# San Joaquin River Basin

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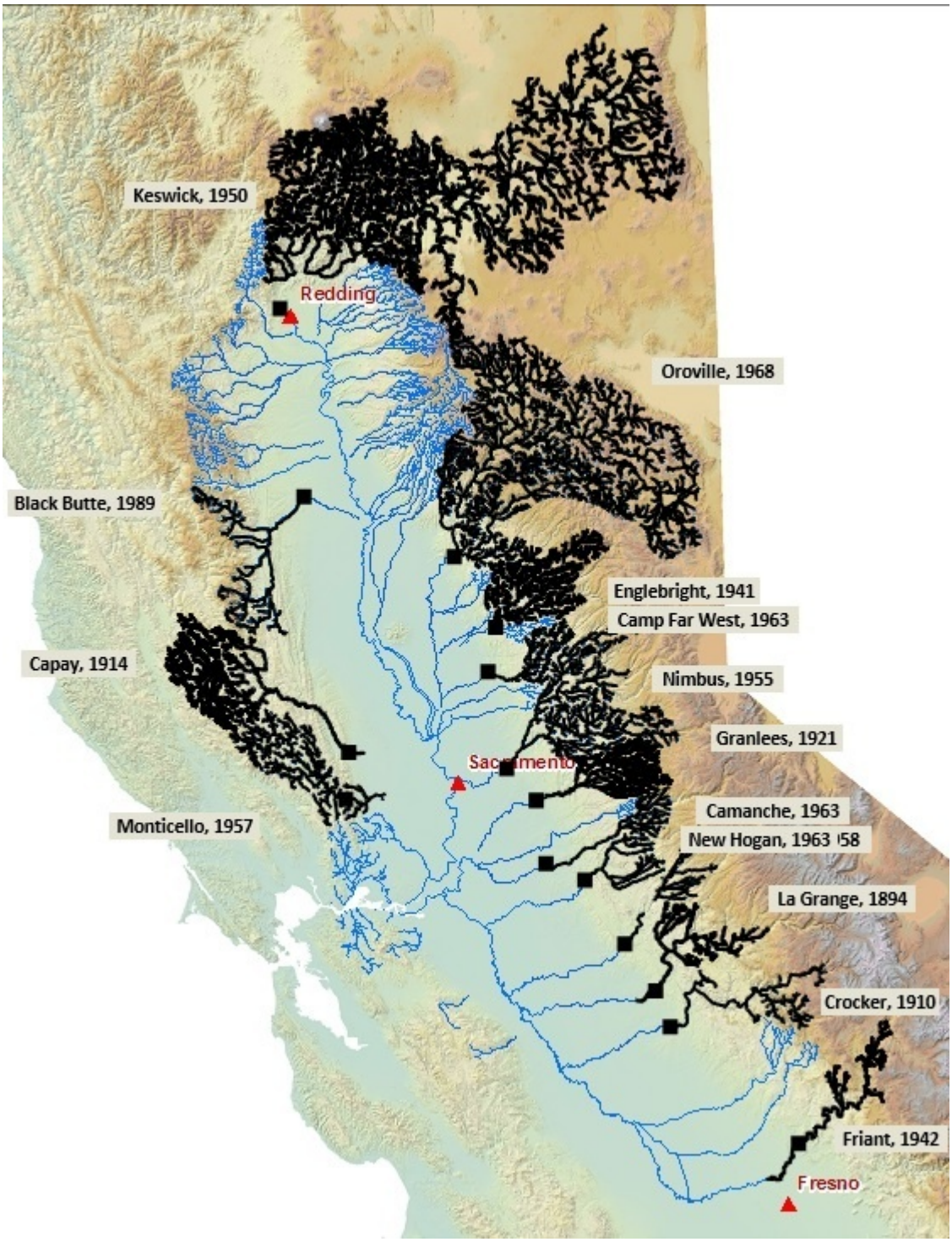
The San Joaquin River originates in the high-elevation Eastern Sierra Nevada mountain range, flowing southwest to the San Joaquin Valley floor, before turning northwest to its confluence with the Sacramento River at the Sacramento-San Joaquin Delta (Delta). The San Joaquin River has three major tributaries: the Merced, Tuolumne, and Stanislaus rivers. The Cosumnes (a tributary to Mokelumne River), Mokelumne, and Calaveras rivers also flow into the San Joaquin River where the river joins the tidally influenced Delta.


*San Joaquin River basin*

The San Joaquin River system has been extensively modified in support of flood control and water supply by placing major dams on all but one of the tributaries (the Consumnes is the only major river in the San Joaquin system to not have a large dam). Construction of large dams for municipal and agricultural water storage and supply, hydroelectric power generation, and gold and aggregate mining have barred salmon from any habitat above the dams, causing them to become locally extinct over the majority of their historical range. Also, many of the lower river floodplains have been developed into urban areas or altered for use as agricultural land.

The combination of these modifications has resulted in the local extinction of Central Valley (CV) spring-run Chinook salmon (*Oncorhynchus tshawytscha*). Although California Central Valley (CCV) steelhead (*O. mykiss*) and fall-run Chinook salmon are present in the San Joaquin River basin, their ranges are currently extremely limited. Damming of rivers, diversion of water, channelizing streams, mining, and alteration of stream flow are detrimental to fish not only because it reduces the amount of habitat available, but also changes the functionality of what remains in ways that impact their survival. Reducing access to historic spawning locations, warm water temperatures, poor water quality, and altered flows to migration routes impose stress on fish populations, and these stressors must be alleviated for populations to recover.

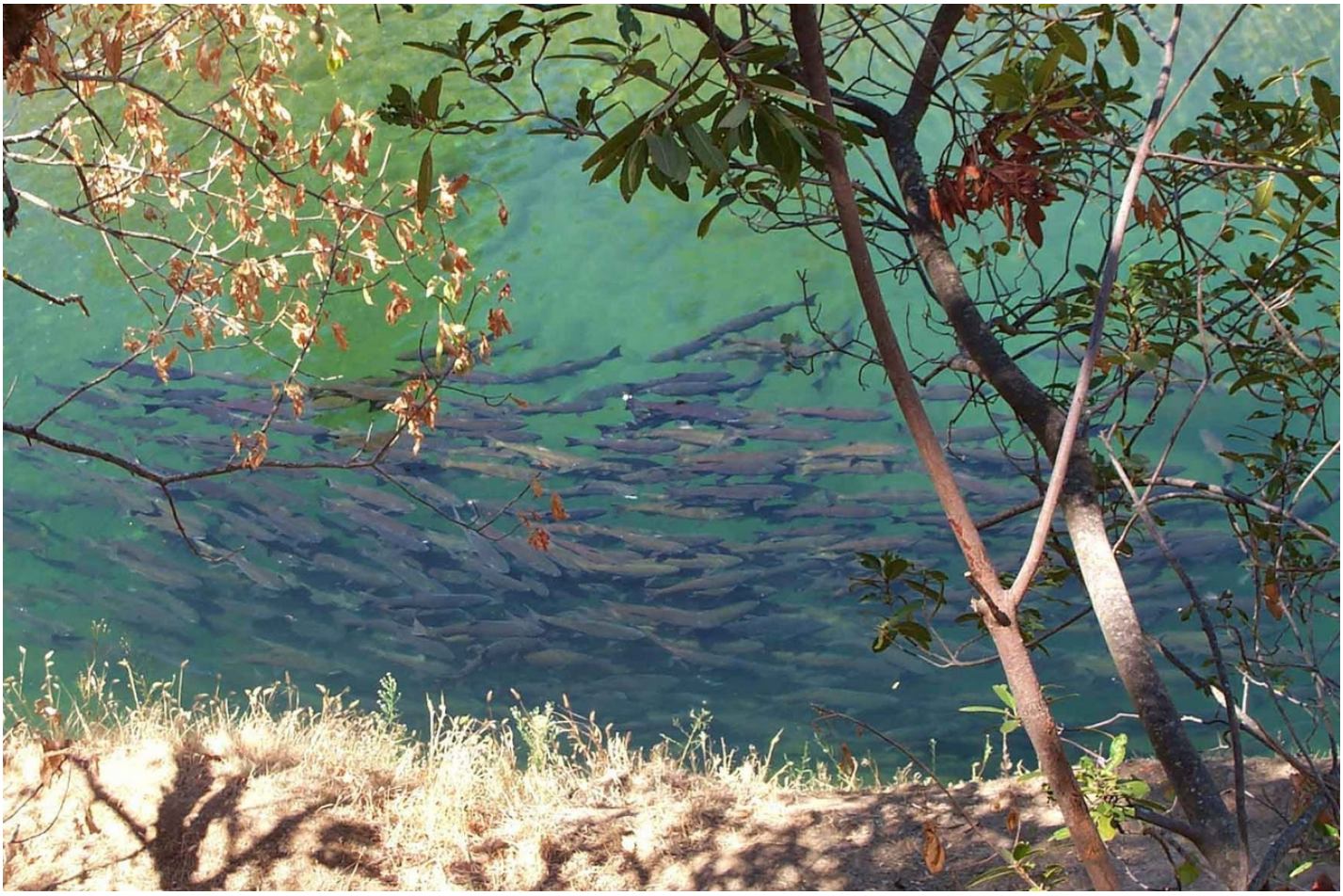


*Dams now block Central Valley Chinook salmon & steelhead from over 90% of their spawning habitat*

Many of the key stressors can be addressed through habitat restoration or enhancement. Addressing the lack of habitat function is an important step to the recovery of CV spring-run Chinook salmon and CCV steelhead populations.

## Focal Species

CCV steelhead and CV spring-run Chinook salmon are the two listed (identified as threatened or endangered under the Endangered Species Act) salmonid species that inhabit the San Joaquin River Basin. CCV steelhead and CV spring-run Chinook salmon are both anadromous fish, meaning these fish are hatched from eggs in rivers and will use riverine and estuarine habitats for development and will migrate to the ocean. After a couple years developing into adults these fish will then swim upriver to the same spot where they were originally hatched to reproduce (spawn).



The CV spring-run Chinook salmon was listed as threatened and in danger of extinction under the Endangered Species Act in 1999. The San Joaquin River was thought to have once supported the largest population of CV spring-run Chinook salmon in California. Currently, CV spring-run Chinook salmon are no longer present in all tributaries in the San Joaquin River watershed and inhabit only a small fraction of their historical range .

Recently, ‘spring-running’ Chinook salmon have been observed in the Stanislaus and Tuolumne rivers. Some scientists believe this means a very small population of self-sustaining (i.e., capable of reproducing without hatchery influence) CV spring-run Chinook salmon may exist in the Stanislaus and Tuolumne rivers .

The CCV steelhead was listed as threatened and in danger of extinction under the Endangered Species Act in 1998. CCV steelhead are extinct from most of their historical range, including the upper watersheds for the mainstem and tributaries in the San Joaquin River watershed, largely because of habitat degradation and destruction, blockage of freshwater habitats, and water allocation problems.

The CV fall-run Chinook salmon also live in the San Joaquin River watershed. CV fall-run Chinook salmon are not listed under the Endangered Species Act. However, this species is still subjected to anthropogenic threats including diversion of water flows in the Sacramento-San Joaquin Delta for agriculture, alteration of estuarine habitat (important for juveniles), and the homogenizing influence of hatcheries. CV fall-run Chinook salmon are classified as a “species of concern” by NOAA Fisheries and the California Department of Fish and Wildlife (CDFW).

# Cosumnes River

The Cosumnes River watershed covers approximately 940 square miles (approximately 600,000 acres), from its headwaters in the Sierra Nevada mountain range to its confluence with the Mokelumne River in the Sacramento-San Joaquin Delta. Elevations in the watershed range from a peak of 7,500 feet to slightly below mean sea level in the Delta. The watershed boundaries are the American River watershed to the north and east, the Mokelumne watershed to the south, and the Delta to the west. The watershed includes portions of El Dorado, Amador, and Sacramento counties.

The Cosumnes River is notable because it is the only major Sierra Nevada mountain range stream system without a major dam on its mainstem or tributaries. Thus, it retains a relatively natural flow regime of high flows in winter and low flows in summer. Sly Park Reservoir is the only major water collection basin in the upper watershed, but it does not have an appreciable effect on flows. Latrobe Falls, a natural barrier, is the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

# Mokelumne River

*Photo: John Benson*

The Mokelumne River watershed lies on the western slope of the Sierra Nevada mountain range in Alpine, Amador, and Calaveras counties. The lower Mokelumne River watershed, downstream of Camanche Dam, is located in the Central Valley and the Sacramento-San Joaquin Delta in San Joaquin and Sacramento Counties. The watershed covers an area of 627 square miles (approximately 400,000 acres) and extends from Round Top Peak (elevation 10,364 feet) near the crest of the Sierra Nevada mountain range to Camanche Reservoir (elevation 235 feet) located in the lower western foothills near the town of Clements. Most of the watershed is forested land within the El Dorado and Stanislaus National Forests.

The lower Mokelumne River begins downstream of Camanche Dam and runs southwest through the town of Lodi and then northwest until it is joined by the Cosumnes River. It then enters the Delta, splitting into the North and South Fork channels near the Delta Cross Channel.

The Mokelumne River watershed is a significant source of water for both consumption and energy production. In the upper watershed the major use of land is public and private timber management. The Camanche and Pardee Reservoirs are managed together as part of an integrated system releasing water to meet various demands for downstream users including storage regulation for flood control, hydroelectric generation, instream flow requirements for salmon, and for the CDFW Mokelumne River Fish Hatchery, which raises fall-run Chinook salmon and CV steelhead. Camanche Dam is the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

# Calaveras River

*Calaveras River at Bellota Weir*

The Calaveras River watershed is located in northern California in Calaveras, Stanislaus, and San Joaquin counties. The river is a tributary to the lower San Joaquin River and drains a watershed area of 470 square miles (approximately 300,000 acres) above the foothill line. Major hydrologic features of the upper watershed include the North and South Fork of the Calaveras River, and New Hogan Reservoir; while major features of the lower watershed include the lower Calaveras River, Bellota Weir, Mormon Slough, Old Calaveras River, and the Stockton Diverting Canal. The four main tributaries below New Hogan Dam are South Gulch, Indian, Duck, and Cosgrove creeks. Among the lower tributaries, Cosgrove Creek provides the largest contribution to the river, as much as 8,500 acre-feet in some years.

The Calaveras River serves as an important source of water for agricultural and municipal uses in Calaveras and San Joaquin counties. Local stakeholder groups have expressed concerns regarding potential effects to water quality and aquatic habitats resulting from runoff, agriculture, recreation, mining, and unscreened diversion operations. New Hogan Dam is the most upstream point a

salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean. Year-round flows are provided from New Hogan Dam to Bellota Weir.

## Stanislaus River

*The lower Stanislaus River near the confluence of the San Joaquin River.*

The Stanislaus River is one of the largest tributaries to the San Joaquin River. The watershed includes an area of 1,195 square miles (approximately 760,000 acres), and the river flows 161 miles from the Sierra Nevada mountain range to its confluence with the lower San Joaquin River approximately 10 miles due west of Modesto. Goodwin Dam is the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

The construction of Goodwin Dam in 1912 and construction of Old Melones Dam in 1926 permanently blocked upstream migration for salmonids from their spawning grounds in the upper Stanislaus watershed. By 1994, it is estimated that approximately 50% of the riparian corridor along the lower Stanislaus River had been converted for agricultural, mining, and urban uses. The Lower

Stanislaus River has been developed to provide water, hydroelectric power, gravel, and conversion of floodplain habitat for agricultural and residential uses. Historically 113 miles of habitat was accessible to salmon and steelhead, but currently only the lower 58 miles are accessible to these fish.

## Tuolumne River

*Spawning habitat downstream of the La Grange Dam*

The Tuolumne River originates as an alpine stream in the high elevations of the Sierra Nevada mountain range. The watershed includes 1,870 square miles (approximately 1.2 million acres), and the river flows southwest for 155 miles from Yosemite National Park to its confluence with the San Joaquin River approximately 10 miles west of Modesto, California. Since the 1800s, potentially more than 100 miles of upstream habitat historically available to Chinook salmon and steelhead have been permanently blocked by the La Grange Dam, the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

Agriculture, ranching, mining, and tourism dominate this region and many people depend on the resources from this watershed for their sustained livelihoods. Additionally, degradation of fish habitat in the lower Tuolumne River has resulted from flow regulation, water diversion, gold and aggregate (sand and gravel) mining, municipal and agricultural water storage, power generation, and agriculture.

## Merced River

*Aerial view of the Merced River Hatchery (1998)*

The Merced River originates as an alpine stream in the high elevations of the Sierra Nevada mountain range. The watershed comprises 1,270 square miles (approximately 810,000 acres), and the river flows 135 miles from the southern part of Yosemite National Park to its confluence with the lower San Joaquin River 5 miles northeast of the town of Merced. Since the 1920s, potentially more than 100 miles of habitat historically available to Chinook salmon and CV steelhead is permanently blocked by Crocker-Huffman Dam, the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

The Merced River Watershed has been significantly modified by dams, flow diversion, gold and aggregate (sand and gravel) mining, levee construction, and clearing of riparian vegetation. As early as the 1870's large canal systems were being built to divert Merced River water for agricultural uses

including, row crops, cattle grazing, and orchard crops. Today, lands within the watershed are comprised of rural and privately owned areas, and are primarily used for agriculture and aggregate mining. The Merced River below Crocker-Huffman Dam is impacted by loss of flow, reduced quantity of spawning habitat due to loss of suitable gravel, and poor water quality. California Department of Fish and Wildlife maintains a hatchery for fall-run Chinook salmon on the lower Merced River just below Crocker-Huffman Dam.

## San Joaquin River

*A portion of the lower San Joaquin River.*

The San Joaquin River flows west from the high elevations of the Sierra Nevada mountain range to the valley floor and then heads north to Vernalis where it flows into the Delta. The mainstem of the San Joaquin River is divided into three sections: the upper, middle, and lower sections. The upper San Joaquin River is defined as the mainstem upstream (south) of Friant Dam (Millerton Reservoir) and includes the north, middle, and south forks. The upper watershed includes approximately 1,675 square miles (approximately 1.1 million acres), and the river flows 66 miles from the south fork to

Friant Dam. Friant Dam is the most upstream point a salmon or steelhead is able to migrate for spawning purposes after spending a portion of its sub-adult/adult life in the ocean.

The middle watershed includes approximately 5,800 square miles (approximately 3.7 million acres), and the river flows 147 miles from Friant Dam to its confluence with the Merced River. The lower San Joaquin River is defined as the mainstem north (downstream) of the confluence with the Merced River to Vernalis. The watershed comprises 12,250 square miles (approximately 7.8 million acres), and the lower portion of the river is approximately 115 miles long.

From Friant Dam to the confluence of the Merced River is the San Joaquin River Restoration Program (SJRRP) area. SJRRP is a long-term effort to restore flows and a self-sustaining population of CV spring-run Chinook salmon to the San Joaquin River (also see: http://www.restoresjr.net/). Spring-run Chinook salmon reintroduction efforts began in 2014 when juvenile spring-run were released into the San Joaquin River for the first time in over 60 years. Since then over 500,000 spring-run juveniles have been released.

Currently, the restoration program uses a small interim conservation hatchery to support these efforts. The use of a conservation hatchery promotes the development of conservation broodstock that will: minimize take of additional wild spring-run stocks, allow for careful genetic management of fish released for reintroduction, and increase the number of juveniles available for release. The fully built conservation hatchery, the Salmon Conservation and Research Facility (SCARF), is currently under construction in Friant, CA. There is limited information available as to how these fish will behave in a river that has been dry for 60 years. The restoration staff is a collection of scientists from five different State and Federal agencies. They are learning more about this new system with each fish that is released into the river.

A major milestone was reached in the spring of 2019 when the first spring-run Chinook salmon in over 65 years completed their life cycle, returning to the San Joaquin River after being released as juveniles. The return of spring-run Chinook salmon demonstrates that conservation efforts are working. Research on these salmon will continue to give biologists a better understanding of how to optimize conservation efforts moving forward.

# More Information

- California Central Valley Office
- San Joaquin River Restoration Project

*Last updated by West Coast Regional Office on 03/31/2020*