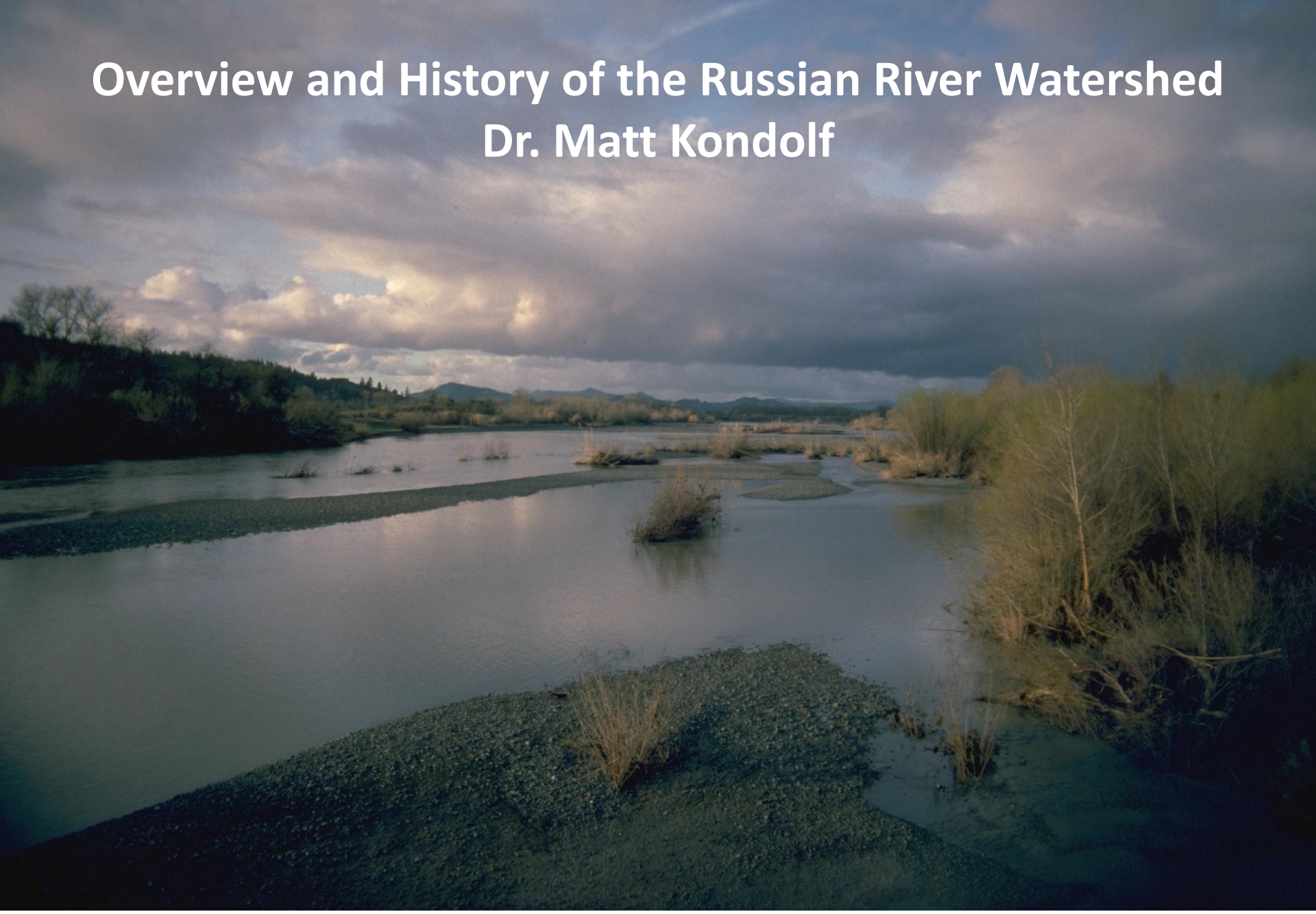
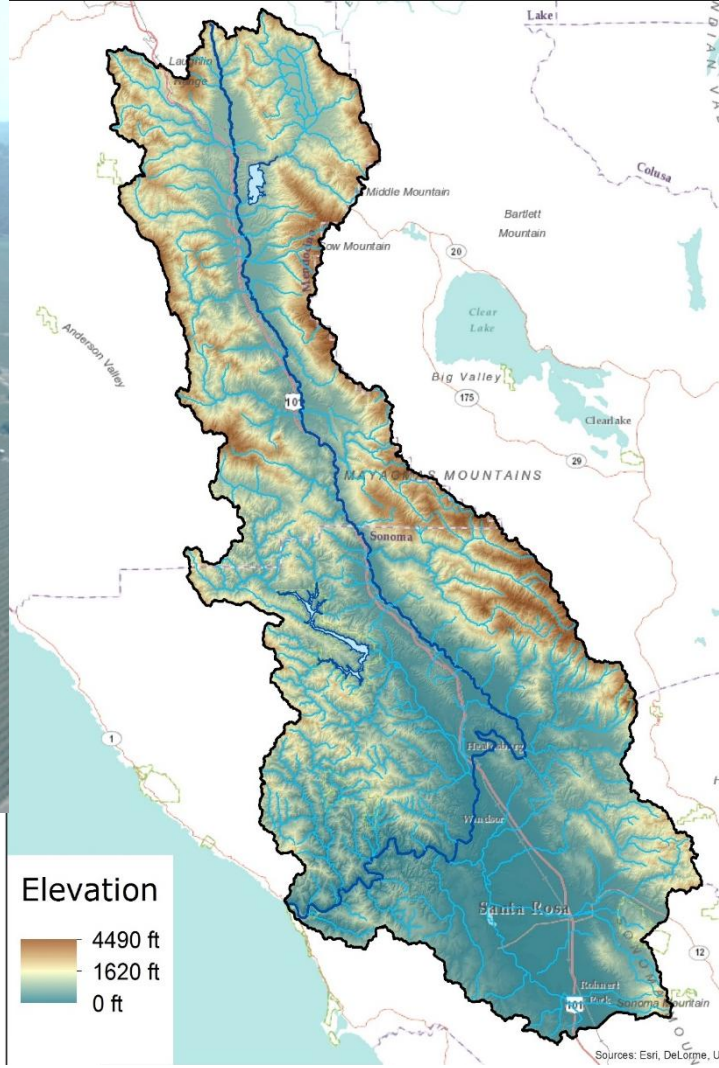
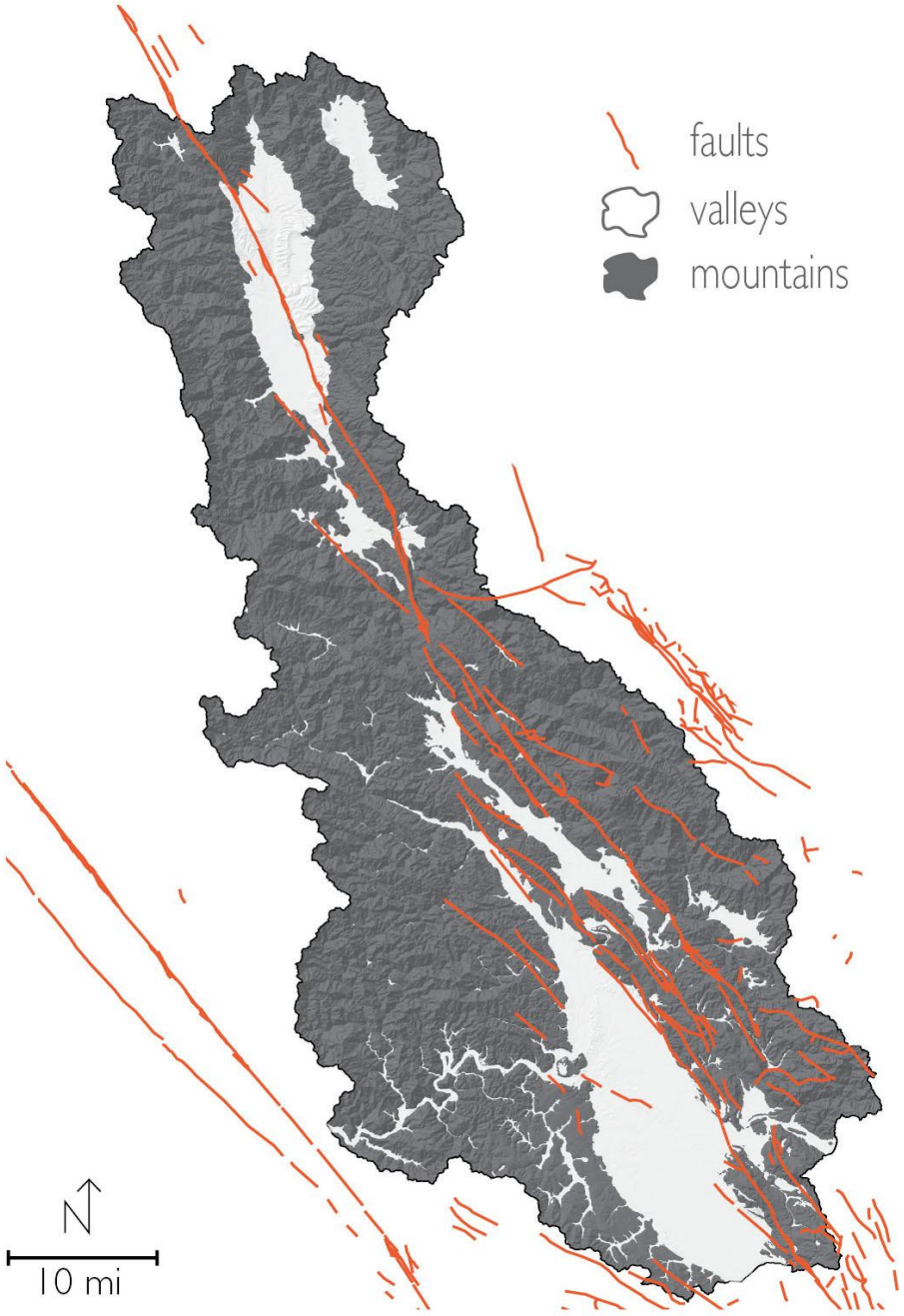
Overview and History of the Russian River Watershed

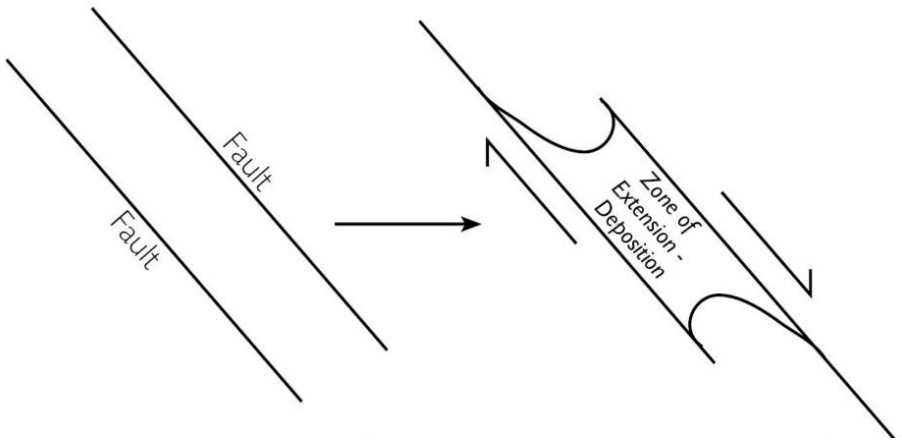
Dr. Matt Kondolf



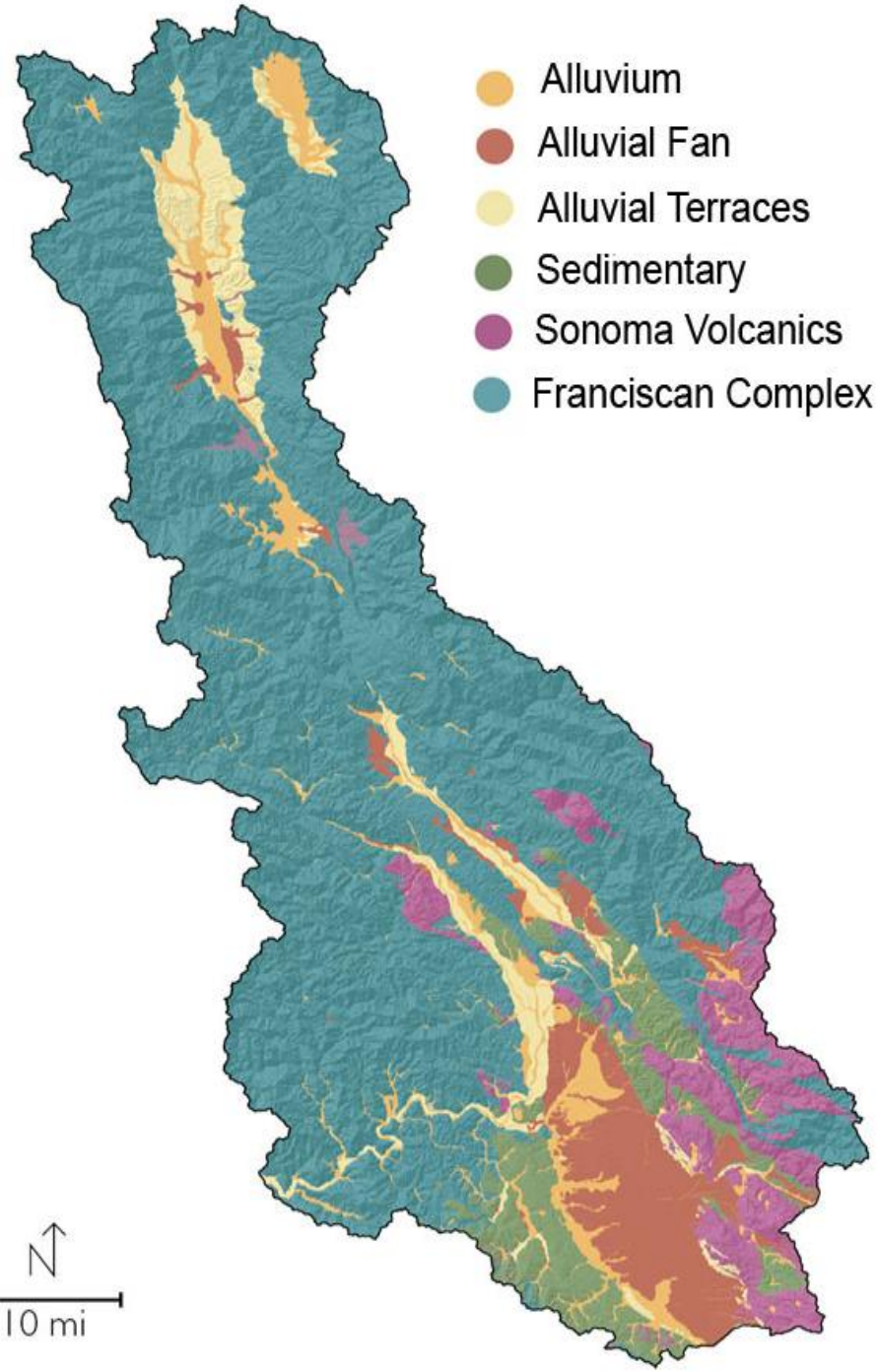


Russian River watershed is one million acres. Unlike most north coast rivers it has a series of alluvial river valleys – Redwood, Ukiah, Hopland, Alexander and Russian River Valley. Mountains border the sides of each valley.



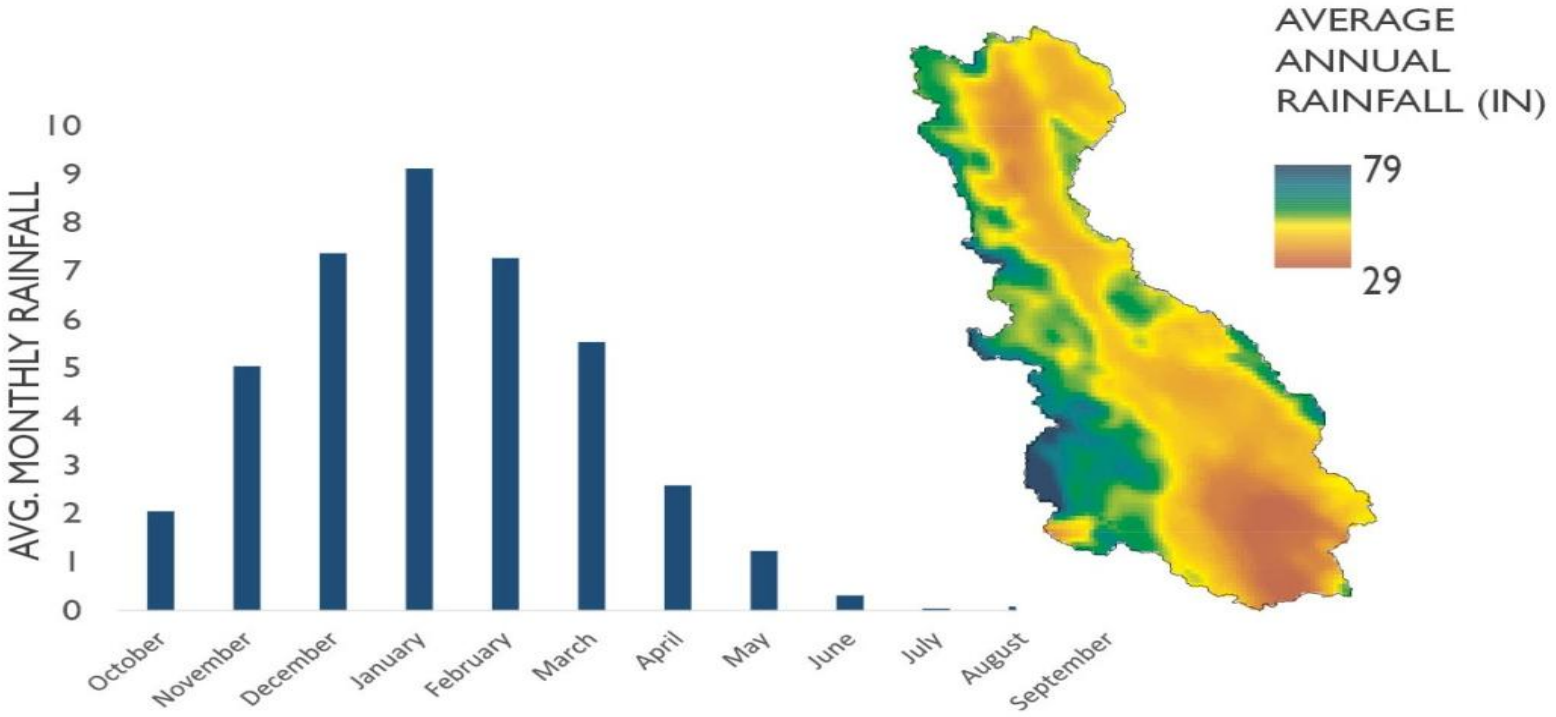


The alluvial valleys are pull-apart basins formed by differential movement along parallel faults creating a depression. The depression widens and deepens over time and fills with gravel, boulders and cobble eroded from the surrounding mountains.



- The basement rock of the watershed is Franciscan Complex, a jumbled mélange of rock types highly prone to erosion and landslides.
- Franciscan Complex is low permeability; wells drilled in these rock types have low production rates of 1-10 gpm.
- One of the other major rock types is the Sonoma Volcanics, deposited during a period of active volcanism 8 to 2.5 million years ago. Wells in this formation can be highly productive in the 100 gpm range.

Mediterranean Climate

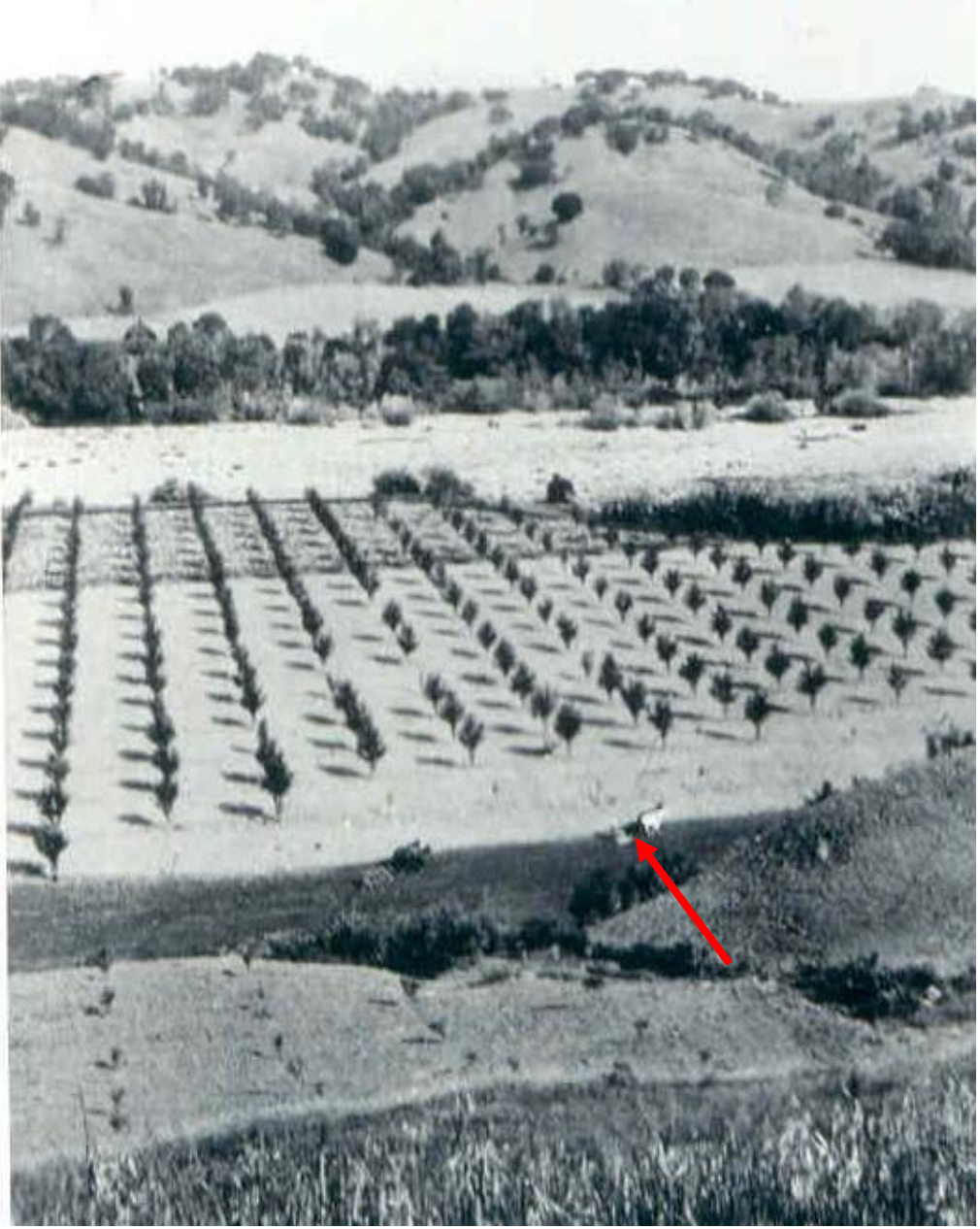


- Average annual rainfall for the entire watershed is 42 inches, varies greatly with topography.
- Coastal mountains have annual rainfall totals as high as 80 inches, whereas southern portions of the watershed have only 22 inches per year.
- Dry season stream flow comes from groundwater storage

Historical Condition

Historical photograph of the Perkins St. Bridge over the Russian River in Ukiah Valley. Note wide shallow channel (Early 20th Century)

Post-flood view of Russian River shows old channels in floodplain



Early agriculture in Alexander Valley. Note horse-drawn plow and wide river channel in background.

An 1851 journal from the expedition of Colonel Redick M'Kee, a U.S. Indian Agent, observed the West Fork of the Russian River on August 24-25 as *"a completely dry channel"*.

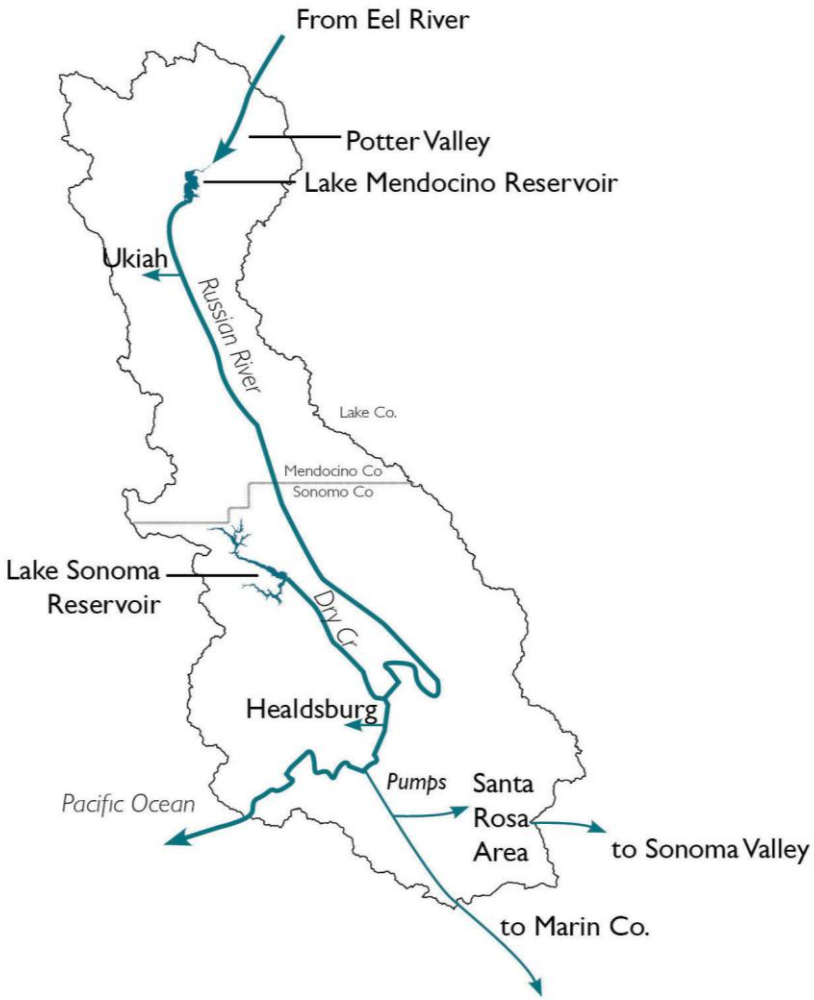
The river in Ukiah Valley is described as *"Above here the river during the dry season runs chiefly under the sand and gravel only to be obtained in occasional pools"*

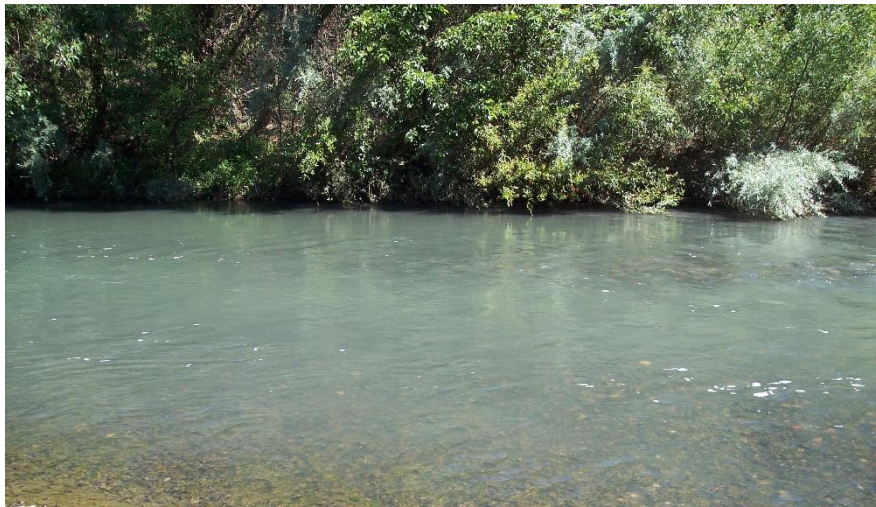
Rainfall records in San Francisco for 1851 show a very dry year.


swimmers

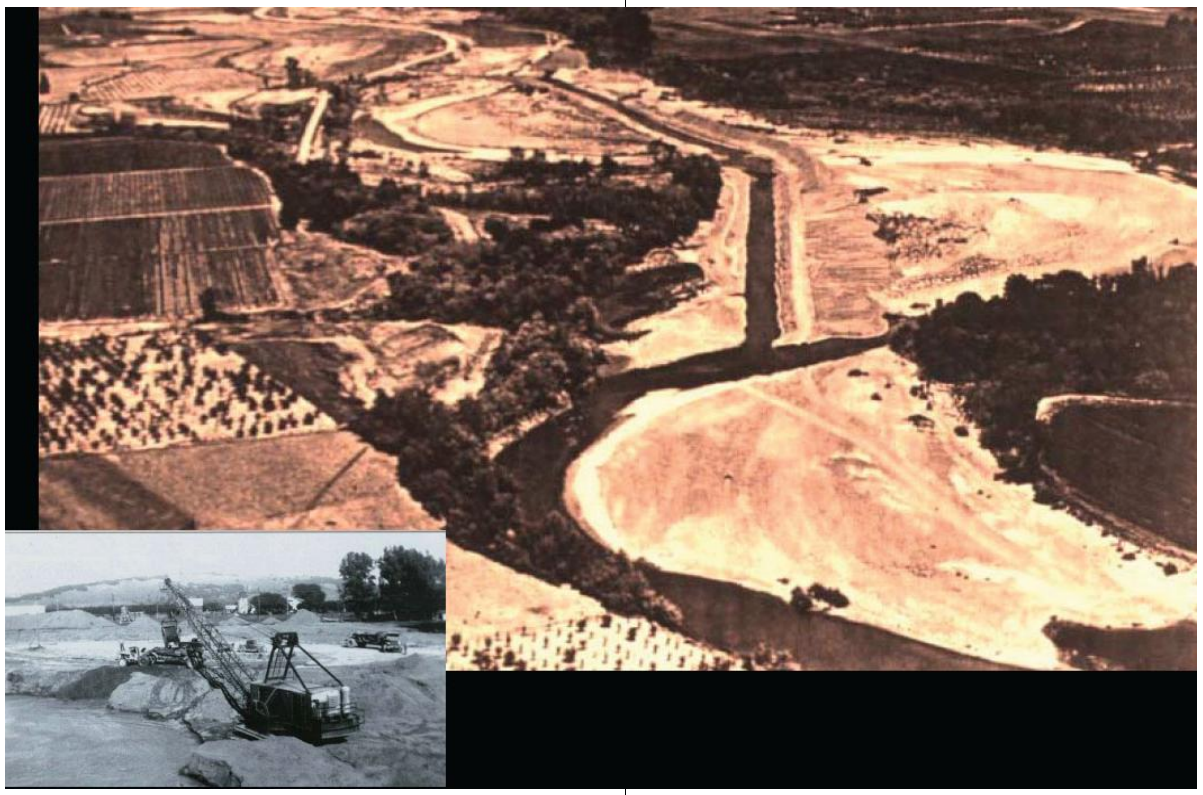
Compilation of Illustrative Historical Low Water Measurements on Russian River Waterways

Waterway	Year	Discharge In cubic feet/second
East Fork Russian River	September 1905	2.2 cfs
West Fork Russian River	September 1905	1.2 cfs
West Fork Russian River	August 1911	0.5 cfs
Ackerman Creek – Ukiah Valley	September 2, 1911	Dry at confluence with river
Orr Creek – Ukiah Valley	September 2, 1911	Dry at confluence with river
Dry Creek	1939	Dry October 1 to December 8
Dry Creek	October 1941 October 1942	2.3 cfs 3.7 cfs
Upper Dry Creek	Sept. 14-24, 30, Oct. 1-6 1944 and Sept 24-Oct. 18 1949	0.1 cfs



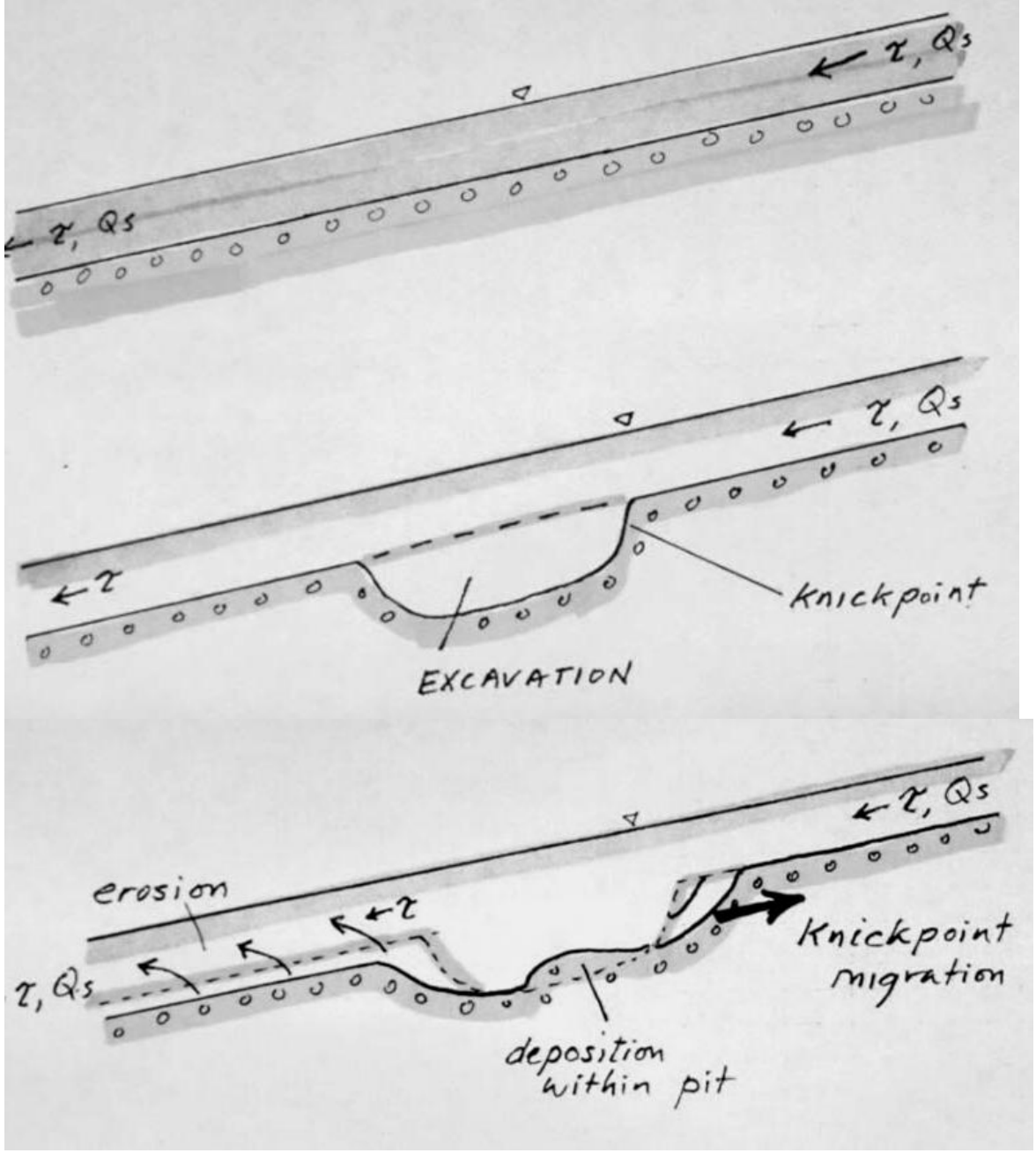


The Potter Valley Project was constructed in 1908 and Lake Pillsbury was constructed in 1922. Coyote Dam was constructed in 1959. Releases from Lake Mendocino provide summer flows to the Russian River.

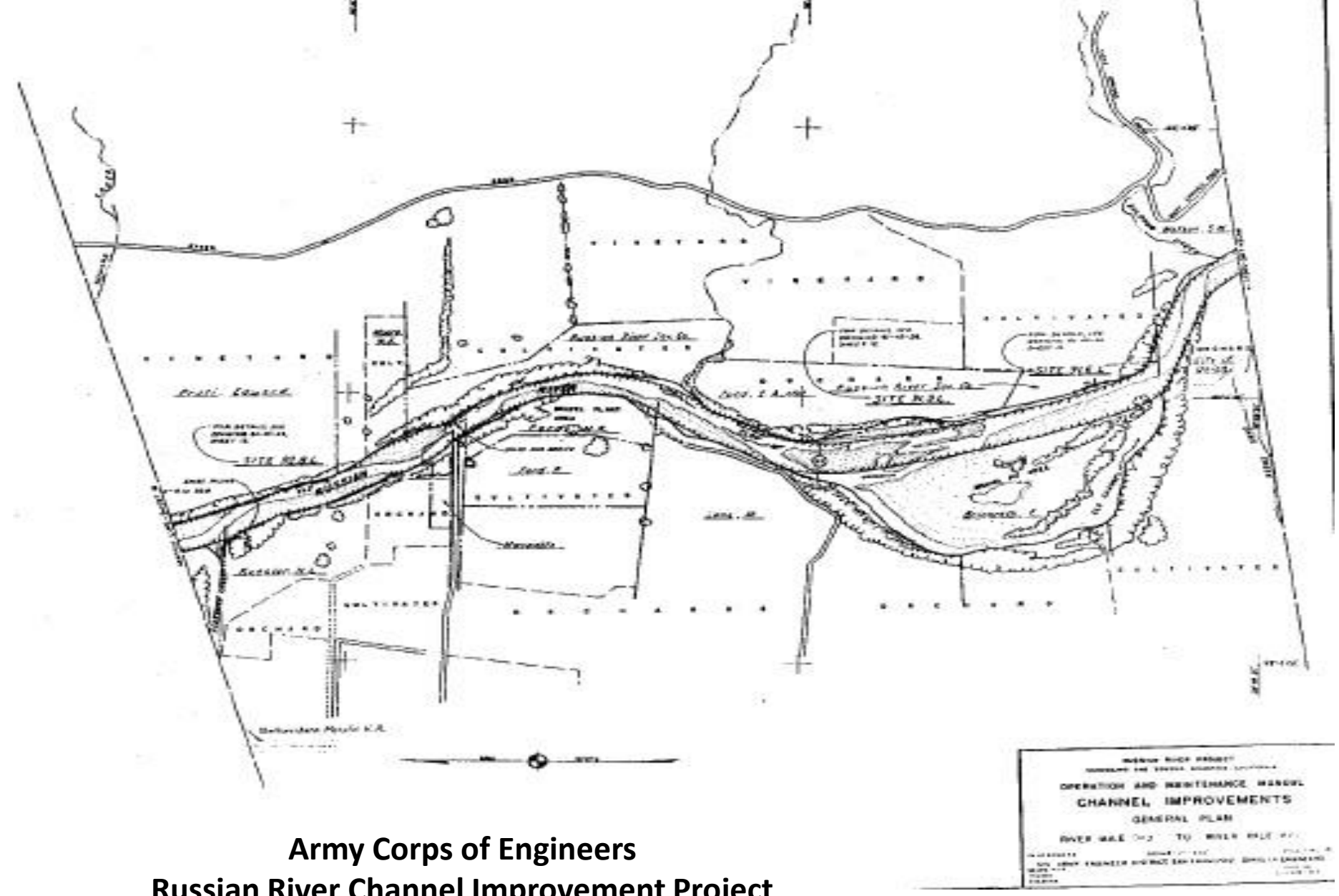


Gravel pit mining of the Russian River valley lowered the river bed by 20-50 ft.
In 1981-90, 10 million tons of gravel were extracted from the river channel.
Instream bar skimming and excavation of floodplain pits continues to be done.
The Russian River continues to adjust to these major impacts.

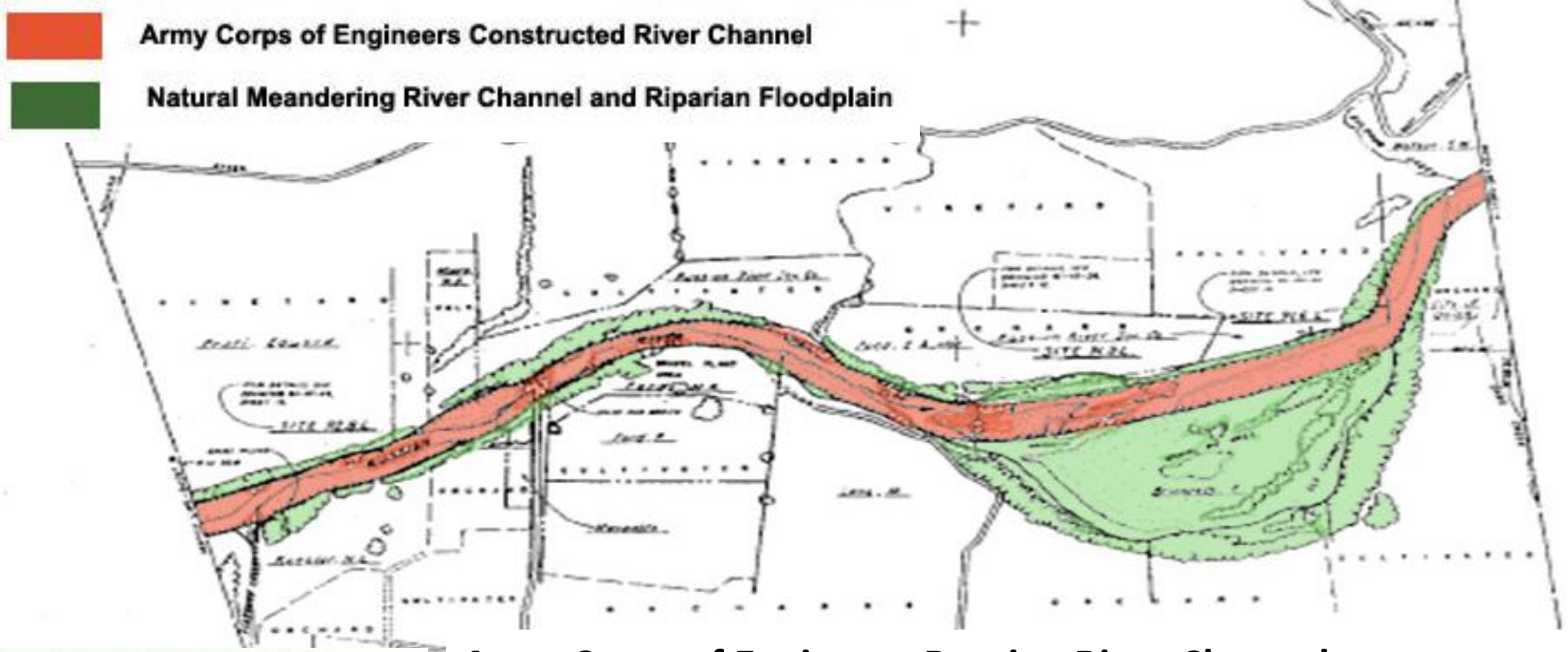
Effect of instream gravel mining: Incision upstream due to headcutting, and downstream due to sediment starvation



The use of car bodies to stabilize stream banks was recommended by the U.S. Dept. of Agriculture



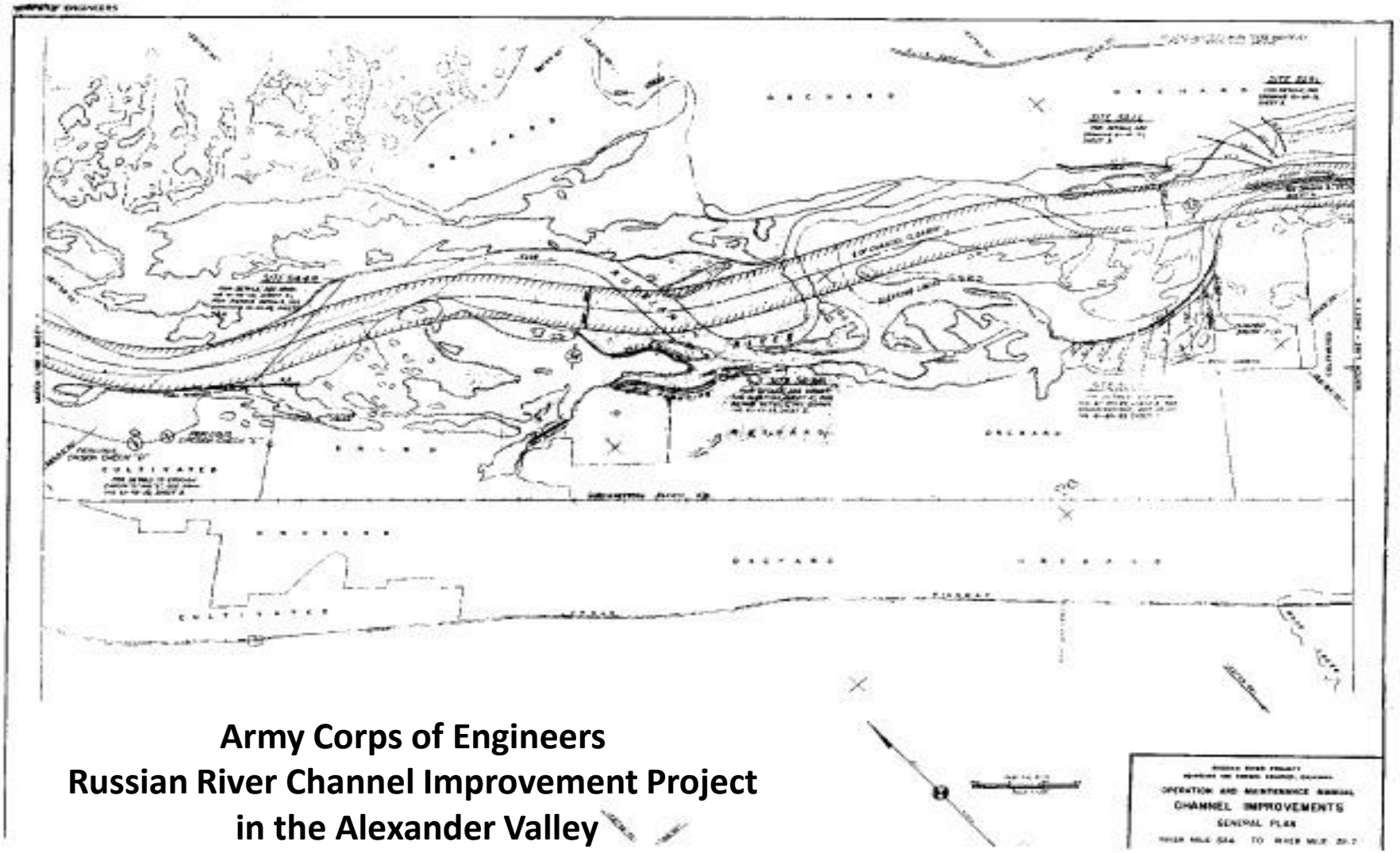
Army Corps of Engineers
Russian River Channel Improvement Project
Ukiah Valley



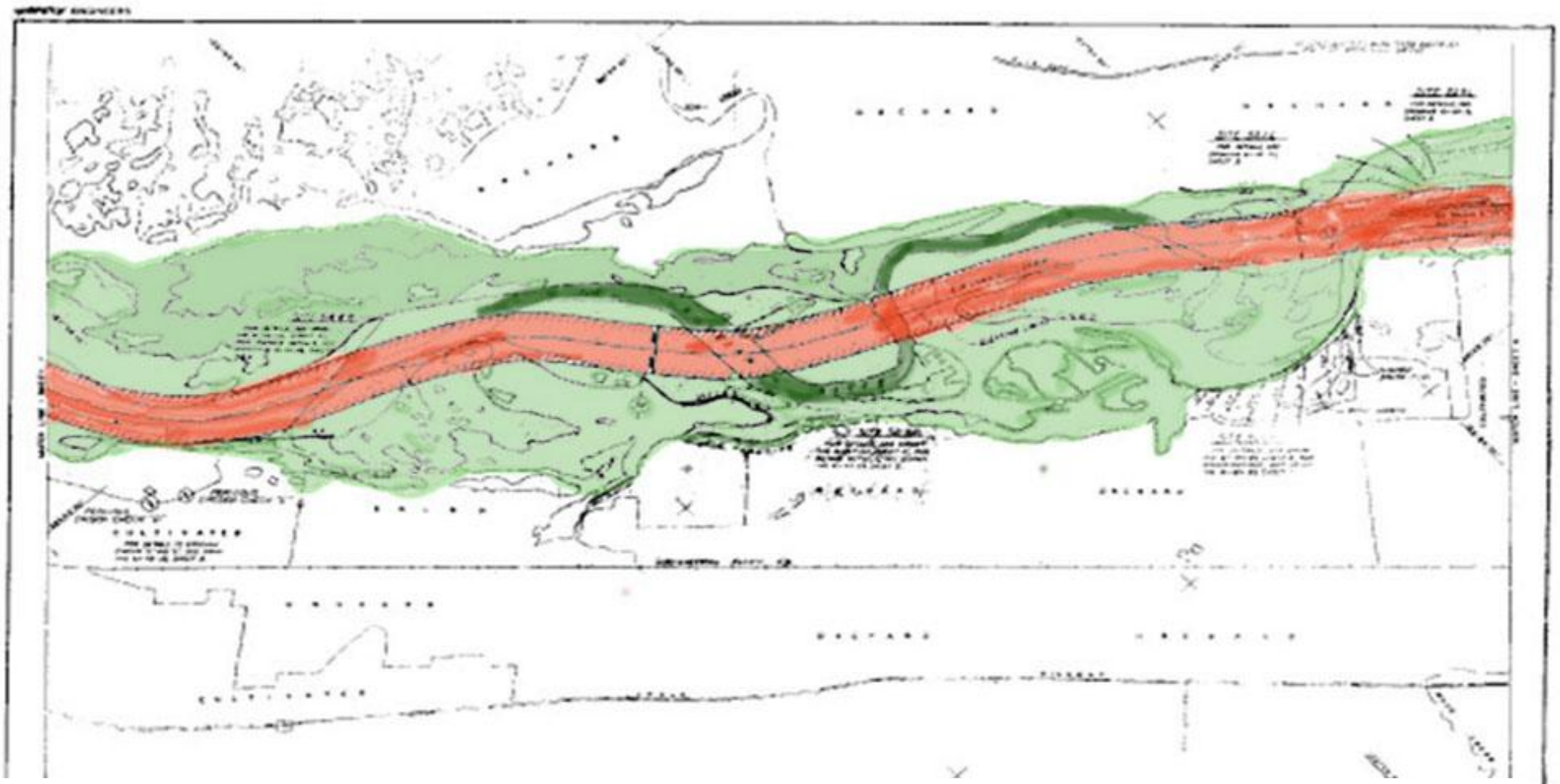
Army Corps of Engineers Russian River Channel Improvement Project in Ukiah Valley 1956-1963

Over the Ukiah-Hopland-Alexander Valley areas of the Russian River, the Corps' project resulted in:

- 635 acres of channel clearing
- 210,000 cubic yards of channel excavation
- 10.8 miles of jacklines
- 4.4 miles of flexible fence
- 2.0 miles of willow planting with wire mesh (30 ft. wide strips)
- 11.3 miles of willow only planting (30 ft. wide strips)



Army Corps of Engineers
Russian River Channel Improvement Project
in the Alexander Valley

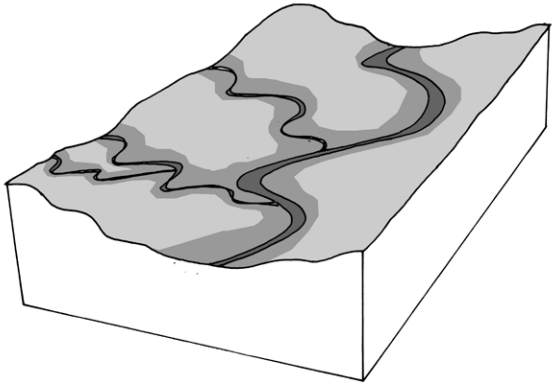


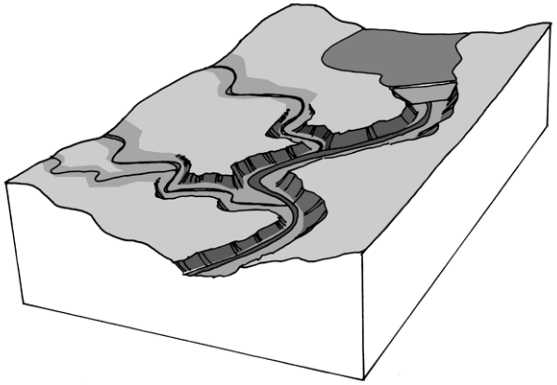
Army Corps of Engineers Russian River Channel Improvement Project in Alexander Valley

Army Corps of Engineers Constructed River Channel

Natural Meandering River Channel and Riparian Floodplain

Jacklines installed as part of the Corps channel improvement project in the 1960s to protect banks have become debris in the river in some locations



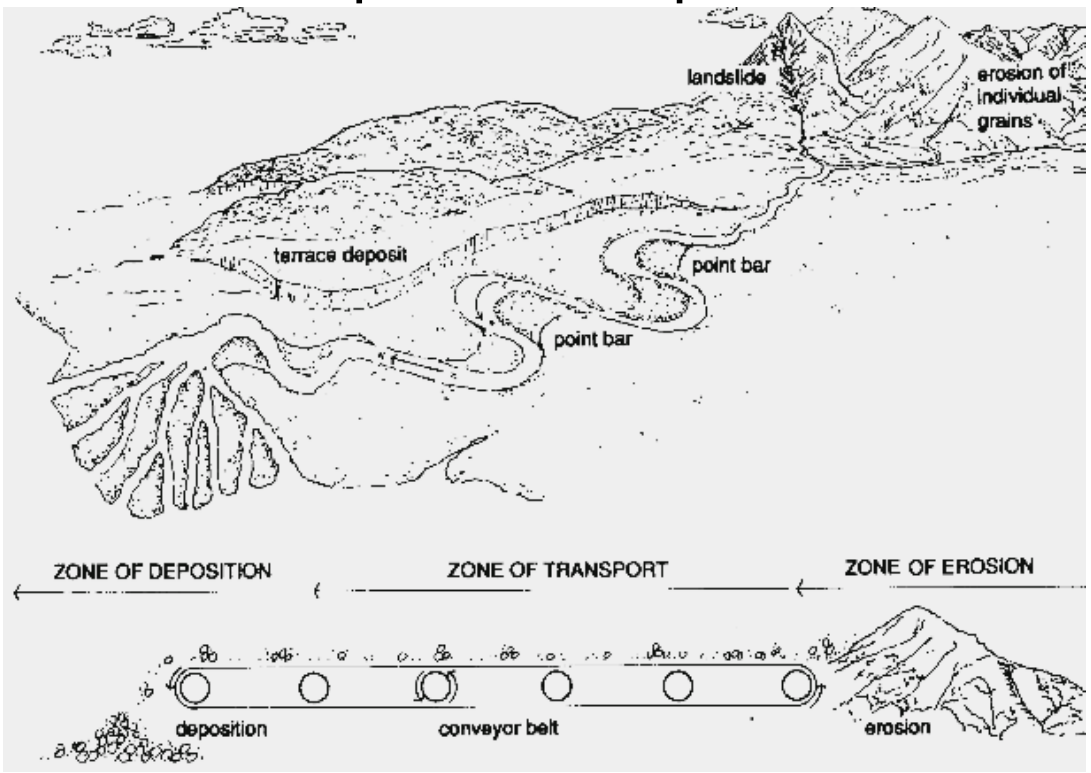


Russian River and tributaries before and after the construction of Coyote Dam. The reservoir impounds bedload releasing "hungry water" that erodes the bed and banks of the river

Incision in the Russian River in Ukiah and Hopland Valleys

Longitudinal Continuity of Sediment Transport

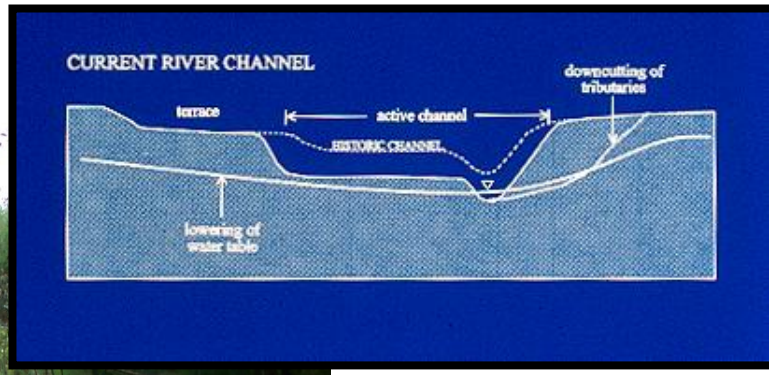
Rivers carry not only water, but also sediment
- an essential component, responsible for channel form



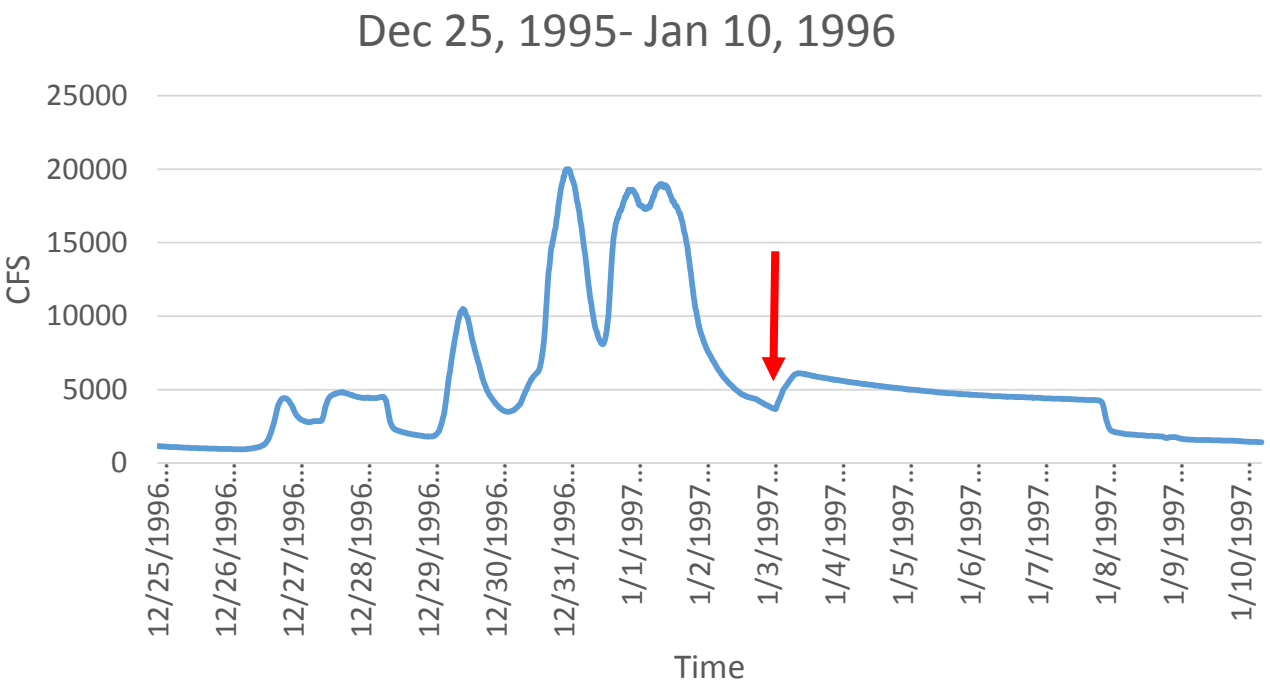
The transport zone is like a conveyor belt:
on geological time scale the sediment is in motion,
with only temporary storage in bars, floodplains, etc..

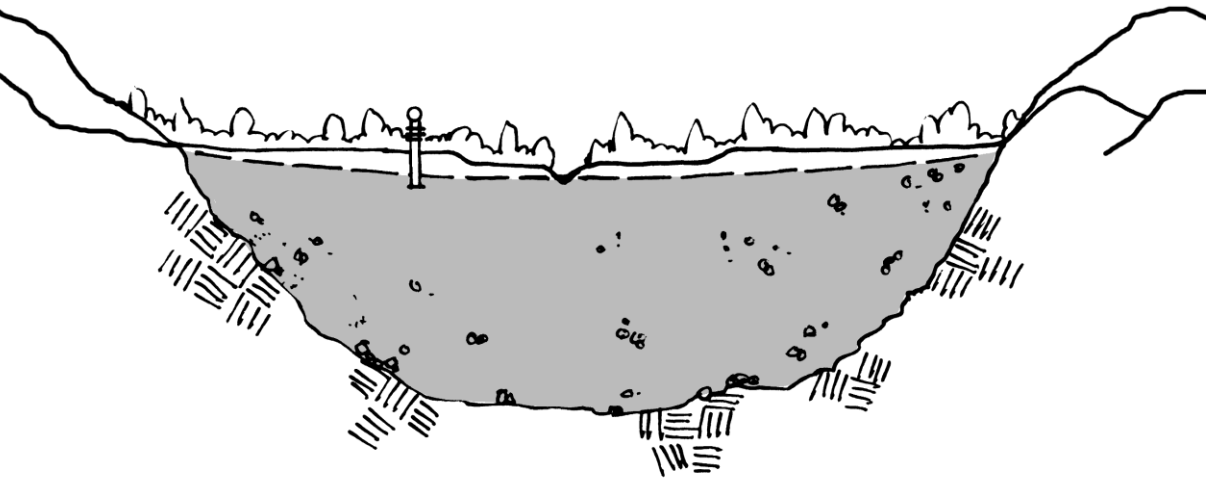
Dams interrupt this natural continuity of sediment flux.

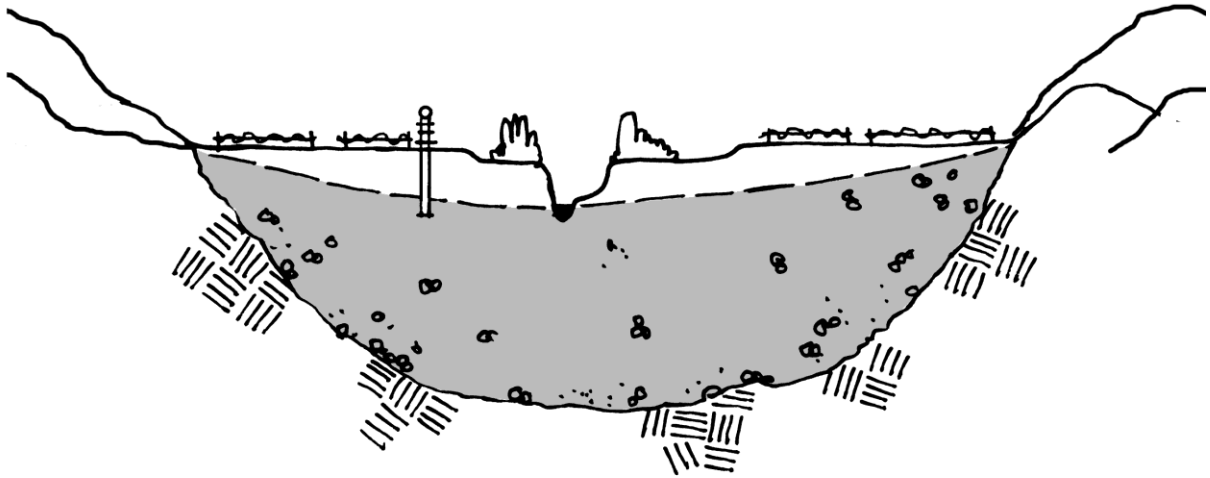
Entrenchment of the Russian River in its alluvial valleys migrates up tributary streams eroding out aquatic and riparian habitats



Flood releases from Coyote Dam following a major storm can cause bank erosion. The effects of flood releases on the geomorphology of the Russian River channel have not been studied adequately.

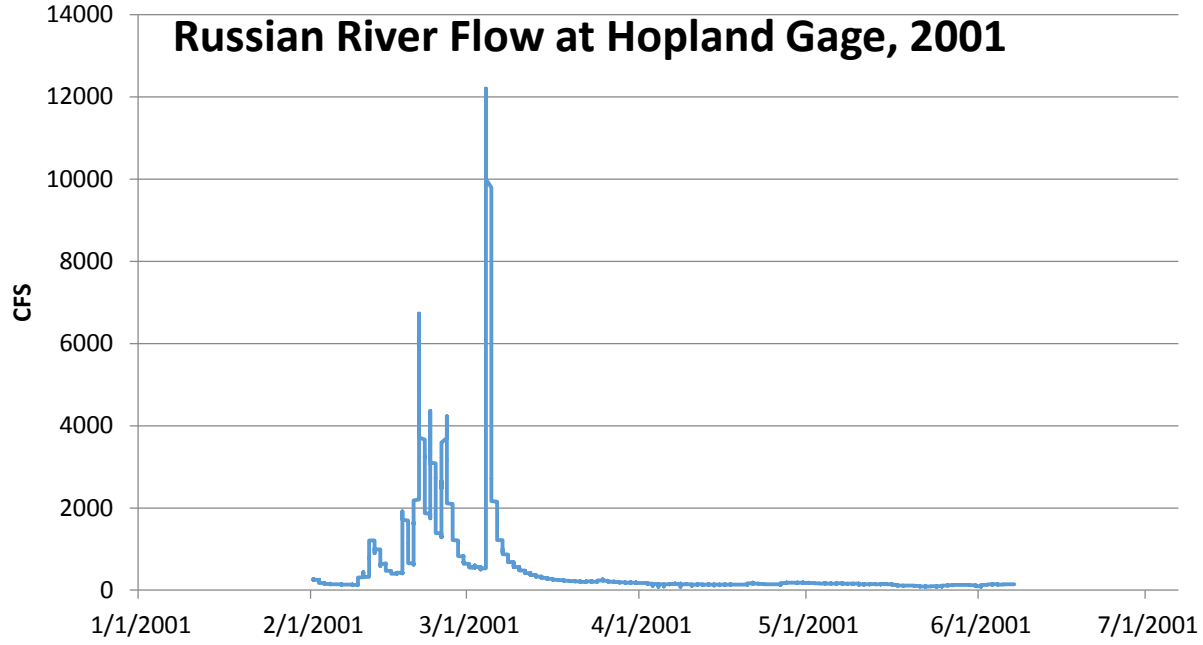


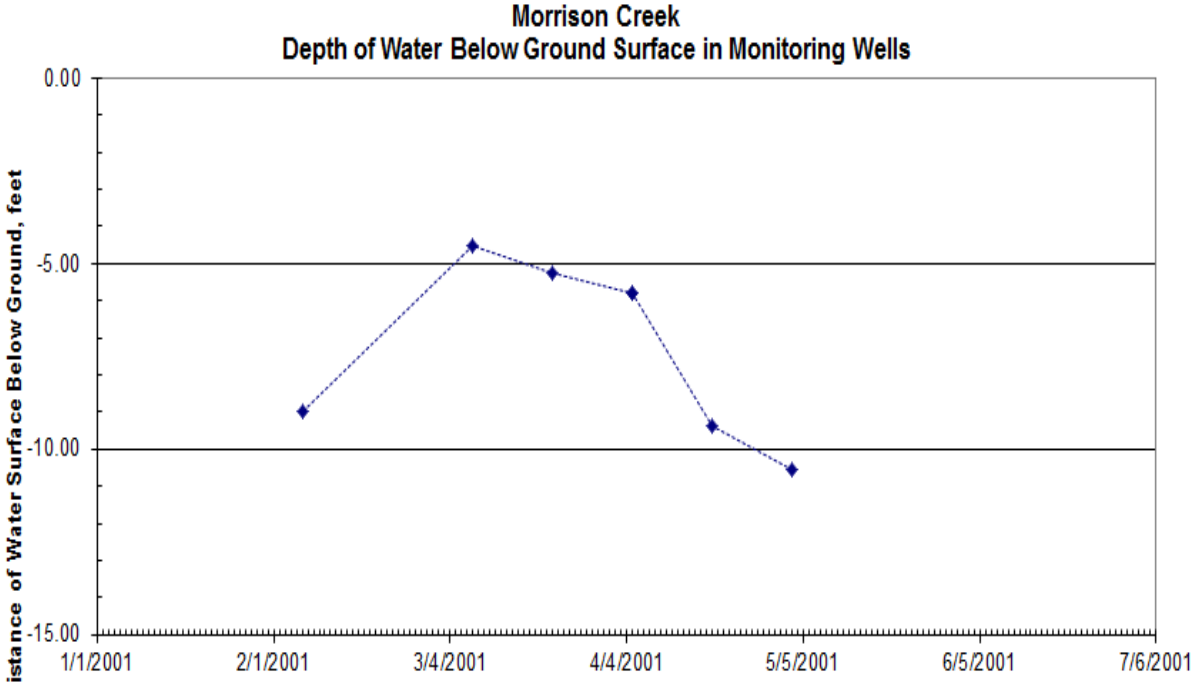




Incision of the main stem river channel lowers the groundwater table in the alluvial aquifer.

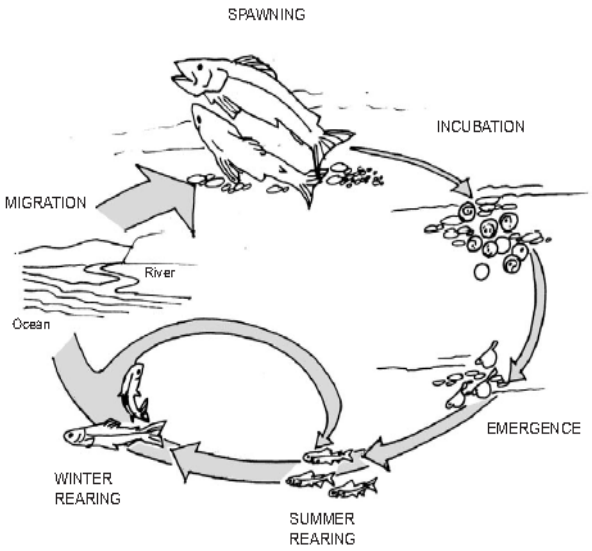
This process has occurred in rivers and groundwater aquifers worldwide including: the Apalachicola River in Florida, the Mojave River in Ca., waterways in the Tar River Basins in North Carolina, Goulburn River in Australia, Drôme River in France and the Mendenhall River in Alaska.

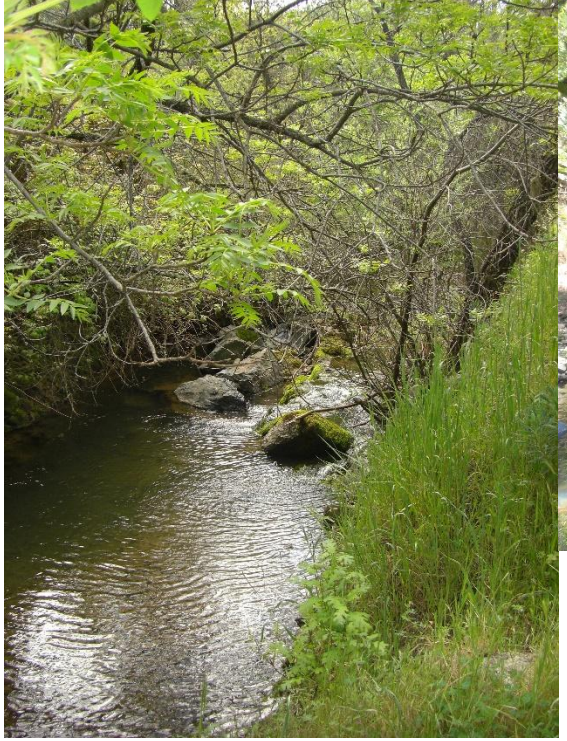


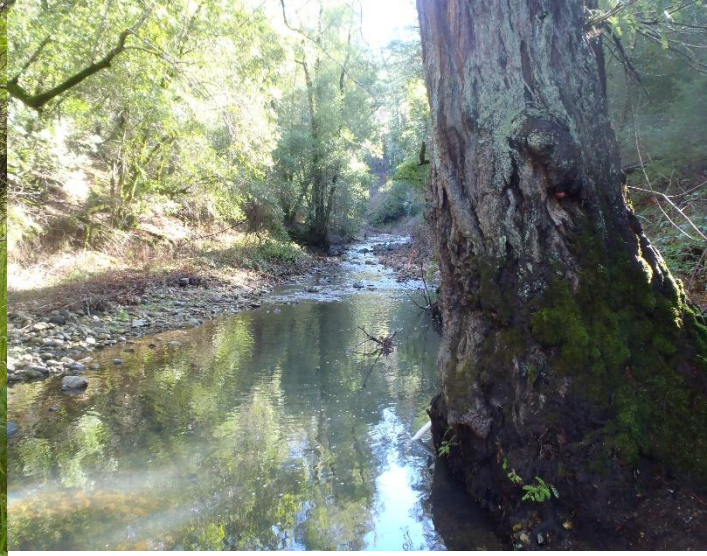


- **The drop in groundwater level in Morrison Creek coincides with the drop in flow levels in the main river channel.**
- **No juvenile steelhead could have migrated out of these creeks in March.**

Morrison Creek flows to the Russian River channel when river stage is high but when river stage is low creek goes subterranean prior to reaching river

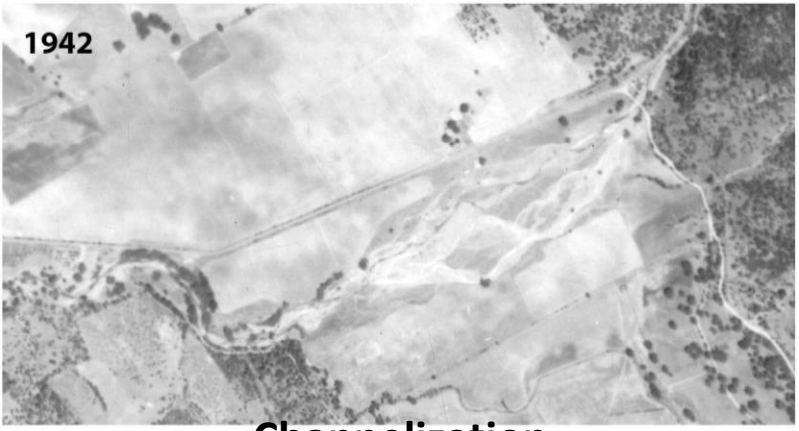




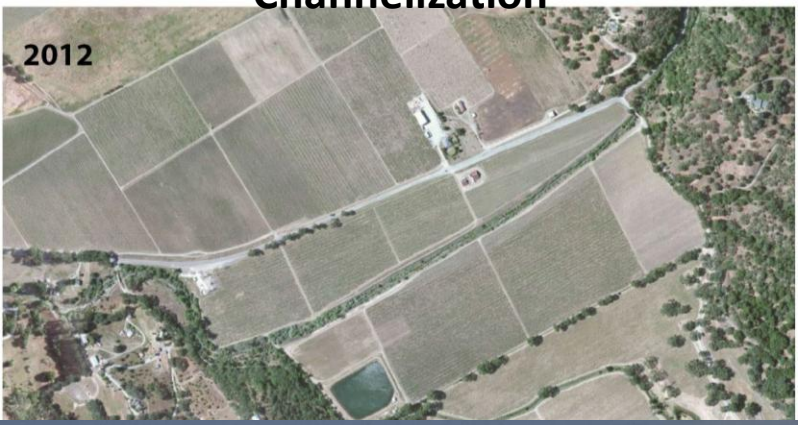


Coho salmon and steelhead trout rear in tributaries in the summer. In the dry warm summer, groundwater provides the cold water in creeks that salmonids require. Many creeks are naturally summer dry, while others maintain flow.

Rearing steelhead in summer groundwater-fed pool



Channelization



Urbanization

On-stream dams

Tributaries in the Russian River are affected by channelization, urbanization, on-stream dams, direct water diversions and channel incision

Direct water diversions

Ongoing Efforts to Restore the System

- Biological Opinion (BO) for Water Supply, Flood Control and Channel Maintenance
- Endangered Species Recovery Plans for Coho and Chinook salmon and steelhead trout
- Russian River Coho Salmon Captive Broodstock Program
- California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grant Program
- Sonoma County Water Agency Dry Creek Restoration Project
- A number of organizations implement restoration projects including Russian Riverkeeper, Trout Unlimited, Resource Conservation Districts, and the California Land Stewardship Institute (Fish Friendly Farming Program)
- Agricultural Water Enhancement Program
- Russian River Habitat Blueprint