WHAT IS THE STORY OF REDWOOD CREEK?

Sedimentation and salmonids

THE JOURNEY THAT LED TO THE creation, and later the expansion, of Redwood National Park has had lasting effects on environmental policy and land uses in the basin as well as forest practice regulations in California. More than 30 years after formation of the Park, Redwood Creek, the major waterway flowing through the Park to the ocean, continues to be a focal point of interest. The water quality of the creek, the creek's anadromous salmon and trout populations, tall trees, and the use of the surrounding forest continue to be subjects of concern to many.

In 1992, the U.S. Environmental Protection Agency (EPA) declared, under Section 303(d) of the federal Clean Water Act, that Redwood Creek water quality was impaired due to sedimentation. The evidence for listing has been less than ironclad, and a public debate has since ensued. Central to the discussion is the fact that Redwood Creek is prone to storm-induced erosional events and the watershed has natural geologic instability.

Along with the concern about water quality are related concerns about protection of fish listed as threatened under the federal Endangered Species Act, including the compatibility of modern forest practices with fish protection and long-term landscape sustainability. In 1997, the National Marine Fisheries Service listed coho salmon as threatened throughout its range in California—including Redwood Creek. In 1999, chinook salmon were listed as threatened, and in 2000, steelhead were listed.

The listing of Redwood Creek as water-quality impaired and the continuing dialog on controlling diffuse (nonpoint) sediment sources and protecting specially-designated fish has prompted a re-examination of the body of information available on the subject. Perhaps a better understanding of the issues will influence future regulatory treatment of Redwood Creek when the water quality and Section 303(d) status is reconsidered; this is the impetus for *A Study in Change: Redwood Creek and Salmon*.

The Questions

- What effects do agents of change have on sediment loading?
- What is the relationship between the strength of salmonid populations and stream sedimentation?
- How has our understanding of Redwood Creek's natural history deepened through observation and study?

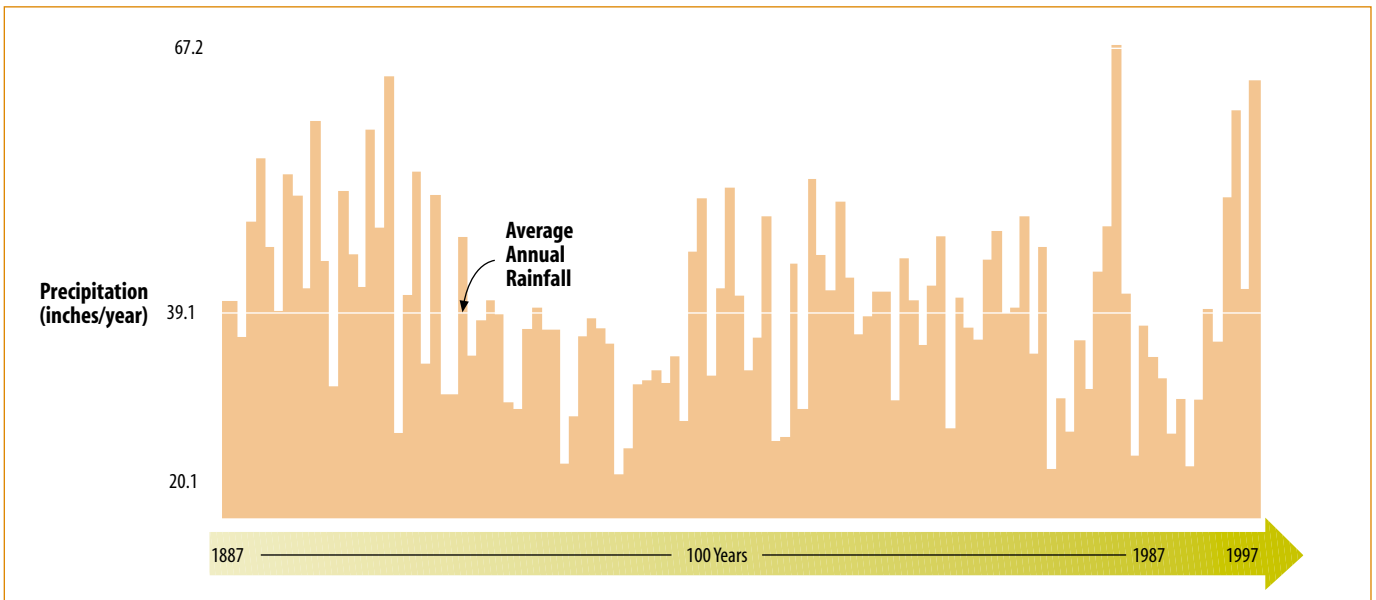
Lush vegetation and abundant fish habitat characterize much of Redwood Creek.

Photo courtesy of Barnum Timber Company

In Search of Understanding

Our story explores the stream sedimentation processes and strength of the Redwood Creek salmonid populations, which have fluctuated over time. Over the years, archaic or partial data and unsupported opinion have influenced many perceptions concerning Redwood Creek; these misconceptions have, unfortunately, continued up to the present day. To provide a new perspective and a scientific basis for re-examining existing policy, the authors of this document have gathered every piece of known data, reviewed all published reports, spoken to available historical eye witnesses, and gathered as many photographs as possible that might shed light on the subject. Our purpose in writing this story is to document that process and facilitate access to information for resource planning and management by stakeholders, policy makers, and other interested parties.

New information on the relationships between natural and man-made ecological changes in producing and maintaining healthy salmon habitat is reviewed, and recent understandings of the effects of changing ocean conditions on adult salmon populations in the context of Redwood Creek provides the basis for this story. In addition, we take another look at historic and current juvenile salmonid surveys to infer the effects that



Annual rainfall at Eureka fluctuates greatly about the average.

Source: Pacific Lumber Company. 1999.

The tributaries of Redwood Creek flow toward Orick and the ocean.

floods, land uses, and other agents of change have had on the salmon populations.

Redwood Creek: A Bird's Eye View

The physical conditions and aquatic habitats of Redwood Creek have varied significantly over recorded history; there is a legacy of extreme natural events and conditions that occurred far in the past, prior to the 20th century. These patterns of natural variability and ecological cycles have made Redwood Creek what it is today.

Redwood Creek is a free-flowing stream that initially winds its way through working forests that provide market-based commodities and natural amenities. It then flows through Redwood National Park on a course to the sea. It rises in the coastal range of Humboldt County up to an elevation of 5,300 feet and runs 80 miles in a northwesterly direction, entering the Pacific Ocean near the town of Orick along California's north coast. The total drainage area of the Redwood Creek basin—technically a sub-basin—covers approximately 180,000 acres or 285 square miles.

A visitor today sees what appears to be a pristine, wild stream. The banks are full of lush vegetation and water flows over cobbles, boulders, and large rocks. Tributaries flow under a canopy of full shade in the summer months.[1] Smaller tributaries have steep gradients where water flows over and around larger cobbles and mossy boulders, moving fine sediment and smaller-sized spawning gravels rapidly downstream.[2]

The vegetation that grows in the Redwood Creek basin is a product of profuse rainfall, which ranges in annual amount from 32 to 98 inches and falls mostly during the winter and spring.[3] Redwood and Douglas-fir forests, tan oak forests, true-oak woodlands, and grass prairies cover the landscape. The famous Tall Trees Grove of Redwood National Park contains redwoods that are among the tallest trees in the world.

The Redwood Creek basin is formed mostly of sheared and fractured bedrock: sandstone deposits that were scraped off an ancient sea bed and lifted up 2 million years ago by the North American Tectonic Plate.[4,5] The sandstone deposits are muddy sediments that once formed inland mountains, but eventually eroded into the sea. The hillslopes of Redwood Creek are composed of sediment that eroded from these ancient mountains standing along the western edge of North America in the final days of the age of the dinosaurs.[6] For example, the Tall Trees Grove grows on a streamside terrace formed by the accumulation of 4,000 years of silt.[7]

Redwood National Park, created in 1968, originally covered only 28,000 acres, encompassing land near the mouth of Redwood Creek.[8] On March 27, 1978, a 48,000-acre extension—representing nearly 30 percent of the Redwood Creek basin—was added to Redwood National Park.[9] The new buffer was designed to protect the resources of Redwood National Park from human activities. This expansion assumed that the private land uses occurring upstream of the new buffer would continue into the future and that the park would be sufficiently large to absorb or resist the political, scientific, and environmental uncertainties associated with the dynamic natural environment.[10]

Land management in such a dynamic environment requires dynamic human responses to new information. In the spirit of adapting to new technology and scientific information, landowners upstream of Redwood National Park have signed a Memorandum of Understanding with the Service.[11] This entails other federal, state, and county agencies; several timber companies; and many private landowners working cooperatively with Park staff to develop and implement state-of-the-art land management practices in a constantly changing political and natural environment.[12,13]