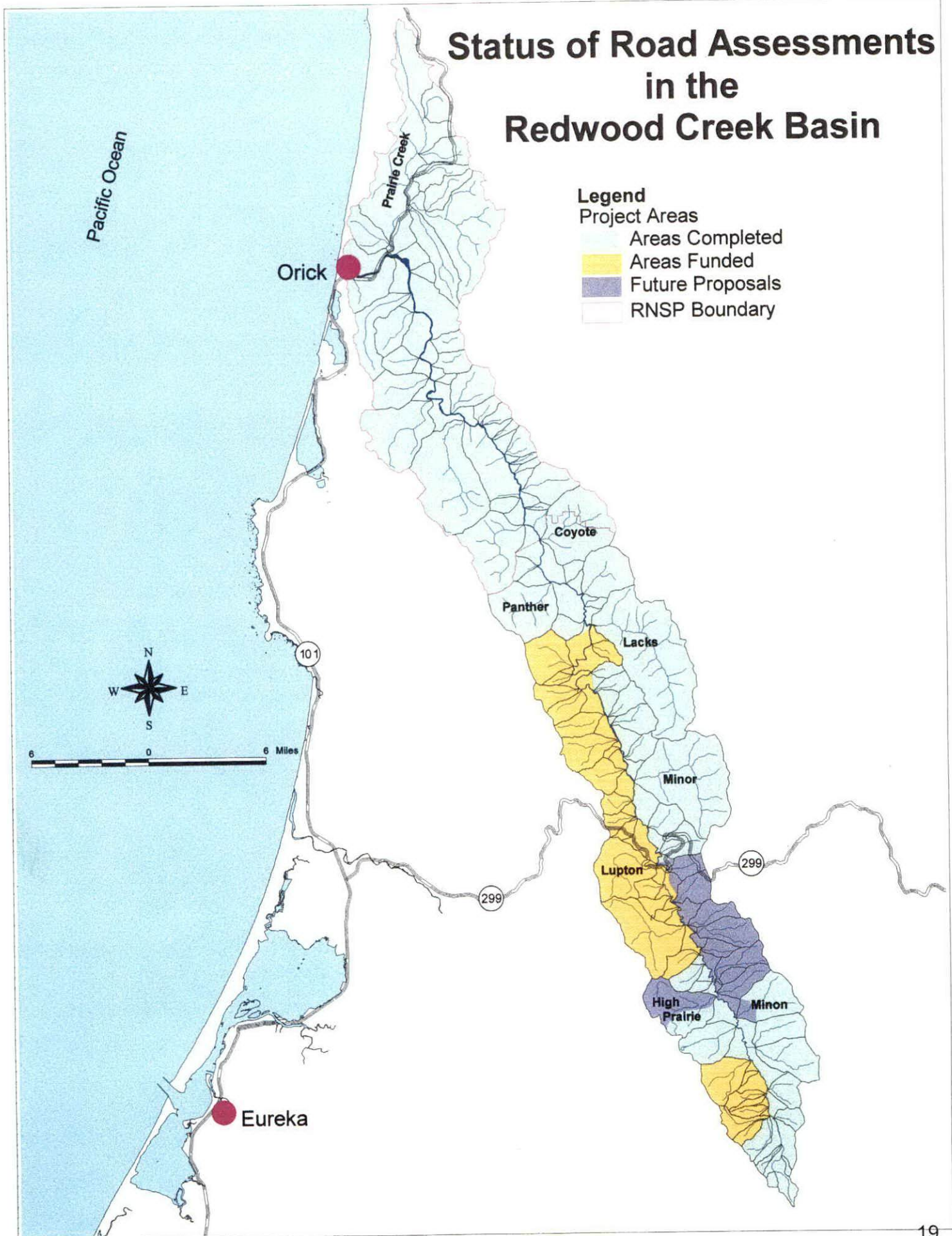
Project Areas

Areas Completed

Areas Funded

Future Proposals

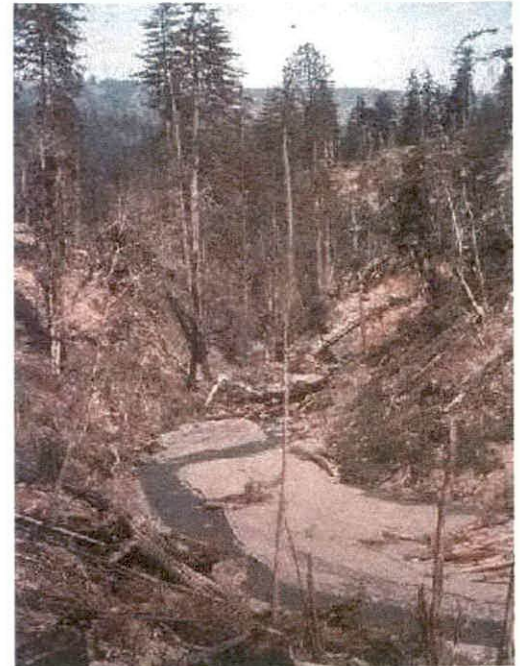
RNSP Boundary



The USGS-WERC Redwood Field Station,
Dr. Mary Ann Madej, Station Leader
mary_ann_madej@usgs.gov

(707) 825-5148 FAX (707) 822-8411

The USGS Western Ecological Research Center Redwood Field Station is located in coastal Northern California. Most of our operations and research are conducted in the Redwood Creek basin and within Redwood National and State Parks. Station scientists conduct research on issues related to timber harvest, effects of past watershed disturbances, watershed restoration, and recovery of disturbed ecosystems, such as in the disturbed stream channel seen in the image to the right. In addition, the station provides technical assistance to the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and other client agencies on developing inventory and monitoring plans, hillslope and channel stability assessments, and other issues.



Current Research Projects

Effectiveness of Road Restoration in Reducing Sediment Loads and Improving Streams

Purpose: To assess the effectiveness of road restoration techniques in various watershed settings, to evaluate how much sediment loads are reduced following road removal, and to assess subsequent trends in stream health in restored areas.

Disturbance History of Redwood-Dominated Riparian Zones

Purposes:

- 1) To document how overstory riparian conditions changed along Redwood Creek and major tributaries since the advent of timber harvest and following large floods.
- 2) To measure the current distributions of young conifers (Douglas fir and redwood) and exotic plants in the understory riparian stands in the Redwood Creek basin.
- 3) To assess the implications of the changes in riparian composition for the long-term potential for shading and large woody debris recruitment to anadromous fish-bearing rivers.

Inventory and Monitoring of Sediment Sources, Sediment Transport, and Channel Trends

Purpose: To conduct long-term monitoring designed to evaluate erosional problems, channel stability, and sediment transport in a highly erodible watershed. A knowledge of the type, size, timing and causes of erosion and sedimentation problems is the first step in prioritizing restoration projects, implementing improved land use practices, and preventing future damage.

Evaluation of Watershed Response to Land Use Change

Purpose: To evaluate future damage to aquatic and riparian resources in north coastal California under different timber harvesting and road building scenarios, coupled with a probability analysis of floods of various magnitudes.