

RIVERS OF CALIFORNIA

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Preface

“And see the rivers how they run
Through wood and mead in shade and sun,
Sometimes swift, sometimes slow,
Wave succeeding wave, they go
A various journey to the deep
Like human life to endless sleep.”

—John Dyer (1700-1758)

For uncounted centuries cold, clear waters have tumbled through the granite gorges and majestic canyons of the Sierra Nevada, broad rivers have wound majestically through California's central valleys and rushing streams have hurried to the Pacific from the heights of the coastal ranges.

Of all its plentiful blessings none has meant more to California than water. Soil, climate and abundant natural resources have made the state a chosen land. Without water, however, there would have been scant population, rich soils would lie fallow and a land of plenty would be largely undeveloped.

Rain and snowfall in California vary from almost nothing in the desert to more than 100 inches annually in some coastal and mountain areas. With a mean average annual rainfall of 22.7 inches, more than 190 million acre feet of water is deposited on California's 101 million acres. Much of it sinks into the soil, escaping man's immediate uses but nurturing forests and meadows from underneath the surface and providing a vast underground water table to be tapped by man to serve his farms.

From the time Franciscan padres first built diversion dams on the San Diego River in 1770 to irrigate their fields, Californians have made constructive efforts to transport and utilize water where it was most needed. Water was the very lifeblood of the gold placer operations 80 years later when the miners advanced the art of building water systems to operate their pans and sluice boxes and then their monitors and dredges.

As the American tide rolled westward in the latter half of the nineteenth century, California's native sons and new settlers turned their attention away from gold to farming and industry. Dry farming gave way to irrigation and millions of acres were brought under cultivation. Always, the key was water.

No effort is made in this book to discuss water in the light of California's growth or the state's present water distribution problems. This is a collection of information about California's rivers, their history, development and geography. It began as a series of articles in PG&E PROGRESS on the principal California rivers. Research for the series disclosed that no complete volume existed on the subject and that little written material was available at all on some streams. Widespread interest in the articles prompted an extension of the series to include most of the rivers of the state and this book is now published as a service to schools, libraries, historians and the public at large.

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AMERICAN

The Gold Rush That Built an Empire Began on Its South Fork

California's most important historical event took place along the American River on January 24, 1848. When James Wilson Marshall spotted gold in a shallow ditch along the river's South Fork he set in motion a migration that has continued in ever-increasing numbers for more than a century.

Marshall's discovery was made at a place 35 miles northeast of Sacramento which the Indians called Culloma and which eventually was named Coloma. Within a year 100,000 prospectors swarmed into California by sea and land and vast riches resulted for some and great disappointment for others.

California's gold belt stretched in several directions for many miles. Elsewhere along the American and throughout the Mother Lode country great quantities of the precious metal were obtained by panning and mining.

Smith Showed the Way

But while much of the Gold Rush history was written around such well known pioneers as Marshall's employer, John Augustus Sutter, and Sam Brannan, it was an earlier figure who did much to pave the way for the settling of California in the area around the American.

Few Californians know that nearly a generation before Kit Carson or John C. Fremont started for California, Jedediah S. Smith had twice entered the state from the east and traveled its length from

San Diego to the present Oregon border.

Smith with 17 men and 300 horses camped on the banks of the American River, near what is now Folsom, for about two or three weeks in the Spring of 1828 waiting for high waters to recede. Historians believe that it was from this point that Smith unsuccessfully made his first attempt to force a crossing of the Sierra during the Spring of the previous year, 1827.

All three forks of the American rise high on the west slope of the Sierra. Extending northeast from Sacramento, the river's basin embraces almost 2,000 square miles between the Bear and Cosumnes watersheds.

The American flows into the Sacramento River just outside the city of Sacramento. Thirty miles upstream from this point, the North and South forks merge, while 18 miles farther up the Middle Fork converges with the North Fork near Auburn. Measured along any one of these forks, the river is slightly more than 100 miles in length.

Mile Drop in Mountains

The American drops 6,000 feet in the first 50 miles, tumbling through deep, narrow valleys amid wooded ridges.

There is a wide fluctuation in flow, with a flood season from March to June. There is an annual average runoff of 2,731,000 acre feet at Fair Oaks, eighty per cent of which flows during the spring months.

Hydroelectric generation first began along the American when the old Folsom plant was opened in 1895. Power was delivered at 11,000 volts to Sacramento 22 miles away, a great achievement for that time. PG&E retired this plant in 1952 and the building was donated to the State of California as a historical landmark.

PG&E operates two plants on the American as does the U. S. Bureau of Reclamation. Sacramento Municipal Utility District placed one plant in service in 1961 and has four more plants under construction or planned.

THIS SWEEPING VIEW of the City of Sacramento shows the American River flowing from the lower right toward its confluence with the Sacramento River near center of picture. Large body of water in the background is the Yolo Bypass. The view looks toward the northwest.



TWO BEARS

Both Rivers Bearing This Name Flow Down Sierra Slopes

One of the most common names among California's waterways is—The Bear. Two sizeable rivers and at least four creeks have such a designation.

The northernmost of the Bear rivers is located in Nevada and Placer counties and flows through picturesque Sierra hills once crowded with gold miners. It first springs to life in Bear Valley just north of Emigrant Gap and flows for 60 miles before joining the Feather River at East Nicolaus. The bulk of its water is imported from the South Yuba River where storage reservoirs operated by PG&E and Nevada Irrigation District provide a regulated



GOLD RUSH HISTORY is all around this section of the Bear River in Nevada County. View taken from State Highway 12, between Grass Valley and Colfax, shows bridge which once carried the defunct Nevada County Narrow Gauge Railroad between these two communities.

supply for diversion from Lake Spaulding.

Lake Spaulding has a 275-foot dam, the crest of which is 5,015 feet above sea level. Wedged into a glacier-cut gorge, the dam, constructed in stages between 1912 and 1919, provides a reservoir with a capacity of 24 billion gallons.

Diverted to Powerhouses

Below the dam, the stored water divides. The greater part is diverted through a tunnel blasted

for almost a mile through solid rock into Bear Valley. Twice in the next several miles it plunges dramatically to spin the turbines of Drum and Dutch Flat powerhouses, two of the nine generating plants in the great PG&E South Yuba-Bear hydroelectric system.

Farther down the river at a point about a mile above Colfax, water from the Bear is diverted into the Bear River Canal, one of California's oldest and most important irrigation arteries. Construction on this canal began in 1851 when a larger and more dependable supply of water was needed for the community of Auburn. Enlarged and reconstructed, this canal is the source of water for two other powerhouses, Halsey and Wise, and feeds irrigation systems of PG&E and Nevada Irrigation District that have made thousands of acres in the Sierra foothills and Sacramento Valley lush and productive as well as providing water for domestic use.

Far shorter in length, but no less spectacular, is the Bear River in Amador County. Thirty air miles southwest of Lake Tahoe, its headwaters begin at elevations above 7,000 feet. Its deep granite gorges are a legacy of the glacier age.

This Bear River, only 16 miles long, is the principal tributary of the North Fork of the Mokelumne River. Bear River Reservoir and Lower Bear River Reservoir, together with Salt Springs Reservoir and four small reservoirs on the North Fork of the Mokelumne River, provide storage and regulated flow for four PG&E power plants downstream along the Mokelumne.

These seven PG&E reservoirs in Amador County have a combined storage capacity of 215,045 acre feet. In addition to providing regulated flow to keep the powerhouses operating efficiently they also play a part in flood control. The water becomes a part of the East Bay Municipal Utility District.

6,000 Foot Climb by Mule Teams

When the Standard Electric Co. (a PG&E predecessor) built Bear River Reservoir in the early 1900's it was a titanic struggle of man against the elements using rudimentary tools. Ten and 12-mule teams hauled donkey engines, boilers, tons of blasting powder, huge gates and pipes from the nearest railhead at Ione, at 300 feet above sea level, to elevations of 6,000 feet. Each trip over rutted roads cut through the wilderness consumed eight to ten days.

In sharp contrast to these pioneer efforts was the construction of Lower Bear River Reservoir in the early 1950's when huge, modern equipment and advanced techniques were used in construction of this 240-foot high rock fill dam.



COLORADO

*Carries Away Half a Million Tons
Of Silt Daily Along 1,450 Miles*

WENDING ITS WAY between California and Arizona, the Colorado passes the community of Topock, Arizona, in background. PG&E's compressor station in foreground handles gas which comes across river through two pipelines at right.

Engineers have estimated that the Colorado River carries away an average of half a million tons of earth every day from the 242,000 square miles of arid land it drains.

The Colorado is the second longest river in the United States, exceeded only by the Mississippi-Missouri. It begins its 1,450 mile course in Rocky Mountain National Park, at Grand Lake, Colorado, and with its major tributaries passes through seven states before emptying into the Gulf of California 80 miles below the Mexican Border. With its tributaries, it traverses 19 major chasms, the largest of which is the Grand Canyon, 217 miles long, a mile deep and from 4 to 18 miles wide.

Swollen at first by clear streams from the Continental Divide, it picks up the Green River in eastern Utah, the San Juan in southern Utah and the Little Colorado in northern Arizona. The Virgin River joins up north of Hoover Dam. Beyond its junction with the Williams and Gila rivers it flows over its own silt, higher than the surrounding desert.

Too Rough for Navigation

Since the Colorado has defied all efforts at commercial navigation, no large city lies at its mouth as is generally the case with other major rivers.

The Colorado flows along the entire border between California and Arizona from a point north-east of Needles, California, to below Yuma. Half of the people in California are dependent in whole or in part on the Colorado for irrigation, domestic, municipal or industrial water purposes.

The great Colorado River Aqueduct carries water from Parker Dam to the Los Angeles area. The All-American Canal, fed by Imperial Dam on the Colorado, irrigates a million acres in Imperial Valley, one of the world's richest agricultural areas.

Hoover Dam, highest in the United States, is one of a series of large dams which have done much

to control floods and stem erosion. Lake Mead, the reservoir behind the dam, was the largest man-made body of water in the world at the time of its construction. The lake is 115 miles long and 589 feet deep and can store 10 trillion gallons or 32,300,000 acre feet of water.

Huge Sediment Flow

With about one per cent of its volume made up of silt, the Colorado pours an average of 180 million tons of sediment into Lake Mead each year.

The average annual flow of the Colorado exceeds 16 million acre feet at some points. In contrast to many of the nation's large rivers, its flow is small but because so much of the Southwest is arid wise conservation and use are especially important.

The word Colorado means "colored" in Spanish, an appropriate designation for these turbulent waters.

Almost a hundred years before the Pilgrims landed on the Eastern seaboard, Spanish explorers had found and traveled the lower course of the Colorado. Francisco de Ulloa sailed from Acapulco July 8, 1539, with a fleet of three vessels and after many difficulties reached shallow waters at the head of the Sea of Cortes (now the Gulf of California). Although he did not see the river he surmised that there was one.

A year later Hernando de Alarcon reached the same point and then used small boats to go up stream to a point 100 miles above the mouth of the Gila River. In 1542 Don Lopez de Cardenas discovered the Grand Canyon but the canyons of the river remained unexplored for 329 years. In 1869 the river was first fully traveled when Major John Wesley Powell led an expedition downstream from Green River, Wyoming.

For half a century disputes have raged over diversion of the Colorado's water. In 1922 a compact was signed dividing the basin and allocating water but controversy still exists.

COSUMNES

Bret Harte Loved This Region With Its Comically Named Towns

It was not long after the discovery of gold at Coloma on the South Fork of the American River, January 24, 1848, that avid prospectors were teeming along the nearby Cosumnes River.

Now, more than a century later, little remains of the funny-named mining camps that stretched along much of this short, beautiful stream. Scarred hills and an occasional chimney are about all that remain of such places as Fair Play, Grizzly Flat, Indian Diggins, Slug Gulch and Pokerville. Some, like Fiddletown and Michigan Bar, boast of scattered homes and ranches, but the lusty era immortalized by Bret Harte is long gone.

Rising in El Dorado County, near the brow of the Sierra, the Cosumnes lies between the American to the north and the Mokelumne to the south. After a swift drop through El Dorado, Amador and Sacramento counties, the Cosumnes loses itself in the Mokelumne 25 miles south of the city of Sacramento. This junction is 30 miles from the point where the Sacramento and San Joaquin rivers merge and where California's two great valleys come together.

Name Has Miwok Origin

The river has been known by several spellings but the origin is believed to be from the Miwok Indian word "kosom" meaning salmon and the suffix "umne" meaning tribe or people. Beginning at an elevation of 7,785 feet, the Cosumnes drops more rapidly than any of the rivers that flow into the valleys. The decline averages more than 80 feet a mile.

Two men figured prominently in the early history of the Cosumnes. They were brothers-in-law, Jared Sheldon, a carpenter from Vermont and William Daylor an English sailor. Sheldon worked for the Mexican Government at the Custom House and Presidio in Monterey from 1842 and 1844 and for his labors was granted five square leagues of land on the north bank of the Cosumnes in the latter year. Sheldon was busy at the time building a flour mill at Bodega, then a Russian settlement, and asked Daylor to assist in developing the Cosumnes land.

Several of the roads leading to the southern mines



BATHERS enjoy the cooling waters of the history-studded Cosumnes River at this point about midway between its headwaters in the Sierra and confluence with Mokelumne River.

passed through the region and Sheldon and Daylor prospered through income from ferries, toll bridges, hotels, trading posts and grist mills. A dam which Sheldon erected for irrigating his land was the object of a dispute with miners in the area. On July 12, 1851 Sheldon and two of his men were killed in a brief skirmish with some of the miners.

Rocky Bottom, Little Erosion

Much of the 580-square mile Cosumnes basin consists of low hills separated by small, irregular valleys. Owing to the rocky nature of the watershed there is comparatively little erosion and consequently very little turbidity in the water.

Bret Harte loved the region and wrote of it in "An Episode of Fiddletown." This settlement was started in 1853 by a party of Missourians. They couldn't agree on a name until one said "They are always fiddlin', call it Fiddletown." The name was used until 1878 when civic pride prompted a change to Oleta. Later the California Historical Society succeeded in restoring the original name.

The richest location for gold mining was situated on the river bar at the main forks of the Cosumnes and was called by the Indian name Yeomet, or Sounding Rock.

EEL

It's a Rare River That Flows Northward

The Eel River has a larger annual runoff than any other stream with a watershed lying entirely in California's coastal mountain ranges.

Draining 3,565 square miles in Lake, Mendocino, Trinity and Humboldt counties, the Eel dumps an estimated six million acre feet of water each year into the Pacific 13 miles south of Eureka.

Unlike the snow-fed Sierra streams, most of the Eel's watershed consists of low-lying mountainous terrain where the precipitation is largely rain.

During four months of the year, July through October, the Eel is a placid stream with only one per cent of its annual runoff meandering through the sand and gravel bars during this period. Stirred by heavy rainfall, the Eel becomes a mighty torrent for much of the Winter and Spring months.

Named by Doctor Gregg

The Eel was named by Dr. Josiah Gregg, a Missouri physician who led an exploration party in the area in 1849. He and his men encountered a small group of Indians who were carrying eels they had caught in the stream.

One of the few American rivers that flow north, the 160-mile long Eel originates far to the south of its mouth in the mountains of Lake County. Although some portions of its basin are 7,000 feet above sea level, its descent to lower elevations is rapid.

Beautiful Lake Pillsbury is located on the upper main stem of the river. This reservoir provides water for diversion into the Russian River for irrigation and power generation at PG&E's Potter Valley Powerhouse. Without this diversion the flow in the Russian River would be substantially smaller during the summer months.

Middle Fork Largest

The first large tributary, the Middle Fork, joins the main river from the east, 40 miles below Lake Pillsbury. The river then flows northwesterly through a canyon for about 100 miles. After being joined by another tributary, the Van Duzen, it meanders for 15 miles through the coastal plain before entering the Pacific. The fall of the Eel ranges from 19 feet per mile in the upper reaches to about 3.5 feet per mile in the delta.

Much of the Eel River Valley is benchland,



THE EEL RIVER presents a placid sight in these views south of Weott, Humboldt County, as the stream nears the Pacific Ocean. Located entirely in the coast mountain range, the Eel drains portions of four counties.

highly fertile and productive in orchards, grain and dairying. But the enormous resource of the basin is the unparalleled forest of redwood which reaches its greatest perfection of growth on the flats along the streams. The Eel and its tributaries flow through a belt of continuous timber fifty miles long and ten miles wide.

On the North Dyersville Flat may be found what is believed to be the world's tallest known standing tree, a redwood 364 feet high.

ONE-TREE BRIDGE over the Eel River is constructed from a single redwood tree. It serves to illustrate the enormous size of some of the forest giants that grow in the area. Many are more than 300 feet in height and 2,000 years old. (Redwood Empire Association Photo).



FEATHER

Land of Spectacular Scenery And Spinning Turbines

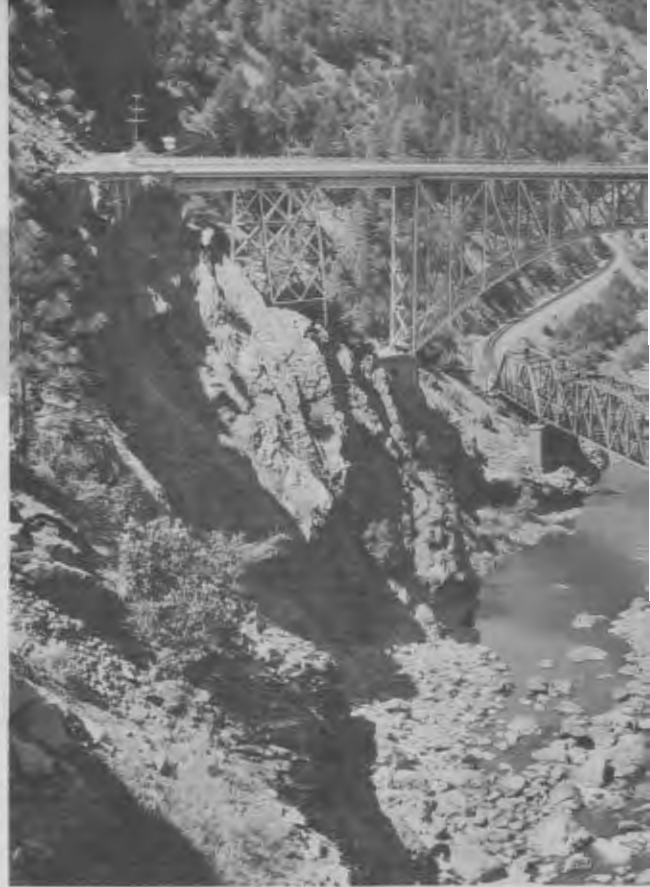
The Feather River Country is a region of steep-walled canyons and forested mountains comprising some of the most breathtaking scenery in California.

The river was given the romantic name "El Rio de las Plumas" (the River of the Feathers) by Spanish Captain Luis Arguello when he led an exploratory party up the canyon in 1817. Arguello, later to become governor of California, was impressed by the myriad feathers of wild fowl he saw floating on the water. Some say they were willow pollen from trees along the bank.

The river's tributaries begin on the majestic slopes of Mount Lassen, while others flow in along 70 miles of picturesque Sierra Nevada inclines. Three great forks, the North, Middle and South, meet near Oroville. At Marysville the Feather receives the waters of the Yuba. Below that it is joined by the Bear River and finally empties into the mighty Sacramento at Verona.

Produced a Fortune in Gold

The Feather's history is woven intricately into the over-all story of California. The discovery of gold along the river at Bidwell Bar on July 4, 1848, opened the fabulous chapter of the Mother Lode era which lasted through the early 1850's. Of all the colorfully named mining camps, hills and gulches, Rich Bar is best remembered. Located three miles east of present-day Belden, it yielded \$3,000,000 in its short, lusty history.



Other once-roaring mining camps, long since gone, were Spanishtown, Frenchtown, Dogtown, Poorman's Creek, Hottentot Bar, Poverty Flat, Henpeck Flat and Pea Soup Bar.

Bidwell Bar, 10 miles east of Oroville, was named for John Bidwell, a much revered lieutenant of John A. Sutter. With his discovery of gold a stampede ensued and the area prospered until 1856 when the gold gave out. Bidwell later became a prosperous agriculturist, distinguished public servant, Civil War general and founder of the city of Chico.

In their search for lumber for their flumes and cradles the Gold Rush miners launched a spectacular timber industry which has continued a healthy economic life to this day. With most of the land located in carefully managed forests, lumbering should continue indefinitely.

Beckwourth Colorful Pioneer

Trapper, guide and colorful mountain man James P. Beckwourth led the first wagon train from Hallelujah Junction to Marysville in 1851 through a pass which bears his name. This became the world famous Feather River Route, now tra-



STAIRWAY of power is created by nine PG&E hydroelectric plants which generate 664,800 kilowatts along Feather River's turbulent North Fork.

versed by the Western Pacific Railroad and a much-traveled highway, U. S. Alternate 40—State 24. The railroad and highway play leap-frog all the way up the lofty granite canyon, criss-crossing each other as they mount a steady grade.

“Stairway of Power”

Among its many distinctions, the fabulous Feather is also a “Stairway of Power.” Pioneering water men saw in the North Fork one of the finest potential sources of hydroelectric power in California.

In the 1880’s Civil Engineer Julius M. Howells noted the region’s natural advantages of underground storage of water in the porous volcanic rock formation and he saw the possibility of a great storage reservoir at Big Meadows, now the site of PG&E’s Lake Almanor. Nine of the company’s powerhouses utilize the water over and over for power before it flows undiminished to other uses. The river’s power capacity was raised to 664,800 kilowatts with a tremendous postwar expansion in which five plants and related works were built at a cost of more than \$140 million.

The Feather will play a significant role in the long debated California Water Plan which proposes the transfer of water from Oroville Dam to a final reservoir in San Diego County. The dam will be the highest (730 feet) and costliest (\$450 million) ever built and will impound 3,500,000 acre feet of water. It will create a lake which will back 15 miles up all three forks of the river.

Under the plan, which will take years to complete, water from the Feather will flow along a new man-made river through the center of California. This will make water available to parts of the San Joaquin and Santa Clara valleys and the San Francisco Bay area as well as parched Southern California.

Game, Fish Plentiful

Feather River Country is a paradise for outdoorsmen and recreation seekers. In addition to the allure of its scenery it has an abundance of wildlife. Sportsmen estimate that there are between 600 and 1,000 miles of trout streams with salmon, bass, steelhead and shad also available in the river at lower elevations. Hunters see deer, bear and occasional mountain lions and some coyotes.

Oroville is the western gateway to the 2,000,000 acres of woodlands, peaks, streams, lakes and meadows that comprise this bountiful vacationland extending north and east toward the Nevada line. Included in the area is Plumas National Forest, largest primeval forest in California.



Melting Snows Swell the Harvest On Rich Kern County Land

The Declaration of Independence was still 52 days from completion when the first white man crossed what is now the Kern River in the vicinity of present-day Bakersfield.

Father Francesco Garces, seeking a practical overland route from the Spanish settlements in New Mexico to Monterey, California, arrived at the Yokuts Indian Village of Woilo, May 7, 1776. Friendly Indians assisted the Franciscan padre, a non-swimmer, to cross the stream which he named Rio de San Felipe and which the Indians had called Po-sun-co-la.

Seventy years later Captain John C. Fremont renamed the stream in honor of the artist, Lieutenant Edward Meyer Kern, who accompanied Fremont on a trek in the area.

The Kern's 155-mile course starts high in the Sierra Nevada in Sequoia National Park, northwest of Mt. Whitney, whose peak of 14,496 feet is the highest California point.

The average annual runoff is 700,000 acre feet. Eighty per cent of this originates from melting snow along the first 15 miles of the course. The Kern River Canyon contains many small glacial lakes and is the only one of many mighty gorges in the Sierra Nevada, which has a north-south trend.

There are two main branches, the North and South forks. The North Fork, larger of the two, heads in Northeast Tulare County. It flows 60 miles in Tulare and 20 miles in Kern County before being joined by the South Fork 30 miles from Bakersfield. Together the forks drain 2,400 square miles, but the North Fork carries more water and is fed by more small tributaries. The North Fork drops at a uniform rate through steep granite canyons. In the 62 miles above Kernville the fall is 5,600 feet and in the 48 miles below that point it descends another 2,100 feet. The main range of the Sierra Nevada drops off rapidly just south of Cirque Peak, where the South Fork originates. This accounts for the comparatively small flow of that branch of the river.

The Kern is the major natural source of water



SWIFTLY FALLING waters from Sierra peaks reach the lower end of San Joaquin Valley through the picturesque rocks of Kern River Canyon.

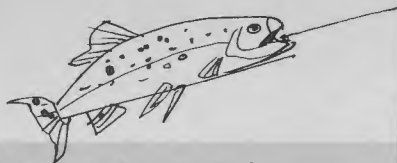
supply for much of the 700,000 acres of cultivated Kern County land. Isabella Dam and Reservoir, a major flood control and conservation project, was completed in 1953. Located at the junction of the North and South forks, Isabella Reservoir has a storage capacity of 550,000 acre feet. Although a "working reservoir," it provides excellent public recreation. The Upper Kern is famous as a trout stream.

To overcome water shortages in some areas, where the water table is receding steadily, the Friant-Kern Canal carries San Joaquin River water south from Friant Dam near Fresno to Kern County and the Kern River, near Bakersfield, a distance of 153 miles.

Together with the Sacramento, Kings and San Joaquin rivers, the Kern is a prime feature of the irrigation pattern of the great Central Valley.

The discovery of gold in Kern River Canyon brought a rush of 5,000 prospectors to the area in 1853-54 and gave the many mining camps the color and vigor experienced earlier in the boom towns of the Mother Lode country. The first mining was for quartz at the Keyes mine in 1853, later to become the townsite of Keysville. Quartz and placer mining continued for a period of 20 years until the mining industry faded.

The first hydroelectric operation on the river was completed in the canyon in 1897. This plant, which later became part of the PG&E system, was enlarged to 3,000 kilowatts in 1917 and to 10,000 kilowatts in 1921. Southern California Edison Company operates three plants on the river.



KLAMATH

Its 263 Miles of Grandeur Originate in Oregon

The breathtakingly beautiful Klamath River is the only major California stream, with the exception of the Colorado, that originates outside of the state.

Source of this 263-mile long river is Upper Klamath Lake just above Klamath Falls in south central Oregon. Initially it is the Link River, a short stretch of water between Upper Klamath Lake and Lake Ewauna at the base of the east side of the Cascade Mountains.

For the first 20 miles the Klamath flows at 5,000 to 4,000 feet elevation through flat swampy country. It then breaks over a rocky ledge and begins a precipitous descent, sometimes as much as 100 to 200 feet a mile, to its mouth on the Pacific Coast.

Joined by Trinity

The Klamath flows generally southwestward as it crosses the Oregon-California line and follows a sinuous course through Siskiyou County. Twenty-two miles after entering Humboldt County the Klamath is joined by the swift running Trinity at Weitchpec.

Turning sharply at a right angle, the Klamath flows northwesterly toward Del Norte County, reaching the ocean at Requa, 15 miles south of Crescent City.

In addition to the Trinity, the Klamath has three other major tributaries, the Scott, Salmon and Shasta rivers, and is fed also by innumerable small streams. It drains an area of 15,000 square miles.

Salmon Abound

The term "fisherman's paradise" has been applied to numerous western rivers but never more appropriately than in the case of the Klamath. Every spring and fall there is a rush of salmon in incredible numbers up the river, a run that continues for eight months of the year. There is also an abundance of sturgeon, flounder, steelhead and trout.

For long stretches the Klamath is a wide, smooth stream, but in its upper course it is a river of torrential grandeur running between banks lined with



FOR LONG STRETCHES the Klamath is a wide, smooth stream but many miles of its course are marked by rapids and fierce currents. Here the river presents a serene appearance at Starwin Ripples, nine miles from its mouth on the Pacific Coast.

firs. Some stretches are game and fish-filled wildernesses reachable only by boat.

The Klamath is not navigable, even for light draft river boats because of the rapids and fierce currents. Sediment from placer operations in the gold rush days gave added scouring power so that the river wore down rocks, which consist of dykes of serpentine embedded generally in micaceous slate.

The Klamath carries more water than any other California river with the exception of the Sacramento.

Explored by Smith

Jedediah Smith, for whom the Smith River is named, explored the Klamath in May and June, 1828. In the summer of 1850 a party of gold miners traveled the Klamath from its mouth to Shasta River, prospecting river bars as they progressed. Gold found on the Klamath and Scott rivers was of superior quality and the immense amounts uncovered was an incentive for the labor required to obtain it.

Rafting logs down the river has been common for years. Bundles of from 40 to 60 logs 40 feet long and connected by wire cable are guided through channels by tiny motorboats.

Known variously as the Klamet, Clamette, Indian Scalp and Smith River, the Klamath has been called by its present name for more than a century. Klamath is derived from the Chinook name for a sister tribe of the Modocs, "Tlamatl." The first person to use a derivative in a geographical sense was Peter Ogden who referred to the Clammitte River.

KINGS

Irrigates 850,000 Acres Of Richest Farm Empire

A straggling band of Spanish soldiers and priests, seeking inland mission sites, were the first white men to see this magnificent stream. It was January 6, 1805, the Féast of the Epiphany. The party under Captain Gabriel Moraga chose the name *El Rio de los Santos Reyes*, "The River of the Holy Kings."

Not large as rivers go, the Kings has been a river of beneficence and royal rage. Snows melting on the summit of the Sierra Nevada, more than 14,000 feet above sea level, give it its first rise. Two dozen peaks, each more than 13,000 feet high, help to swell its body as it tumbles southwesterly for 130 miles into the dry, fertile plains below.

Feeds Rich Farm Empire

The Kings has never carried cargo or commerce. Long given to destructive rampages, it has been conquered by man for irrigating and electrifying the greatest agricultural empire the world has ever known.

Three forks flow together in its upper reaches. In its delta the river branches once more. The North Fork, known also as Fresno Slough, is full only in times of flood when surplus water finds its way north to the San Joaquin River. The South Fork, until the building of Pine Flat Dam, spent its surplus water in Tulare Lake.

Before the arrival of white men, Indians hunted and fished along the river's banks. They also built mud-covered brush houses where they gathered around fires built in the center. Water was poured over heated stones to induce perspiration and the Indian men then dived into the river's cold water.

Renegade Indians, Mexicans and whites waylaid and frequently murdered farmers and solitary travelers. Chief among these was the bandit Joaquin Murietta and his band. He had a hideout on the crest of the Cantua Hills, in the Coast Range, directly overlooking the lower reaches of the Kings River. Three great boulders set on the summit of the range provided Murietta's fortress from which



RUGGED GRANDEUR of the Kings River canyon may be seen in this view just below Wishon Reservoir. Full use of stream is made for irrigation and power generation.

his sentries looked out over the level plain below and watch passing parties. A military party trapped and killed Murietta and his notorious lieutenant, Three-Fingered Jack, an Indian, in July, 1854.

Struggle Over Rights

More concerned with coastal settlements than life in the interior valley, the Spaniards and Mexicans made no use of the Kings. Early American settlers, disappointed in their search for gold, turned to the land and the river as a means of building their fortunes in the new West. By 1875, irrigation canals carried water to thousands of parched acres. As more and more land was brought under cultivation, the struggle for water rights became acute. Some issues were settled with bloodshed and others became involved in court litigation that dragged on for more than 40 years.

The remarkable advantages of the Kings for the generation of electricity were noted as far back as 1900 but the disputes between farmers, irrigation districts and canal companies over water flow long made hydroelectric generation impossible to achieve.

Two men perhaps more than any others were responsible for the present productive state of the river. One was a young engineer and the other a far-sighted utility leader.

The engineer was Charles L. Kaupke, who was loaned by the State of California, to smooth "trou-



COURTRIGHT RESERVOIR 8,184 feet above sea level, stores 123,300 acre feet of water as part of Kings River hydraulic project. Rising 300 feet above the stream bed, the dam contains 1,564,000 cubic yards of rock. Peaks more than 13,000 feet high in the background.

bled waters” among those disputing water rights. He was appointed Kings River Water Master in 1917. By the time of his retirement 38 years later he had settled major differences and won the admiration of contesting parties for his integrity and Solomon-like decisions.

Wishon's Great Dream

The utility pioneer was Albert Graves Wishon. From the time he first viewed the river early in this century until his death in 1936, he pursued a dream which has now been climaxed with PG&E's \$80,000,000 development on the river. Twenty-three years elapsed between the time Wishon, then manager of San Joaquin Light and Power Corporation (PG&E predecessor), first studied the Kings Canyon and the construction of Balch Powerhouse, a stream-flow plant that had no seasonal storage.

In 1954 Pine Flat Dam, a large flood control and irrigation project, was completed by the U. S. Corps of Engineers. This dam made possible the storage of water farther upstream for electric power generation and the reregulation of the flow for irrigation, as well as conserving flood waters for dry years.

When finally completed in 1962, the three new plants of the hydroelectric project will have added

278,500 kilowatts to PG&E's integrated system. Two of these plants are already in operation. With the project's completion, the Kings will be one of the most extensively developed hydroelectric systems in the country. PG&E's complex of reservoirs, tunnels, penstocks and powerhouses will utilize the water three times as it drops 7,000 feet in 20 miles.

All Its Water Useful

Today, all waters of the Kings are put to beneficial use within the 1,100,000 acre service area of the river. More than 850,000 of these acres are irrigated. Since the introduction of gravity irrigation in the area before the Civil War, more than \$70,000,000 has been spent in private capital by the farmers in the construction of canals, weirs and headgates.

The Kings River Water Association was formed in 1927 and has 34 members including irrigation and other types of districts, mutual water companies, canal and ditch companies and other organizations.

Thus a dream of farsighted men is realized. Water of the Kings is borrowed to generate power and then returned to the stream for the production of food and fiber to feed and clothe millions. And some of the electricity is used to bring to the surface for irrigation, water that has percolated into underground pools.



LARGE SPRINGS gushing from lava formations feed the McCloud River, seen here as it nears Shasta Lake, after coursing through Shasta and Siskiyou counties.

As rivers go, the 60-mile long McCloud is relatively short but few American streams can match its surrounding beauty.

Water from the perpetual snow fields on the south and east sides of Mt. Shasta percolates through porous volcanic formations to form large springs, giving the McCloud its principal flow. Rising at an elevation of 5,000 feet in Shasta County, it flows northward for five miles into Siskiyou County, from where it courses west and south.

Before Shasta Reservoir was constructed, the McCloud discharged into the Pit River, which in turn became part of the Sacramento River downstream. The McCloud and Pit now enter Shasta Reservoir through separate arms of that huge lake. From its head waters to the point where it disappears into Shasta Reservoir, the McCloud descends 4,200 feet.

Surface Runoff Small

The upper portion of its 670 square mile watershed is a broad upland basin of gentle topography lying between Mt. Shasta and Blue Ox Mountain. Precipitation here is heavy but because of the very porous volcanic formation it is readily absorbed. The amount of surface runoff is relatively small.

The lower section of the basin consists of a narrow canyon with limited drainage. The summits of

McCLOUD

Honors a Scotsman Who Visited Area on Ill-Fated Expedition

the ridges which bound this area are only six to ten miles apart.

There is only one tributary of consequence, Squaw Valley Creek, but one of its lesser tributaries, Mud Creek, is well known in the area.

Mud Creek can generally justify its name, but in certain years when the glacier from which it springs melts back, it becomes virtually a creek of mud and deposits large quantities of volcanic ash and silt in the McCloud River. Because of the great amount of silt and ash contributed even in normal years the river has a milky or cloudy appearance for a great part of the year.

The cloudy appearance, however, does not account for its name. The McCloud preserves, under an altered spelling, the name of a Scotsman, Alexander Roderick McLeod. He led the first expedition of the Hudson's Bay Company into the area in 1827. This group penetrated northern California on an ill-fated trapping venture in which they narrowly escaped starvation and death. During a severe winter they were forced to cache their furs and traps and seek a warmer climate.

Fishing Area Upstream

The primary recreation use on the river is in its uppermost reaches where camp grounds and good fishing are available. Most of the lower McCloud Canyon is inaccessible by road and large segments are closed to visitors.

This cool and unusual river has a more constant flow than other northern California streams because it rises from springs and thus is less affected by the runoff from rain and snow.

An application by PG&E has been approved by the Federal Power Commission for hydroelectric development of the McCloud and related projects on the Pit River. This would harness the McCloud and Iron Canyon Creek, which is a tributary of the Pit. A generating capacity of 323,000 kilowatts will be developed in three power plants supplied with water from four new reservoirs—one on the McCloud, one on Iron Canyon Creek and two on the Pit.

MERCED

Fed by Mighty Waterfalls From Yosemite's Canyons

For more than a century writers have sought unsuccessfully to describe properly the incomparable beauty of Yosemite National Park. One man who loved it more than most, Naturalist John Muir, wrote:

"The park includes the headwaters of the Tuolumne and the Merced rivers, two of the most songful streams in the world; innumerable lakes and waterfalls and smooth silky lawns; the noblest forests, the loftiest granite domes, the deepest ice-sculptured canyons, the brightest crystalline pavements and snow mountains soaring into the sky twelve and thirteen thousand feet, arrayed in open ranks and spiry pinnacled groups partially separated by tremendous canyons and amphitheatres; gardens on their sunny brows, avalanches thundering down their long white slopes, cataracts roaring gray and foaming in the crooked rugged gorges."

Starts in Sierra

The Merced River originates at an elevation of 11,000 feet on the west slope of the Sierra Nevada. Its basin touches the main divide only at Mount Lyell, 13,090 feet above sea level. From its source it flows west through Yosemite into the San Joaquin Valley at Merced Falls, 60 air miles from its beginning. It joins the San Joaquin River between Merced and Modesto.

Lieut. Gabriel Moraga named the Merced in 1808 when his thirsty band of soldiers came upon it after a 40-mile march across a treeless plain. In gratitude, he called it El Rio Nuestra Senora de la Merced (The River of Our Lady of Mercy).

Nowhere in the world are there waterfalls of such variety within a single area as those that leap here in the spring and early summer. Each has its own particular beauty, but the most overpowering when in full flow are Upper and Lower Yosemite falls with a combined drop of 2,425 feet. The upper falls is equal to nine Niagaras piled one on top of the other.

The falls are at their fullest in May and June while winter snows are melting.

It is commonly believed by geologists that when the Sierra Nevada Range was formed by the gradual tipping of a great block of the earth's surface 400 miles long and 80 miles wide, streams draining this block were tipped westward and with a torrential force cut deep canyons. The period of



THE GRANITE peaks of Yosemite Valley form a spectacular backdrop for the headwaters of the Merced River. Nevada Falls and Vernal Falls are seen here.

tipping and stream erosion covered so many thousands of centuries that the Merced River was able to wear away several thousand feet of sedimentary rock which covered the granite.

Ground by Glaciers

A million years ago, during the great ice age, large quantities of ice and snow accumulated in the valleys and on the slopes above them. In places this was half a mile thick and glaciers developed. On at least three occasions they moved down the canyon grinding and polishing its bottom and sides and widening and deepening it.

There are two hydroelectric generating plants on the Merced River, downstream from the small hydro plant of the Yosemite National Park Service. Merced Irrigation District has built Exchequer Dam and powerhouse in Mariposa County which stores 281,200 acre feet of water. The output of the power plant is sold to PG&E. Merced Falls Powerhouse, owned by PG&E, is located eight miles downstream from Exchequer.

Two additional dams and powerhouses have been proposed by MID near Bagby and Snelling. Together with the proposed enlargement of Exchequer these would have an estimated storage capacity of 1,605,000 acre feet. Three new powerhouses are planned with a total capacity of 166,000 kilowatts. When the Snelling Dam is built it would flood out PG&E's Merced Falls powerhouse.

MOKELUMNE

Ice Age Created Sapphire Lakes in Sierra Canyon

Outstanding scenery and colorful history are the qualities that make the Mokelumne River one of California's most interesting streams.

Rising at the crest of the Sierra in a relatively narrow headwater area in Alpine County, the Mokelumne is 130 miles long. It drains an area of 700 square miles and has an annual average runoff of 722,000 acre feet of water at Pardee.

Its three headwater branches, the North, Middle and South forks, occupy impressive canyons 1,000 to 4,000 feet deep and drain a rugged area about 47 miles long and 16 miles wide.

The Mokelumne drains into the San Joaquin River about 20 miles before the latter reaches the head of Suisun Bay.

Named for Indian Tribe

The Mokelumne, like many other Sierra streams, takes its name from the Indian tribe that once inhabited the area. Muk-kel was the name of the Mokelumne tribe's principal village and "umne" means "people of."

Lake Tahoe is some 40 miles to the north of the North Fork and Yosemite Valley 60 miles to the south. The Alpine Highway, famous in California history as the trail made by John C. Fremont and Kit Carson in the early 1840's, traverses the northern edge of this area on its way to Carson's Pass over the Sierra and into the Nevada side of the chain.

The North Fork is the largest branch and begins in the barren snow fields of the Sierra at altitudes up to 10,000 feet. There are emerald meadows and sparkling sapphire lakes nestling in profusion in canyons and gorges. These lakes are a legacy of the ice age, filling low areas excavated by glaciers. At lower levels of the North Fork and the Middle and South forks the drainage area is covered with a dense stand of conifers.

Development of the North Fork for water and power dates back to Gold Rush Days. The Mother Lode Country proved one of the richest of all Sierra bonanzas and an estimated \$300 million was taken from Amador's gold mines and placers. Here are historic names, Jackson, Fiddletown, Volcano, Sutter Creek, Drytown, Poverty Bar, Llanca Plana. They are names to be found in the



SALT SPRINGS RESERVOIR located on the upper reaches of the Mokelumne River watershed is a key factor in the efficient use of the river's water. It has a capacity of 141,800 acre feet and is a part of PG&E's hydraulic development on the North Fork.

stories of Bret Harte and Mark Twain and in accounts of the exploits of the bandits Joaquin Murietta and Black Bart.

Over 400,000 acre feet of water storage has been constructed in eight reservoirs on the river and its tributaries. Water is stored in these reservoirs during the spring runoff and flood periods and is later released to generate power and to supply farms and homes with water which would otherwise have wasted to the ocean.

Link to Gold Rush Era

The tie between the gold era and the hydroelectric era that began nearly a half century later was the water systems which the miners built to supply their placer and quartz claims. The water rights, flumes and ditches of the forty-niners became the nucleus of today's maze of conduits for the water-powered generation of electricity.

Hydroelectric development on the North Fork is an excellent example of the economic utilization of a water source.

The river and a tributary are harnessed repeatedly in a chain of five powerhouses which produce 224,000 kilowatts of power. Four of these are PG&E plants and power from the fifth, operated by the East Bay Municipal Utility District in conjunction with Pardee Reservoir, is purchased by PG&E. The water district transports water from the Mokelumne by aqueduct to serve many communities on the east side of San Francisco Bay.

NOYO

Spectacular Scenery and a Famous Train, "The Skunk"

The thirty-five mile long Noyo River originates five miles west of Willits in Mendocino County and flows into the Pacific just below Fort Bragg.

Similar in size and rugged beauty to a dozen other streams that spill into the beating Pacific surf from Westport on the north to Gualala near the Sonoma County line, the Noyo is perhaps better known than most of these for at least two reasons. It is the locale of one of the most famous small railroads in the west and is a mecca for sport and commercial fishermen.

The railroad is the California Western whose only passenger train, "The Skunk," is world famous. Traversing a country of unusual beauty, "The Skunk" crosses and recrosses the Noyo on its serpentine-like trip from Fort Bragg to Willits.

Loops Over Grades

Begun in 1885 as a logging railroad, the line was gradually extended east from Fort Bragg until it reached Willits in 1911. Between Shake City and

Summit, an airline distance of two miles, the line loops for more than eight miles over heavy grades and bowknot turns.

Originally built with 115 bridges, the California Western right of way has been relocated and realigned so that it now has only 34 bridges and trestles.

"The Skunk" passes through one of the largest tree farms in California, owned by the Union Lumber Company of Fort Bragg. It includes four units totaling 210,000 acres and is named for C. R. Johnson, a founder of Union Lumber. Johnson was a stalwart among the hardy pioneers who developed the redwood industry against the odds of nature during the nineteenth century.

Noyo is Indian meaning creek and was the name of a Pomo village near the mouth of Pudding Creek. This creek was called No'-yo-bida by the Indians but the name was later transferred to the river south of Fort Bragg, doubtless by the Coast Survey in a report in 1855.

Coast Survey charts in 1870 refer to it as Pudding River. According to a local story, sailors called Noyo River "put in creek" because its mouth provided the only safe anchorage in the area. This name may later have been transferred to the stream north of Fort Bragg and changed to the present form by folk etymology.

Despite dredging operations carried on every four years by the Army Corps of Engineers, the Noyo channel fills quickly and passage for fishing boats and other craft is tricky during heavy seas.

Crude Methods in Early Days

Lumber mills were operated in Noyo harbor and elsewhere along the river during much of the second half of the nineteenth century. In those pre-railroad days, redwood logs were cut in the summer and early fall, hauled to the river's banks by ox or bull teams, and rolled into the beds of the streams. There they would lie until the first freshets of winter lifted and floated them down to the mills.

Fishing is enjoyed in the winter for 19 miles upstream from the mouth of the Noyo. Except for short stretches near children's camps, these areas are closed to fishing in the summer. But Noyo harbor is a haven for hundreds of fishermen during the summer when the ocean offers salmon, crabs, shrimp, rock cod and sanddabs.



BOATS IN NOYO HARBOR await a busy summer season of ocean fishing amidst the rugged beauty of the Mendocino coast. Once the site of redwood lumber mills, the harbor, just below Fort Bragg, is now a recreation center.

PIT

Springs in Lava Beds Give It an Even Flow



Pit River country is a wild and beautiful region where the warring Indian tribes, the Pits, Modocs, and Wintoons, once massacred immigrants en route to Oregon and the California gold fields. One of the most interesting streams in the West, the Pit River winds for nearly 200 miles through three Northeastern California counties.

Both the North and South forks originate on the west slope of the Warner Mountains in Modoc County. The Pit then cuts across Lassen and traverses Shasta County before it joins the waters of the McCloud and Sacramento in Shasta Lake.

It drains a basin of more than 5,000 square miles, formed by volcanic action and prehistoric lava flows. The land is honeycombed with subterranean channels and perennial springs fed by melting snow and winter rains which sink through porous ground instead of running off the surface. Because of these underground storage pools, the Pit's flow is more uniform than any other major river in the state.

Fall River Mills Between Basins

The lumber town of Fall River Mills separates the upper and lower basins. The upper basin is a broad plateau of semi-arid character and lava bed plains lying between 4,000 and 5,000 feet elevation. These are interspersed with mountain ranges, rising several thousand feet higher.

At the extreme end of the upper basin is Goose Lake, astride the California-Oregon border. Once 10 miles wide and 40 miles long, this lake was dry in 1849 when immigrant wagon trains drawn by oxen crossed its bed. Heavy rains later made it possible to barge freight across the lake. When it again went dry in 1924, the old road could be seen.

Gathering volume as it flows through the lava beds of Modoc County, the river drops into a canyon, hemmed in by mountain walls, just below the point where it is joined by its tributary, Fall River. From there for more than 75 miles, the stream runs fast and full-bodied, falling rapidly in elevation as it hurries to its confluence with the McCloud and Sacramento. The sharp descent below Fall River Mills takes it between Mt. Shasta



ONE OF SIX PG&E plants in the Pit River system, Pit 1 stands like a beautiful castle on the Rhine. The Pit has the most uniform flow of any California river.

(14,380 feet elevation) and Mt. Lassen (10,437 feet). Both of these lofty peaks are snow-covered throughout the year, with snow above the 8,000 foot mark even in mid-Summer.

Source of Name

It is not known for certain how the river came to be known as the Pit. One explanation is contained in Joaquin Miller's book "Life Among the Modocs." He wrote: "We crossed the McCloud and our course lay through a saddle in the mountains to Pit River; so called from the blind pits dug out like a jug where their enemies or game are likely to pass. These pits are dangerous traps; they are 10 to 15 feet deep, small at the mouth, but made to diverge in descent so that it is impossible for anything to escape that once falls into their capacious maws. To add to their horror, at the bottom, elk and deer antlers that have been ground sharp at the points are set up so as to pierce any unfortunate man or beast they may chance to swallow up."

Many early-day maps misspelled the name as Pitt, under the mistaken notion that it was named for the English statesman, William Pitt.

Hydro History

None of the rivers in the Cascade and Sierra mountains was better designed by nature for hydroelectric generation. Engineers studied the area as early as 1875, but problems of financing and transmission proved difficult until PG&E and the Red River Lumber Co. jointly began operation in 1921 of two plants on Hat Creek, a tributary.

In addition to the Hat Creek plants, PG&E operates four other Pit River plants and has received licenses for three more including one plant to be located on the banks of the Pit River but using water from the McCloud River. When completed these nine plants will have a combined normal operating capacity of 718,000 kilowatts.



PLAY SPOT for thousands of visitors to the Redwood Empire is the Russian River district of Sonoma County. (Redwood Empire Association Photo.)

Although the Russian River lacks the spectacular size and length of many of California's Sierra streams, it has been a source of relaxation to thousands of swimmers, boaters and fishermen for decades.

Flags of six nations have flown at various times in or near the 1,485 square miles it drains. The banners of England, Spain, Mexico, Russia, California Republic and the United States are symbolized in the history-filled past of Russian River country.

Rising in the eastern part of Mendocino County, on the west slope of the Coast Range, of mountains, it flows southeastward to a junction with tiny Santa Rosa Creek in Sonoma County. Here it turns westward, enters a low canyon and flows on to the Pacific at Jenner, eight miles above Bodega Head.

Tributaries Small

Besides Santa Rosa Creek, the principal tributaries of the 100-mile long river are the East Fork, Big Sulphur Creek, Austin Creek and Dry Creek. Except during the rainy season they are minor in size and flow.

For nearly 25 miles inland from its mouth, the Russian River is bordered by an almost unbroken line of summer resorts and cottages. Much of its route is lined by stately redwoods, which cool and beautify its banks. Crowding the slopes of the encompassing hills, they give an ever verdant aspect to the region.

Geologists believe it once drained into San Francisco Bay until geological changes forced it to seek a new channel through the Coast Range to the sea.

The Indians called it Shabaikai or Misallaako for "long snake." An 1821 diary of the Spanish Padre Blas Ordaz called it the San Ygnacio River. Mexican records and land-grant papers refer to it by various names. In a petition for the Bodega grant, July 19, 1843, the Spanish version of the modern name appeared as la boca del Rio Ruso, "the mouth of the Russian River."

The name is the result of the Russian colony at Fort Ross that flourished from 1812 to 1841 as a

RUSSIAN

Flags of Six Nations Have Flown Over This Area

fur and granary center. Eager to supply food for colonists in Alaska and Kamchatka and to obtain furs for the homeland, Russians and Aleut Indians were sent as colonists from Sitka by Branoff, "The Little Czar."

Fort Overlooked Sea

Fort Ross was built as a stockade on the bald coast west of Santa Rosa. Ten-foot high redwood poles enclosed a rectangular area 300 by 280 feet with octagonal blockhouses projecting at two opposite corners and a chapel at another. Within the stockade stood the commandant's house, barracks, warehouses and a jail. Outside were 60 crude dwellings and workshops. Ten cannon looked out over the stockade 110 feet above the sea.

The Russian colonists enjoyed friendly relations with Indians in the valley, having bought the land they occupied for three pairs of breeches, three hoes, two axes and four strings of beads.

The colony was never a great economic success. In 1841, having cleaned out most of the fur bearing seals and otters in the area, the Russians sold out to the Swiss empire-builder, Captain John Sutter, for \$30,000. He transferred the livestock to his Sacramento Valley settlement and never used the Fort Ross area land.

Eel Water Diverted

If it were not for a PG&E hydroelectric development on the Eel River, the Russian River would be so much smaller that summertime recreation activities would not be possible to the degree they are now enjoyed.

Water which might otherwise run waste to the sea is diverted through Potter Valley Powerhouse from the South Fork of the Eel via Lake Pillsbury and Lake Van Arsdale. Stored during the winter, some of this water is used for irrigating Potter Valley in Mendocino County and the rest is diverted to the Russian River.

Another important factor in flood control water conservation and recreation on the river is Coyote Dam, built by the U. S. Army Corps of Engineers in 1959. Located five miles north of Ukiah, it has a capacity of 122,500 acre feet.



The "Nile of the West" Was Once a Busy Gateway To the Gold Fields

Almost one-third of the annual runoff of all California streams reaches San Francisco Bay through the 400-mile long Sacramento River.

In its sometimes placid and sometimes turbulent flow from the mountains near the Oregon border, the Sacramento carries an average annual runoff of 22,390,000 acre feet, more water than the mighty Colorado.

Rich in history, the Sacramento has a drainage area of 26,960 square miles. Its source is a small lake on Mount Eddy, one of the peaks of the Klamath Mountains. Flowing eastward for 12 miles from this point, it turns south for 370 miles to Suisun Bay, 50 miles northeast of San Francisco Bay. Many tributaries help to swell it, the largest being the McCloud, Pit, Feather, Yuba, Bear and American rivers, all of which rise on the rugged sides of the Sierra and the Cascade ranges.

Between Redding and its mouth, the Sacramento drains the great valley which, like California's capital city, was named for it. Of the land which adjoins the stream's bed and its tributaries, 650,000 acres are irrigated.

Drains Mount Shasta

Elevations range from below sea level in the Delta to the 14,161 foot summit of snowclad Mount Shasta.

Legend has it that the first white men to see the river were two members of the Hernando Cortez party in 1520. Whether this was so or not is open



AERIAL VIEW shows Sacramento River looking toward California State Capitol in upper right. Passenger boats plied the river this far until 1941.

to dispute. The first known discovery occurred centuries later when Captain Luis Antonio Arguello accompanied by 10 Spanish soldiers and 10 neophytes as oarsmen went up the river in the craft San Rafael in 1817.

First to navigate the river on a commercial basis were Russian traders who dealt in tallow, hides and furs prior to 1840 from their posts at Fort Ross and Bodega.

Spanish explorer Gabriel Moraga had given the name El Rio de los Sacramentos to what eventually became the Feather River at a time when the Sacramento was still called Rio de San Francisco. In time the name Sacramento was applied to the main stream.

Captain John Augustus Sutter, former Swiss Army officer, and three companions landed a rowboat on August 12, 1839, at the confluence of the American and Sacramento rivers after a journey from San Francisco (then called Yerba Buena).

Start of Commerce

In 1841 Captain Sutter purchased some property from the Russians at what is now Sacramento. Included in the deal was a 40-foot schooner and the first record of its appearance on the river was in August 1841. This voyage is considered the commencement of American commerce on the Sacramento.

With the discovery of gold at Sutter's mill at

SACRAMENTO



THE BUTTES form a majestic background for this view of the Sacramento River below Redding. The stream is navigable for shallow-draft vessels as far upstream as Red Bluff.

Coloma January 24, 1848, the river became a gateway to the gold fields. In 1850 there were 28 steamers, 23 barks, 19 brigs and 21 brigantines plying the river. Craft drawing as much as 13 feet offered freight and passenger service to Sacramento (called New Helvetia at the time) and shallower draft vessels went as far as Marysville and Red Bluff. One way fare to Sacramento was \$30. Berths cost \$5 and meals were \$1.50. These prices were extremely high at the time, but the argonauts paid them willingly in their headlong rush for fortune.

Silt, Floods Disrupt Flow

By 1855 miners' tents sat like a great cloud of feeding gulls along the path of the upper river. Shovels, "long toms" and pans threw tons of red silt into the stream and fish died in the poisonous flood.

While the lust for gold made the river the outstanding waterway of the West, hydraulic mining destroyed the possibilities for extensive water traffic. Damage which started with the advent of hydraulic mining in 1856, was accentuated by a great flood in 1862. Shoals formed, navigation channels were fouled and millions of cubic yards of silt dumped into the river bed. By the time the courts enforced a ban against this type of mining in 1884 navigation was closed to all but the shallowest draft vessels.

Although early day writers called the Sacramento "The Nile of the West," it was a brawling

scene, for hired "runners" were constantly cracking up opposition boats, boarding up gangways or making passage on some boats so unpleasant they drove away customers. Ship explosions were common as the captains pushed their strained and rusting boilers to the breaking point for speed.

The last of the river passenger boats disappeared in 1941 but more modern means of transportation had all but killed them off long before the Nineteenth Century died.

Deep sea ships will sail the river 90 miles inland once the Sacramento Deep Water Project Channel is completed by the Army Corps of Engineers in 1963. Authorized in 1946 by Congress, the ship channel will have a depth of 30 feet at low tide with a bottom width of 200 feet. The route will follow the river to a point above Rio Vista where a 28-mile ship channel will veer off to link up with the Sacramento Deep-Water Harbor.

New Course Shorter

Shorter by 15 miles than the present crooked river route, the channel will be similar to a smooth lake, subject only to tidal action. Terminus of the channel will be Lake Washington, a natural lake in Yolo County, a mile and a half west of the river at the City of Sacramento. A canal 13 feet deep through a lock will connect the deep water turning basin in Lake Washington with the river opposite Miller Park in Sacramento. A barge canal lock 86 feet wide and 600 feet long near the Sacramento River will prevent river flood waters from entering the deep water turning basin. Extensive development of shipping and storage facilities is planned at Lake Washington.

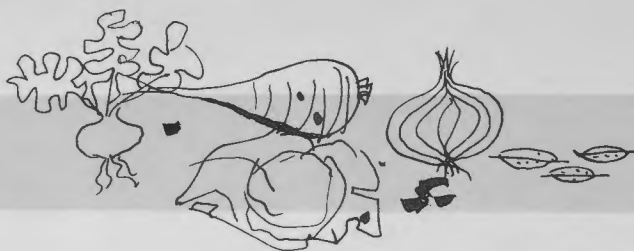
Barges carry petroleum up the river as far as Colusa and bring grain downstream from Colusa County.

Shasta Lake, a man-made reservoir capable of storing 4,500,000 acre feet of water, was completed on the Sacramento in 1945 as a key part of the Central Valley Project. Designed essentially for flood control and water conservation, it also is used to generate electricity in plants having a capacity of 450,000 kilowatts. Located in western Shasta County, the dam backs up water from the Sacramento into the Pit and McCloud rivers.

PG&E has long participated cooperatively with the Federal Government in CVP. The company's widespread regional power system firms up CVP power and distributes power to CVP customers in exchange for power delivered to the company at Tracy.

Although there are no PG&E hydroelectric plants on the Sacramento River, there are many such company developments on the river's tributaries. By helping to regulate stream flow these facilities have done much to eliminate flood threats which over the years have caused considerable damage in the Sacramento Valley.

SALINAS



Most of Its Water Percolates Beneath the Surface

The 170-mile long Salinas River is the largest submerged stream in America and the third longest river in California.

With the main body of its water percolating beneath the surface, the Salinas presents a tranquil appearance as it flows northwesterly from the middle of San Luis Obispo County, to empty into Monterey Bay a few miles southwest of Castroville in Monterey County.

Pale cottonwoods line much of its banks, a contrast to the green shrouded Sierra streams far to the east. It winds quietly through the entire length of the rich Salinas Valley where bountiful crops of lettuce, sugar beets, celery, onions and almonds thrive on its underground pools.

Named for Salt Marshes

The name comes from the salt marshes near its mouth which once were commercially important in the Spanish era. It has been known also by several other names—Santa Delfina, San Antonio and Rio de Monterey. For a time in the 1820's it was even confused with a mythical river, the San Buenaventura, that was supposed to flow from the Sierra, south of San Francisco, and empty into the Pacific.

Western tributaries of the Salinas have their sources in the elevated, well-watered Santa Lucia Range while the eastern tributaries drain the low

mesa lands and western slopes of the Mount Diablo Range.

Estrella River comes in from the east as the first important tributary. The Nacimiento and San Antonio rivers flowing parallel to each other for 30 miles out of the Santa Lucias empty into the Salinas north of Mission San Miguel. Farther downstream the Arroyo Seco and San Lorenzo Creek join the main river.

The lower 93 miles of the Salinas meanders through the comparatively narrow valley from Wunpost to Monterey Bay.

First Seen by Portola

White men first saw this river in September 1769 when the hard-pressed expedition of Don Gaspar de Portola stumbled into the Salinas Valley in search of Monterey Bay. This trip ended in failure as the disease-wracked, hungry force turned back while only a day's march from the bay which General Vizcaino had discovered 168 years before.

The valley is a land rich in history. Long before Deacon Elias Howe erected an inn, store and meeting hall in 1856 on the site of what eventually became Salinas, this area was used to pasture the livestock of the Presidio and Mission in Monterey. The world-famous California Rodeo at Salinas traces its history to the Spanish era when the annual roundup of the cattle was followed by a festive celebration.

THIS TRANQUIL scene along the Salinas River is a half mile above the point where it empties into Monterey Bay near Castroville. It is known as "The Upside Down River" because so much of its water is in pools of sand beneath the surface.



SAN LORENZO

*Gives Beauty to a
Valley of Redwoods*



FLOOD CONTROL WORK on the San Lorenzo River in Santa Cruz beautified the stream and reduced the possibility of a repetition of the disastrous flood of 1955 which resulted in the loss of eight lives and damage of \$10 million.

The San Lorenzo River has often been called "the most fished stream in California."

Flowing through the beautiful valley that bears its name in Santa Cruz County, it is an integral part of one of the state's most beautiful vacation areas.

Several small creeks join to form the river near the resort town of Boulder Creek. Thereafter it passes around and under Highway 9, dropping steadily toward the city of Santa Cruz and Monterey Bay.

Its 25-mile length is short in contrast to most other California rivers but to the thousands of visitors who flock to the area each summer and to a growing number of year-round residents it is a source of tranquil beauty.

In the two centuries since it was discovered by the Portola Expedition, it has often roared over its banks in angry floods. The most devastating of these occurred just before Christmas in 1955. Much of Santa Cruz was buried under several feet of water, eight lives were lost and property damage exceeded \$10 million.

Flood Threat Reduced

A comprehensive flood control program has since been carried out at a cost of \$4 million and the threat of future damage has been largely eliminated.

The first white men to see the San Lorenzo were nine members of an advance party sent out by Portola. Headed by Sergeant Jose Francisco Ortega, the group mounted on mules splashed into the waters of the river at Santa Cruz on October 14, 1769. Portola, who had been resting with his tired party at the Pajaro River to the south, moved north and named the San Lorenzo for St. Lawrence on October 17.

Five years later Father Francisco Palou selected a site on a small hill a mile from the river as the

location for the Mission of the Holy Cross (Santa Cruz).

One of the most picturesque portions of the river is Henry Cowell Redwoods State Park, between Felton and Santa Cruz. The park is set in the very heart of the first large scale lumbering operations on the Pacific Coast, dating back almost 125 years. These virgin trees were saved for posterity because they were too large for the crude equipment of the original lumbermen. Set in the heart of the park is a Ghost Town that was a thriving business center when George U. Collins finished the first real wagon road into the valley at the close of the Civil War.

"Black Knight's" Sawmill

Further north is Quail Hollow Road, a route followed by pioneers traveling to the sawmill of the famous Captain Harry Love, the "Black Knight of the Zayante," who led the party that killed the bandit Joaquin Murietta. Sand from this region is in great demand for building purposes.

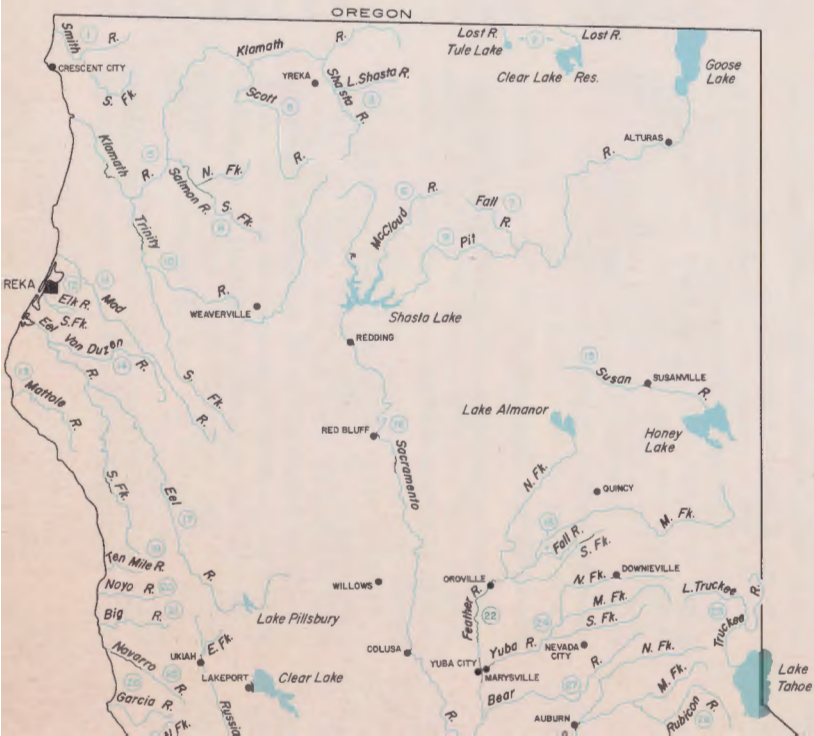
Bear Creek, one of the leading tributaries of the San Lorenzo, was so named because the area was the habitat of grizzlies after this often vicious animal had disappeared elsewhere.

The San Lorenzo was given a fairyland setting in 1895 and again in 1896 when proud residents staged a Venetian Water Carnival. At the time a large lake existed in Santa Cruz where the waters of the river flowed into Monterey Bay. A barge bearing the carnival queen moved across the illuminated waters followed by a long train of gondolas and other water craft fantastically decorated.

Older residents deplore the passing of such colorful events but all residents of the city are grateful the river has been realigned to guard against floods.

RIVERS OF CALIFORNIA

LIST OF RIVERS



<i>Alamo</i>	80	<i>Mod</i>	11	<i>San Jacinto</i>	74
<i>Amargosa</i>	59	<i>Mattole</i>	13	<i>San Joaquin</i>	47
<i>American</i>	31	<i>Merced</i>	43	<i>San Lorenzo</i>	48
<i>Bear</i> (NEVADA & PLACER CO'S)	27	<i>McCloud</i>	6	<i>San Luis Rey</i>	77
<i>Bear</i> (AMADOR CO.)	32	<i>Middle</i>	42	<i>Santa Ana</i>	72
<i>Big</i>	21	<i>Mojave</i>	64	<i>Santo Clara</i>	68
<i>Calaveras</i>	38	<i>Mokelumne</i>	37	<i>Santa Margarita</i>	76
<i>Carmel</i>	54	<i>Nacimiento</i>	60	<i>Santa Maria</i>	62
<i>Carson</i>	34	<i>Napa</i>	35	<i>Santa Ynez</i>	66
<i>Chowchilla</i>	46	<i>Navarro</i>	25	<i>Scott</i>	4
<i>Colorado</i>	70	<i>New</i>	79	<i>Shasta</i>	5
<i>Cosumnes</i>	15	<i>Noyo</i>	20	<i>Sisquoc</i>	65
<i>Cuyama</i>	63	<i>Old</i>	40	<i>Smith</i>	1
<i>Eel</i>	17	<i>Otay</i>	83	<i>Stanislaus</i>	39
<i>Elk</i>	12	<i>Owens</i>	45	<i>Sur (Big & Little)</i>	69
<i>Fall</i> (SHASTA & SISKIYOU CO'S)	7	<i>Pajaro</i>	19	<i>Susan</i>	18
<i>Fall</i> (BUTTE & PLUMAS CO'S)	18	<i>Pit</i>	9	<i>Sweetwater</i>	82
<i>Feather</i>	22	<i>Rubicon</i>	28	<i>Ten Mile</i>	19
<i>Fresno</i>	50	<i>Russian</i>	29	<i>Tia Juana</i>	84
<i>Garcia</i>	26	<i>Sacramento</i>	16	<i>Trinity</i>	10
<i>Guadalupe</i>	44	<i>Salinos</i>	58	<i>Truckee</i>	23
<i>Gualala</i>	50	<i>Salmon</i>	8	<i>Tule</i>	57
<i>Kaweah</i>	51	<i>San Antonio</i>	18	<i>Tuolumne</i>	41
<i>Kern</i>	61	<i>San Benito</i>	53	<i>Van Duzen</i>	14
<i>Kings</i>	52	<i>San Diego</i>	67	<i>Ventura</i>	67
<i>Klamath</i>	5	<i>San Dieguito</i>	78	<i>Walker</i>	36
<i>Los Angeles</i>	69	<i>San Gabriel</i>	71	<i>Whitewater</i>	75
<i>Lost</i>	2	<i>San Geronio</i>	73	<i>Yuba</i>	24

(NUMBERING OF RIVERS IS FROM NORTH TO SOUTH)



1962

SAN JOAQUIN

Eight Major Streams, 15 Minor Ones Feed This 350-Mile River

Few rivers in the United States flow north. The 350-mile long San Joaquin is one of these.

Together with its many tributaries it constitutes one of the two great river systems of California, the other being the Sacramento. And with the Sacramento, it pours its water into Suisun Bay whence it reaches San Pablo and San Francisco bays and the Pacific Ocean. These two great rivers, almost equal in length, flow toward the Golden Gate through some of the world's most fertile soil.

Named for Saint Joachim, believed by Roman Catholics to be the father of the Virgin Mary, the San Joaquin rises in the high Sierra, southeast of Yosemite National Park. It is formed by the junction of the Middle and South forks. Part of its course, 125 miles, is through mountains before it issues forth in a trough of the valley that bears its name.

The river was seen by Father Crespi on March 30, 1772, when with Flages he was attempting to reach Point Reyes and he named it San Francisco for Saint Francis of Assisi. Gabriel Moraga gave it the name San Joaquin when he reached its southern part in 1805 or 1806. Before and after Moraga's visit various sections of the river had different names. However, in the records after 1810 San Joaquin is mentioned as if it was a well-known name.

Drains Lofty Lakes

Of its two original forks, the South Fork drains the larger area and is considered the head of the main stream. This branch rises in Martha Lake, southwest of Mount Goddard, 11,007 feet above sea level. The principal tributaries of the South Fork, Evolution, Piute, Bear and Mono creeks, drain innumerable lakelets, many of which are more than 11,000 feet high.

Eight major streams and 22 minor ones flow into the San Joaquin. Running from the south to

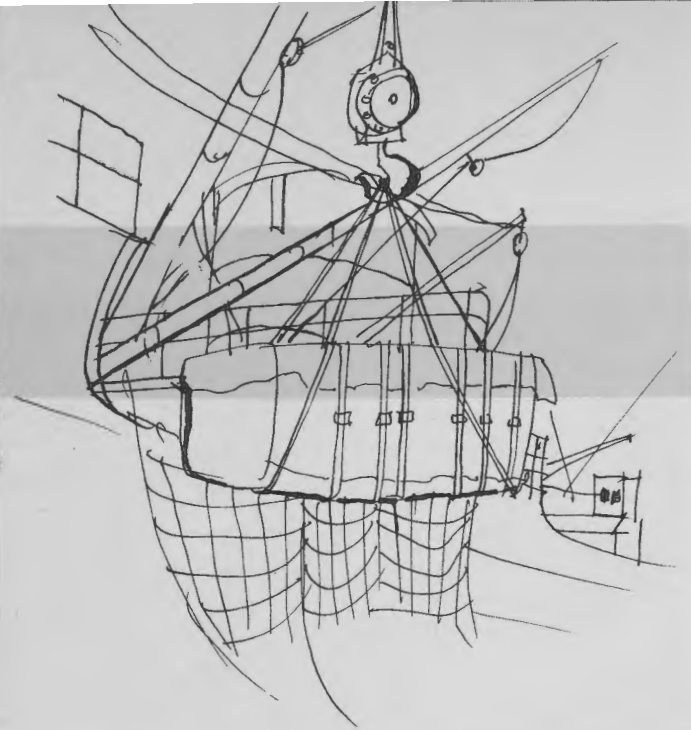


ENHANCING THE SAN JOAQUIN RIVER'S importance to the economic life of California's great Central Valley is the Port of Stockton. Lying 75 miles inland from the Golden Gate, the port has increased its tonnage ten times in 25 years.

the north, the major streams are the Fresno, Chowchilla, Merced, Tuolumne, Stanislaus, Calaveras, Mokelumne and Cosumnes. All of these have their head waters in the Sierra Nevada, and most of them drain rugged mountainous areas ranging from a few hundred feet above sea level in the foothills to from 10,000 to nearly 14,000 at the crest of the Sierra.

The San Joaquin River basin is 290 miles long and 130 miles wide and embraces 32,000 square miles or one-fifth of the entire state. The basin constitutes the major portion of the south lobe of the Central Valley which lies southeast of an imaginary line drawn from San Francisco Bay to Lake Tahoe. The rim of the basin is formed by the crest of the Sierra Nevada at the east, the Tehachapi Range at the south and the Coast Range at the west.

The precipitation in the river's basin varies greatly both geographically and seasonally. It



FREIGHTER wends its way along the San Joaquin River bound for the inland Port of Stockton. This rich delta country was formed ages ago from silt deposits built up over the tule-covered swamps.

ranges in seasonal average from 50 inches in the mountains to less than 10 inches on the valley floor. About 90 per cent of the precipitation falls from November to April and most of it is snow.

Variety of Crops

Early Valley residents devoted their efforts largely to raising grain and cattle but the introduction of irrigation made possible a great variety of crops. Bountiful harvests of deciduous and citrus fruits, olives, nuts, grapes, nearly every vegetable, grain, alfalfa and cotton are raised along with beef cattle, sheep, hogs and poultry.

Greatest spur to the development of the San Joaquin Basin came after 1875 with the building of the Central Pacific Railroad. By 1931 more than two million acres of land had been placed under cultivation.

Navigation of the San Joaquin at one time extended far upstream to a point called Sycamore, 10 miles north of Fresno. With the coming of the railroad this line was abandoned and water-borne trade was carried to a point near Newman, 60 miles from Stockton, where the Merced joins the San Joaquin. This stretch has not been used commercially in recent years.

On February 3, 1933, the dream of many men became a reality. The SS Daisy Gray, a coastal lumber schooner, became the first of many ocean-going vessels to call at the new Port of Stockton.

A deep water port had been sought by businessmen there as early as 1910. First authorization by Congress called for a nine-foot deep channel from San Francisco. This authorization was later increased to 24 and finally to 33 feet. The extensive dredging project was completed by the Corps of Engineers.

In its first year of operation the Port of Stockton handled only 309,546 tons of cargo. Today that total is little more than is handled each month. The port's facilities cover 485 acres and it has berthing facilities for 11 vessels having a depth of 32 to 36 feet alongside.

Joint Ventures

PG&E operates seventeen hydroelectric plants on the San Joaquin and its tributaries, while Southern California Edison Company operates eight plants there. Cooperation among these companies, the farmers and the Federal Government has made possible development of both power and irrigation. In 1944 Friant Dam was completed as part of the Central Valley Project. This permits water from the San Joaquin to be transported to Kern County.

Between Stockton and Suisun Bay, the San Joaquin River wends its way through rich delta country formed ages ago from silt deposits left by rivers, building up inch by inch over the tule-covered swamps. Incredibly fertile soil makes the delta a producer of agricultural wealth running into hundreds of millions of dollars annually. Mechanized farming is the rule.

SMITH

Heavy Winter Rains Fill This 45-Mile Del Norte River



Only in comparatively recent times has the name of Jedediah Strong Smith found its rightful place of honor among the stout heroes of the early West.

One of the few California landmarks that perpetuate the memory of this determined trail blazer is the Smith River.

Located largely in Del Norte County, in the extreme northwest corner of California, the Smith drains 727 square miles, of which 75 square miles are in Oregon. Except for small areas along the coast, its entire basin is located in tree-studded mountains.

The Smith drains an area that has the largest runoff per square mile of all the river basins in the state, since the average annual precipitation runs around 99 inches. Because this rainy season is concentrated mostly from November to March, the summer flow is quite small. Stream flow figures are scant but the river averages about four million acre feet a year.

Deep Gorges, Canyons

The distance from the headwaters of the Middle Fork to the Pacific is 45 miles. The river flows mostly through deep gorges and canyons as it drops from an elevation of about 5,800 feet to the coastal plain just north of Crescent City.

Jedediah Smith and a party of fur trappers first came upon this river June 20, 1828. Smith was a native of Bainbridge, N. Y., who had set out from St. Louis in 1826 to find trade routes to California and the Northwest.

Before he was slain by Comanche Indians on the Santa Fe Trail seven years later at the age of 32, Smith had carved a dramatic and exciting career. He was the first white man to cross the State of Utah from north to south and west to east, the first American to enter California by the overland route and first to scale the High Sierra. He was the first to explore the Pacific hinterlands from San Diego to the banks of the Columbia. Smith was the first white man to cross the future State of Nevada.

These were but a few of the most important



THE MEMORY OF one of California's most determined pioneers, Jedediah Smith, is perpetuated by the Smith River. The scene above is northeast of Crescent City. Old sketch of Smith, left, is the only original likeness of him in existence.

firsts credited to the greatest trail breaker of his period, a man who charted the way for the spread of the Republic from the Missouri to the Western Sea.

In 1828, after some weeks spent trapping the lower San Joaquin River, Smith and his party ascended the Sacramento to a point opposite the present site of Red Bluff. From here they made an epic journey west to the Trinity and Klamath rivers despite harassment from unfriendly Indians.

Massacred by Indians

Moving north he discovered the Smith and continued on to the Rogue, Coquille, Coos and Umpqua rivers. On July 14, 1828, while Smith and two others were out scouting, 14 out of 15 men remaining in camp were massacred by Indians.

Although some settlers found their way to the Smith as early as 1848 it was not until 1870 that logging operations led to much activity in the area. The crude lumbering methods of those days limited cutting on rough ground to a distance of only a hundred yards from the river's banks. Today lumbering is still an important economic factor although much dairy farming and cattle raising are conducted in the region.

Smith's name was permanently applied to this river after the name had been used briefly at various times to identify about six other California rivers.

STANISLAUS

100 Miles of Rare Beauty From the Sierra to the Valley

Twelve hundred square miles of some of California's most picturesque territory comprise the drainage basin of the 100-mile long Stanislaus River.

Originating at the crest of the Sierra, 10,000 feet above sea level, the Stanislaus and its tributaries flow through granite peaks, domes and glaciated basins as they race toward a junction with the San Joaquin River deep in the valley.

Coursing through Tuolumne, Calaveras and Stanislaus counties it passes the colorfully-named ghost towns of the Mother Lode. Along the way are well-timbered ridges, basins and canyons which give way gradually to rolling foothills with scattered oak timber.

Joins San Joaquin

Forty miles from the Sierra crest, the two principal tributaries, the North and Middle forks, come together to form the Stanislaus proper. Six miles farther downstream it is joined by the South Fork. From here it meanders through the foothills for 35 miles and then across the level valley to meet the San Joaquin River flowing north.

Spanish explorer Gabriel Moraga was probably the first white man to see the Stanislaus, in October, 1806, while on an expedition seeking sites for missions. He named it Rio de Nuestra Senora de Guadalupe.

In 1827 a young Indian neophyte Christian ran away from Mission San Jose where he had been named after one of two Polish saints called Stanislas. He was thought to be the instigator of a general uprising of Indians in the San Joaquin Valley. General Mariano Vallejo, then stationed at Monterey, succeeded in breaking up the band after bloody fighting on what was then called Rio de los Laquisimes. The river later became known by the name of the Indian leader Stanislas, who fought so bravely there.

John C. Fremont ferried across the river in 1844 and was much impressed by the level valley, the seventy-yard wide stream and the rich bottom land. He used the Americanized name, Stanislaus, when mapping the area.

Weber Finds Gold

The next decade brought the discovery of gold and thousands of prospectors. When Charles W. Weber, German-American pioneer of the San Joa-

quin Valley and founder of Stockton, got word of the gold strike at Coloma in 1848, he enlisted the aid of Indians in a search for gold along the Stanislaus and Mokelumne rivers. The precious metal was found along both streams and the rush was on.

Among the many colorfully named mining communities near the Stanislaus was Sawmill Flat, once the haunt of Joaquin Murieta, the colorful Robin Hood of banditry. Born of a good Mexican family, he was an honest, hardworking placer miner with a rich claim until he and his sweetheart were beaten by ruffians. Embittered, he became an outlaw in central California until he was slain in 1853 at 21.

Hydroelectric generation and irrigation development along the Stanislaus have been going on for years with a partnership between the Oakdale and South San Joaquin irrigation districts and PG&E.

Farmers Benefit

Latest of these is the Tri-Dam Project which commenced operation in 1957. Costing \$52 million, its three powerhouses have a combined installed capacity of 81,000 kilowatts and its three reservoirs can store 230,000 acre feet of water. PG&E buys the power output and the money it pays the districts retires bonds sold to build the project without cost to Stanislaus and San Joaquin county farmers.

In an earlier partnership the district built Melones Dam and PG&E built a powerhouse with the company paying for the use of the falling water. Stanislaus Powerhouse, operated for 53 years by PG&E at 40,000 kilowatt capacity, is to be replaced by a more efficient 82,000 kilowatt plant. Four other PG&E plants utilize the river to generate 13,000 kilowatts of power.

THIS GRANITE gorge on Clark Fork of the Stanislaus is typical of the beauty found along much of the river.



TRINITY

James Hilton Found His Inspiration For "Shangri-La" in This Setting

Located midway between the warmth of the upper Sacramento Valley and the cool dampness of the Humboldt coast, the 150-mile long Trinity River drains 3,000 square miles of ruggedly beautiful country.

The Trinity rises in the vicinity of the Salmon and Scott mountains and flows south, west and then north to join the Klamath at Weitchpec. The main river and its principal branches, the East, North and South forks, are located largely in Trinity County.

Although the entire watershed is still sparsely populated, it was a bustling area during the height of the Gold Rush. Weaverville, county seat of Trinity County, is the largest community along its path, although its population is less now than during the 1850's when men were washing gold at every rock and bar along the river.

Granite Slopes, Sharp Ridges

Known as "Weaver" by old timers, the county seat is a picturesque community with an odd combination of frontier and Victorian architecture. Located 47 miles from the nearest railroad, Weav-

THIS VIEW of the Trinity River is between Willow Creek and Hoopa Valley Indian Reservation and is symbolic of the area's great natural beauty.



erville is dominated by the Trinity Alps whose rugged granite slopes, sharp ridges and serrated peaks closely resemble the Swiss mountains for which they were named.

The late James Hilton attributed to Weaverville the inspiration for his best seller "Lost Horizon." "They call it Weaverville but to me it is Shangri-La, the strange and wonderful somewhere that is not a place but, rather, a state of mind."

The name of the Trinity was an historical accident. In the late Mexican and early American times, Trinidad Bay (discovered by Captain Bruno Ezeta in 1775) was assumed to rank next to San Diego and San Francisco as the third great California port. When Pierson B. Reading came upon the river in 1845 he gave it the name of Trinity (English version of Trinidad Bay), believing it emptied into Trinidad Bay.

The Trinity River was known to the Klamath Indians as the "Hoopah" and the Hoopa Indian Reservation is located astride it, in a seven-mile long valley 32 miles northeast of Eureka. This valley is the site of sawmills and farms.

To Serve Central Valley

For more than a century men have talked of turning the Trinity eastward to flow into the Sacramento. For a third of that time engineers have studied the feasibility of the Trinity Project. Now under way, this project will cost the Federal government a quarter of a billion dollars. It will divert an average of 820,000 acre feet of water annually and will provide an estimated 1¼ billion kilowatt hours of electrical energy. Keystone of the project is Trinity Dam, nine miles upstream from Lewiston, completed in 1961 to store 2,500,000 acre feet of water. Four project powerhouses will have a capacity of 384,300 kilowatts.

Pacific Gas and Electric Company's Junction City Powerhouse is the only commercially operated hydroelectric plant in existence today on the river. Located on the Trinity, the powerhouse utilizes water from Canyon Creek, a Trinity tributary, and has been generating electricity since 1905.

It is believed that much gold remains in the Trinity River area but few search for it because of today's gold price. Fishermen find the river a delight while seeking trout, steelhead and salmon.



TRUCKEE

Cradled in Lake Tahoe, It Serves Western Nevada

A party of pioneers bound from Missouri to California in 1844 was escorted from Battle Mountain, Nevada, to Sutter's Fort by a gentle Paiute Indian guide named Truckee. In gratitude for his help James Madison Harbin, guide of the party, named one of the rivers they passed in his honor.

In the succeeding years the 96-mile long Truckee River has filled many roles. Before the advent of modern refrigeration thousands of tons of ice were harvested from connecting ponds. During the latter half of the 19th Century it was used to float logs to railroads and lumber mills. It now provides the force to spin turbines in five small electric plants and its waters provide domestic and irrigation needs for much of Western Nevada.

Passes Through Reno

Born on steep Sierra slopes north of Carson Pass, it is cradled in Lake Tahoe and buries itself finally in Pyramid Lake, 50 miles northeast of Reno. The Upper Truckee is one of many sources of water that form the 123,500-acre Lake Tahoe. It flows into the lake at the south end and Truckee River proper flows out of the northwest side of the lake near Tahoe City. It flows north and then northeast for 32 miles before it crosses the California-Nevada border and 14 miles beyond that it passes picturesquely through Reno.

In order of importance, the principal tributaries are Little Truckee River, Prosser, Donner, Dog and Squaw creeks. The average annual runoff of the river at the California-Nevada state line is about 567,000 acre feet, of which 173,000 is drawn from Tahoe and 394,000 acre feet supplied by tributaries below the lake.

The California-Nevada line runs north and south through the river's basin, leaving the greater part of the higher elevations in California and most of the urban and farm area in Nevada. Elevations of the basin range from almost 10,000 feet to 5,000 feet above sea level.

U. S. Controlled Since 1915

Because of the high elevation of the river's basin most of the precipitation is in the form of snowfall, with the bulk of the runoff occurring during April, May and June. During the late summer the runoff from the lower half of the watershed is scant, but

through the control afforded at a dam at Lake Tahoe, the runoff from the upper basin is conserved until dry periods, thereby maintaining a good flow in the river the year around.

The first artificial control of the waters of Lake Tahoe was by means of a log dam built on the Truckee River just below the mouth of the lake by the Donner Boom & Lumber Company in 1870. The river's flow has been controlled by Federal regulation since 1915. This calls for a maximum water level of the lake at 6,229 feet above sea level.

The Truckee has been called Reno's most feared, frustrating, erratic and loved landmark. Frequently its waters have rampaged through the city with the most devastating floods occurring in 1937, 1950 and 1955. The last was the most violent with the river pouring 20,000 cubic feet of water a second along its swollen, 300-yard wide course. Damage totaled almost \$4 million. Considerable flood control work has been carried out since and more has been proposed.

WATERS FROM LAKE TAHOE form the beginning of the Truckee River shown here near Tahoe City. Other mountain streams provide two-thirds of the river's flow as it continues its course through California and Nevada before losing itself in Pyramid Lake.





TULE

Once Fed Huge Tulare Lake Which Has Since Dried Up

A 9,500 FOOT descent marks the Tule River's course from lofty Sierra peaks to the rich farm land of the San Joaquin Valley. Unlike most Sierra streams, the Tule never reaches the ocean.

Like all Sierra streams, the Tule River is surrounded by beautiful, rugged scenery. But unlike most of these mountain waterways it does not flow all the way to the Pacific.

For uncounted centuries it helped create Tulare Lake, once the largest body of fresh water west of the Rockies. Together with its neighbors, the Kaweah, Kings and Kern, it carried melting snows into this vast body of water that is no more.

When San Joaquin Valley farmers first began tapping the Kern and Kings for irrigation around 1875, Tulare Lake covered more than 1,000 square miles. It was 80 miles long with a maximum depth of 31 feet. A paddlewheel steamer once ventured into the lake from the San Joaquin River. It was wrecked trying to get back downstream and its channel became "Steamboat Slough."

Lake Disappears Gradually

As more and more water was diverted for the flourishing crops, the lake began to recede until it finally became nothing more than a mud puddle. The disappearance of the lake was a gradual thing and occasional spring floods periled farm operations until construction began on two control dams, Success Dam on the Tule and Terminus Dam on the Kaweah, following construction of Pine Flat Dam on the Kings and Isabella Dam on the Kern.

Old timers in the San Joaquin Valley like to recall the steamboat, Mose Androos, which operated on the lake, pulling a barge of cattle across the shallow waters of Tulare Lake. They smile nostalgically at the comical recollection of hogs from Hog Root Island diving for mussels with only their tails left above the surface.

A good portion of the 400-square mile Tule River watershed is located in low foothill country which produces little runoff except during severe winter

storms. Most of the average annual runoff of 132,000 acre feet originates with slow-melting snows at elevations up to 9,500 feet in Sequoia National Park.

The North Fork joins the Middle Fork 10 miles northeast of Porterville to form the main river and they are joined by the South Fork near Daunt. The river's basin forms a rectangle 25 miles long and 15 miles wide.

Diversion of water for irrigation purposes is made by the Lower Tule River, Porterville and Vandalia Irrigation districts and by several mutual and private water companies. A large amount of the water enters the underground reservoir through the delta's permeable soil and is later recovered by pumping.

Valley Once a Marshland

The river derives its name from the Aztec Indian word tullin or tollin which designates a cattail or similar plant. At one time vast portions of the San Joaquin Valley were marshland covered by luxurious growths of reeds. Most of these acres have been reclaimed for cultivation through drainage. A place where the tulle grows is called "tullar" in Aztec. The Spanish explorer Gabriel Moraga called the area around Tulare County "Valle de los Tules," in 1813.

Two-thirds of the upper part of the Tule River basin supports a growth of grass and brush and a scattering of timber. In the higher elevations it is covered with good timber and heavy underbrush.

Two small hydroelectric plants are operated on the Tule. PG&E has one with a capacity of 6,400 kilowatts located at the junction of the north and south forks of the Middle Fork. Downstream on the same fork is a 2,500 kilowatt plant of the Southern California Edison Company.

TUOLUMNE

This Dashing Stream Allays the Thirst of San Francisco

The living glaciers that line the slopes of Mt. Lyell, a 13,090-foot Sierra Nevada peak, provide water for California's two largest cities, Los Angeles and San Francisco.

Melting snows on the south and east side flow into the Owens River and on to the giant Los Angeles Aqueduct. On the north and west side, Mt. Lyell feeds the Tuolumne River, source of water for San Francisco and some of its Peninsula neighbors.

The main Tuolumne drains a wide expanse of mountains sloping west from the Sierra crest between the Merced River basin on the south and the Stanislaus watershed on the north.

In its picturesque descent it flows through Yosemite National Park and Stanislaus National Forest and emerges from the foothills near La Grange before flowing out across the valley to empty into the northbound San Joaquin, 10 miles west of Modesto.

En route, it spins electric turbines and some of its water is diverted for irrigation and domestic and industrial purposes.

Exuberant Mountain Energy

The Tuolumne pierces deep granite canyons and flows through meadows of incredible beauty, prompting Naturalist John Muir once to write of its "glinting and singing in exuberance of mountain energy."

It rushes through the Grand Canyon of the Tuolumne at great speed, dropping 4,000 feet in

SYLVAN GLADES in Yosemite National Park and Stanislaus National Forest are pierced by the Tuolumne River as it drops toward the San Joaquin Valley.



GLACIER-LINED canyons and mountain meadows are to be found along much of the route of the Tuolumne River. This scene is typical of its rugged beauty.

four miles. Tuolumne Meadows is one of the most perfect mountain meadows, lying at the junction of the Lyell and Dana forks and surrounded by magnificent peaks. Save for the high valley and meadow areas in Lyell Canyon and at Dana and Tuolumne meadows, the upper watershed is especially rugged.

Below Hetch Hetchy the walls of the river canyon are less precipitous and several important tributaries, including the South and Middle forks, Cherry Creek and Clavey River, join the main stream.

Snows Bring Heavy Runoff

Heavy snowfalls on the upper half of the watershed serve to produce fairly large runoffs with an average yield of 1,300 acre feet per square mile.

The Turlock and Modesto Irrigation districts have water rights which go back to the 1890's. In 1923, they joined in building Don Pedro Reservoir, with a capacity of 290,000 acre feet and a hydroelectric plant with a capacity of 30,000 kilowatts. A second, smaller plant of the districts is at La Grange.

An act of Congress in 1913 granted San Francisco the right to develop the Hetch Hetchy project in Yosemite National Park and Stanislaus National Forest. The city has constructed a large storage reservoir on the main river at Hetch Hetchy Valley and smaller reservoirs on Eleanor and Cherry Creeks. Designed for an ultimate delivery of 400 million gallons of water daily, tunnels and pipeline convey the water by gravity 117 miles across the San Joaquin Valley to distribution reservoirs south of the city. Three power plants in this project have a capacity of 217,250 kilowatts.

Much lusty Gold Rush history involves the Tuolumne, along which the precious metal was discovered in 1849.

The name Tuolumne is Indian in origin but historians differ on its meaning. One of the more popular versions is that it comes from the word Talmalamne, meaning cluster of stone wigwams, since Indians in the area at one time lived in caves or recesses in the rocks.





THE YUBA River drains a narrow watershed on the west slope of the Sierra Nevada providing excellent hydroelectric and recreational facilities.

Blessed with the riches of gold and great natural beauty, the Yuba River is a colorful link between pioneer days and California's modern industrial and agricultural empire.

The Yuba and its tributaries have produced more of the valuable yellow metal since 1848 than any other river in the United States. An extensive system of reservoirs and ditches begun by Forty-niners serves as a nucleus for one of the most highly developed hydroelectric systems in the world.

Although its watershed is never more than 36 miles wide, the Yuba drains an area of 1,357 square miles as it makes a rapid descent down the west slope of the Sierra Nevada and on to Marysville where it empties into the Feather River.

Gold Found in 1848

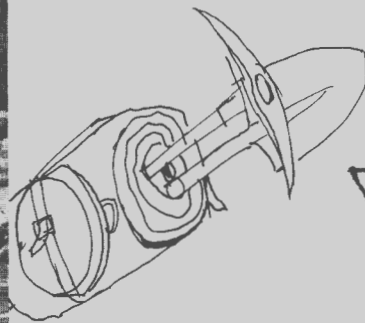
First to discover gold along the Yuba was Jonas Spect. Down on his luck and discouraged after long and unsuccessful prospecting on the American and Bear rivers, Spect hit "pay dirt" in sizeable quantities on June 2, 1848.

Gold and the Yuba have been closely linked ever since. During the first three years of the gold rush, 50 communities sprang up along its shores. These towns and crude camps were peopled by 10,000 men who worked at the whim of the turbulent river. Some acquired fortunes, many more worked hard without success. The towns were deserted almost as quickly as they had been settled.

Placer mining declined and hydraulic operations dominated from the 1860's until Congress in 1884 answered the pleas of Sacramento Valley farmers to halt the dumping of silt in the river. It has been estimated that 700,000,000 cubic yards of material, moved by this kind of mining, was forced into the river, raising its bed as much as 100 feet in some places.

In time dredging operations commenced and continue to this day.

The river was discovered March 14, 1828 by Jed-



YUBA

Has Produced More Gold Than Any Other U. S. River

ediah Smith, first white man to lead a party of settlers overland. The name Yuba was first applied to a land grant in that area in 1844 and in 1850 the name was applied to one of California's original 27 counties.

Gen. Mariano Vallejo, one of the last Mexican officials of California, wrote that the county derived its name from the Spanish word "uvas" (grapes). These grew wild among the willows and cottonwoods along the river.

Named for Indians

But Captain John A. Sutter disagreed, claiming he had named the river Yuba for the Indian tribe he had found living there in 1840. The name also appeared in early writings as "Juba," "Yubo," "Yupu," "Jubu," and "Uber."

Headwaters of the Yuba start at the crest of the Sierra at elevations of more than 8,200 feet. The North Fork rises in lavas which vary much in composition and hardness but which generally afford a deep soil for timber and shrub growth. The Middle Fork rises in similar lavas as well as granite. With a mean annual precipitation of 54 inches, these forks are fed by warm rains and soft snows that sometimes give a high flood runoff. The South Fork lies on a broad granite surface into which the streams have not cut deeply until it reaches a point 16 miles from the summit, where it drops rapidly.

Lake Spaulding System

Key to the well-developed hydroelectric and water conservation system on the Yuba and Bear rivers is Spaulding Dam. Tributary to this lake or to streams in the area are a score of man-made reservoirs at elevations from 5,000 to 7,750 feet. Eventually water from these spins generators in 12 PG&E powerhouses on the two rivers with a capacity of 170,400 kilowatts.

Thus the mountain empire of storage reservoirs and canals which were begun by the Forty-niners aids agriculture by flood prevention and conserving water until it is needed for irrigation. And more lasting than the gold that lured the Argonauts is the wealth of water power which is "mined" over and over again in the public service.

Alamo

Extends northward from the Imperial Canal in the southern end of the Imperial Valley to the Salton Sea. The Alamo occupies a channel which had been one of the distributaries of the Colorado during the formation of its delta. It is fed only by drainage water. (Imperial County)

Amargosa

The name was recorded by Captain John C. Fremont in April, 1844, for the Spanish word meaning "the bitter water of the desert." Death Valley was formerly called Amargosa because the river flowed through it as far as Badwater after making a U turn north of the Avawatz Mountains. What is now called the Amargosa Desert is mainly in Nevada. The river is 140 miles long and repeatedly appears, disappears and reappears. Its water is absorbed by the sands until the channel crosses a bedrock where it emerges to view. The water is potable near its source in the springs of Nye County, Nevada, but it becomes salty along its course. (Inyo and San Bernardino counties)

Big

Tributaries of this 40-mile long stream include the South, Middle and North forks and Valentine and Martin creeks. Flows into the Pacific at the town of Mendocino. (Mendocino County)

Calaveras

The upper Calaveras watershed lies in Calaveras and Stanislaus counties on the western slope of the Sierra Nevada. The lower portion of the 633-square mile watershed is in central and eastern San Joaquin County on the gently sloping floor of the San Joaquin Valley.

The North and South forks join about seven miles above Hogan Dam which is 36 miles from Stockton. The Calaveras joins the San Joaquin River northwest of the latter city. The total length is 80 miles, 35 in the valley and 45 in the mountains. Torrential in the winter, the river is dry for a few months during the summer.

The name, meaning "skulls," was often used by Spanish mapmakers where human skeletons were found. A party headed by John Marsh in 1836 and 1837 came upon a place near the river where there were a great many skulls and skeletons. A great deal of gold was obtained from this river by placer mining during the Gold Rush period.

The basin is almost wholly in a foothill region. Although the highest parts reach 6,000 feet above sea level, only a small portion exceeds 4,000 feet. The hills are low and separated by small irregular valleys. The upper portion of the basin supports a heavy growth of timber and the Calaveras grove of big trees (*Sequoia gigantea*) is partly in the basin and partly in the Stanislaus River Basin.

SWOLLEN BY WINTER rains, the Calaveras River is seen here flowing west through Sierra foothill country. Torrential in the winter, it is dry during portions of the summer.





THE DRY BED of the Chowchilla River may be seen from Highway 99, 10 miles north of Chowchilla. Active for only part of the year, this 65-mile long stream is a tributary of the San Joaquin.

Carmel

Flows 30 miles northwest through the coast ranges to Monterey Bay, south of Carmel. Discovered by Vizcaino, January 3, 1603, and called Rio del Carmelo, probably honoring three friars of the Carmelite Order who were members of the expedition. Eventually the name was Americanized. In 1771 Fathers Serra and Crespi moved Mission San Carlos from Monterey to a point by the river and it became known as Carmelo Mission although the original name was retained officially. (Monterey County)

Carson

The East and West forks rise in Alpine County, on the east slope of the Sierra divide at elevations of 10,000 feet. The two forks converge in Nevada and terminate in the desert-like Carson Sink. The river was named by John C. Fremont for his guide, Christopher (Kit) Carson, with whom he had crossed the Sierra Nevada in 1844.

Chowchilla

Formed by the junction of the East and West forks on the south slope of the Chowchilla Mountains at elevations of 6,000 feet, it flows southwestward into the San Joaquin River near Chowchilla. The lower bed is often dry from June until the first autumn rains. It is 65 miles long.

This river has been known by various spellings. The present version is found on the maps of the Pacific Railroad Survey. The first ascertainable recording is ranheria de Chausila, by Sebastian Rodriguez in April, 1828.

(Merced and Madera counties.)

Cuyama

Winds 85 miles through the Coast Ranges before joining the Santa Maria River east of the City of Santa Maria. The flow is intermittent. The name is believed to be that of an Indian ranheria, shown as Culama and Cuyama on land grant maps. The word means "clams" and is pronounced in various ways. (Santa Barbara and San Luis Obispo counties)

Elk

Named by the Josiah Gregg party on Christmas Day, 1849, after they had enjoyed a dinner of elk meat. The river had been called Ka-sha-reh by Indians in that area.

The Elk is spanned by two of the three remaining covered bridges in Humboldt County. It originates in the highlands southeast of Eureka at an elevation around the 2,000 foot level and consists of two forks, the North and South, and a number of subsidiary creeks and drainage gulches. Including its forks, the river flows for a distance of 15 miles through second growth timber to its outlet in Humboldt Bay at the southern edge of Eureka.

Elk River was the scene of extensive lumbering activity in the late 1880's and early 1900's and traces of the logging railroad right-of-way and old lumber camps are still evident. (Humboldt County)



ONE OF THE FEW covered bridges still left in California, this structure crosses the Elk River at Fields Landing. Considerable lumbering activity took place in this area during the late Nineteenth Century.

Fall (Plumas, Butte)

This short but beautiful stream rises in Southwest Plumas County at an altitude of 5,650 feet and flows 10 miles before entering Butte County. After a circuitous westerly course of 15 miles it reaches the Middle Fork of the Feather River. About a mile above its mouth it leaps over a cliff 640 feet, making a practically vertical, single, unobstructed leap into a solid rock box canyon. When mountain snows are melting in late winter and early spring Fall River has a flow of 1,500 to 2,000 cubic feet a second. This area is ruggedly mountainous and timbered and can be reached by a hiking trail.



THESE GIANT REDWOODS in the Bull Creek Dyerville Forest, 45 miles south of Eureka, are in a park area of 13,000 acres, the preservation of which was made possible through a gift of John D. Rockefeller, Jr. The Eel River drains this area.

Fall (Shasta, Siskiyou)

Named by John C. Fremont in 1846 because of its cascades, it is 15 miles long and a tributary of the Pit River. (Shasta and Siskiyou counties)

Fresno

Part of the channel of this 75-mile long river is dry in summer. It has a basin of 272 square miles and flows southwestward past Madera to join the San Joaquin River. Fresno is Spanish for "ash" and was applied to the river because the Oregon ash is native to the area.

It is possible that el monte redondo, mentioned by Sebastian Rodriguez on April 23, 1828 when he was in the vicinity of the present city of Fresno, was a round grove of fresnos and may be the origin of the name. (Madera County)

Garcia

This 32-mile long stream follows a winding course before entering the Pacific just east of Point Arena. Probably named for Rafael Garcia who was granted nine leagues on the coast north of Fort Ross on November 15, 1844. (Mendocino County)

Guadalupe

Named for the Mexican saint, Our Lady of Guadalupe, patron of the expedition Juan Bautista de Anza, which passed through the area on March 30, 1776.

Guadalupe was one of the most popular place names in early California. It was applied to certain land grants, a lake, valley and mountains. What is now the Stanislaus River was called Nuestra Señora de Guadalupe in 1806. (Santa Clara County)

Gualala

Flows into the Pacific near the town of Gualala and is fed by the North, Middle, South and Wheatfield forks. Historians are divided on the origin of the name. Some insist it comes from Pomo Walali, "where the waters meet." Others say it is the Spanish version of Valhalla, which in Teutonic mythology was the abode of heroes fallen in battle. The name was apparently applied to the river by Ernest Rufus, captain of Sutter's Indian Company. (Sonoma and Mendocino counties)

Kaweah

Formed in Sequoia National Forest at elevations of almost 11,000 feet, the Kaweah has a drainage area of 715 square miles and five forks, the Middle, East, North, South, and Marble. It flows 10 miles southwest to the floor of the San Joaquin Valley where it divides into many channels. It is located entirely in Tulare County and is dissipated for irrigation purposes. Sequoia National Park is situated almost entirely in the Kaweah Basin and contains the largest growth of trees in the Sierra. The name is derived from the Yokuts tribe Kawia or Gawia who lived on the edge of the plains on the north side of the river. The river was named San Gabriel by a Spanish expedition in 1806 and later was known as the Four Creeks.

In 1886 Burnette G. Haskell established the Kaweah Co-operative Colony at what is now the town of Kaweah in Tulare County. Purpose of the colony was to cut and market lumber on a socialistic basis. Internal dissension and creation of Sequoia National Park brought about the collapse of the colony in 1891.

GRANITE DOMES rise majestically above the Kaweah River in Sequoia National Park. Located entirely in Tulare County, this river is dissipated into irrigation channels.



Los Angeles

An intermittent stream 50 miles long which flows along the base of the Santa Monica Mountains through downtown Los Angeles to empty into San Pedro Bay at Long Beach. Torrential flows in the rainy season are controlled by masonry embankments and huge catchment basins on the upper river and tributary creeks. The Portola Expedition camped on the bank of the river on August 2, 1769, and named it in honor of Our Lady of the Angels.

The Los Angeles and San Gabriel rivers are units of a comprehensive plan for flood control in Los Angeles County. The Los Angeles River improvement, including Sepulveda Flood Control Dam and Basin, has been completed and many of the tributary streams are improved with channels, dams and debris basins. Water is sometimes diverted from the channel for percolation into the ground-water body at adjacent water conservation spreading grounds.

Lost

Flows northwest from Clear Lake Reservoir, Modoc County, into Klamath County, Oregon, and south into Tule Lake, four miles south of the California-Oregon border in Siskiyou County. It is 75 miles long and extensively developed for irrigation in Oregon and California.

The river is literally lost between Clear Lake and Tule Lake. Engineers have tried in vain to find an underground flow.



DRY DURING THE SUMMER months in its upper reaches, the Mad River wends its way for more than 90 miles in Humboldt and Trinity counties reaching the Pacific at a point north of Arcata.

Mad

The basin is very narrow and the tributaries are unimportant. With its major windings, it covers 90 miles and empties into the Pacific above Arcata. In the upper parts, its channel is dry during the summer months but farther down it continues throughout the year. The lower course passes through the redwood belt.

It was named in December, 1849, by Dr. Josiah Gregg who explained that he lost his temper at the site when fellow members of his exploration party attempted to leave him while he was determining the latitude of the mouth of the river and a violent argument ensued. (Trinity and Humboldt counties)

Mattole

Fifty miles long and consists of the North and West forks. It flows into the Pacific about 35 miles south of Eureka. The name commemorates an Athabaskan tribe who were practically exterminated because of their fierce resistance to white intruders.

The Mattole originates in northern Mendocino County and runs generally north through deep canyons to its mouth a few miles north of Punta Gorda in Humboldt County. The Mattole area was the scene of early day oil explorations and limited oil exploration activity at the present time.



FLOWING THROUGH the picturesque hills west of Garberville, the Mattole River provides a pastoral scene of quiet beauty as it curves its way toward the Pacific, 35 miles south of Eureka.

Middle

Just as Old River is a channel off the San Joaquin, Middle River is a channel from the Old. Its source is a point four miles below where Old River forms in San Joaquin County. It extends for 29 miles north and west to its outlet in the San Joaquin, 30 miles above the mouth of the latter stream. Middle River is a natural channel and has been deepened and widened by dredging for construction of levees on its banks. For the first five miles, it is a shallow stream with depths of only a foot at low water. Gradually it widens to 1,000 feet and depths of 40 feet at low water. The river is popular with fishermen.



LOOKING WEST from Highway 4, between Stockton and Antioch, the Middle River presents a typically placid scene among the low stretches of the San Joaquin Delta.

Mojave

Rises in the San Bernardino Mountains near Lake Arrowhead. Its headwaters flow from elevations of 5,000 to 8,000 feet above sea level. It follows a circuitous route of 100 miles, mostly underground, through the Mojave Desert to Soda Lake, 60 miles east of Barstow. Its drainage basin comprises 1,470 square miles, of which 250 may be classed as mountains, 219 square miles as foothills and 1,000 square miles as plains and desert buttes. The name is derived from the warlike Yuman tribe on the Colorado where California, Nevada and Arizona now meet. There are more spelling variations to the word Mojave than any other Indian word in California literature. (San Bernardino County)

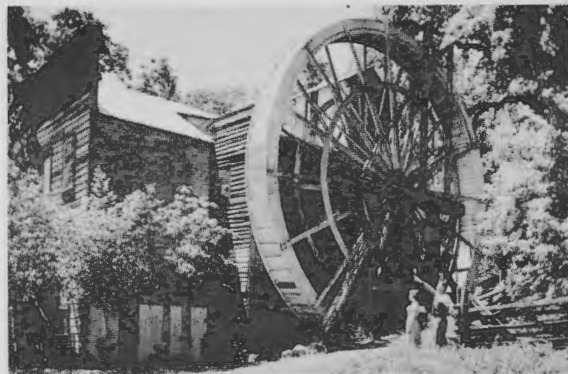
Nacimiento

A short river in San Luis Obispo and Monterey counties that forms Nacimiento Reservoir and is the main tributary of the Salinas River. The name apparently arose from a misunderstanding. The Portola Expedition camped along it on September 21, 1769, and Father Crespi called it "a very large arroyo, whose source (nacimiento), so they said, was not far off." When the Anza Expedition came to the same river, Anza apparently assumed that the piror expedition had named this river Nacimiento, perhaps associating the word with "The Nativity," another meaning of the word and not with the "source of the river." Early maps used both a small n and a capital N, further confusing the matter.

Nacimiento Dam was constructed in 1956 about seven miles upstream from the Salinas. It has a capacity of 350,000 acre feet.

Napa

A short river that flows through Mare Island Strait and enters San Pablo Bay. In the lower eight miles it flows through a tidal marsh that is connected through sloughs with Sonoma Creek. It was named for Patwin Indians who resided in the area but there is considerable conflict as to the meaning since the word Napa is traced to a number of Indian words meaning "grizzly bear," "near home" or "motherland."



THE 40-FOOT WHEEL and wooden cogs of Old Bale Mill have long been silent but stand as a reminder of the days when California was under the Mexican flag. Now a State Landmark, the mill is located in Napa Valley between Calistoga and St. Helena not far from the Napa River. (Redwood Empire Association Photo).

Navarro

Flows for 50 miles through the coastal range of mountains west of Hopland in Mendocino County to terminate in the Pacific about 18 miles south of Fort Bragg. Principal tributaries are the North Fork and Rancheria, Anderson and Indian creeks.

Although the name resembles that of the Spanish Province Navarra, or the family name Navarro, it is believed to be an Indian name.

New

A drainage channel which originates in Mexico, the New River flows northward through the Imperial Valley to the south end of Salton Sea. It was created in 1905 when the Colorado overflowed its banks and is fed by drainage water from Mexico and the Imperial Valley. (Imperial County)

Old

The most westerly through channel of the many interconnecting sloughs and channels traversing the San Joaquin Delta, the Old River begins and ends with the San Joaquin River. It originates three miles downstream from Mossdale, and, after flowing west for 12 miles, goes north 20 miles to the mouth of the San Joaquin. The original Old River Channel has lost its identity to a considerable extent due to the many deep channels bordering its general course. Channel depths vary from 13 to 36 feet and widths from 120 to 600 feet. Fifty miles in length, Old River forms the boundary on the east side of Contra Costa County and the upper west side of San Joaquin County. It is a popular fishing ground.



A FLIGHT OF SNOW GEESE form a symbolic picture above Old River, haunt of thousands of sportsmen each year in the San Joaquin Delta. This view is near the boundary of San Joaquin and Contra Costa counties from Highway 4.

Otay

Flows 25 miles west to the south end of San Diego Bay in San Diego County. Savage Dam impounds a water supply reservoir for the City of San Diego. The name is from the Diegueno Indian word otai and means "brushy."

Owens

The Owens River is formed by the joining of Dry Creek, Deadman Creek, and Glass Creek, all of which head on the east slope of the Sierra crest, from Mammoth Mountain on the south, to San Joaquin Mountain on the north.

Water from the Mono Lake Basin flowing from the eastern slopes of Mount Lyell on the south, to Mount Conness on the north, are collected by the Los Angeles Bureau of Water and Power from Lee-Vining Creek, and Walker, Parker, and Rush Creeks. This is carried by gravity through a tunnel nearly fifteen miles in length to the head of the Owens River, about twenty miles northwest of the Long Valley Dam, which forms Crowley Lake, a Bureau of Water and Power reservoir. Below the Long Valley Dam, the Owens River flows southeasterly through the trough of Owens Valley to nearly dry Owens Lake. At a point about 43 miles northwest of the Owens Lake its waters are carried by gravity through the Los Angeles Aqueduct 233 miles to the San Fernando Reservoir.

The headwaters of the Owens River contain the largest stand of Jeffrey pine in the world. The snow pack, especially on Mammoth Mountain, is among the heaviest in California, affording the longest skiing season available to southern and central Californians.

The area on the west side of the valley is largely U. S. Forestry Service land. Much of the east side area is also Federally owned and administered by the U. S. Bureau of Land Management. Thousands of cattle and sheep are grazed along the upper Owens. In the lower, or southern area, the removal of water to Los Angeles limits the number of livestock that can be grazed.

The lake and the river were named by John C. Fremont in honor of Richard Owens, of Ohio, a member of his third expedition (1845-56). (Mono and Inyo counties).

Pajaro

Located in Santa Clara, San Benito, Santa Cruz and Monterey counties, it is formed by Pacheco, Uvas and Llagas creeks and San Benito River, and reaches the Pacific through Monterey Bay north of Moss Landing. Thirty miles long, it was named by soldiers in the Portola Expedition on October 8, 1769, after they came upon a dead bird which the Indians had stuffed with straw and which the Spaniards thought resembled a royal eagle.

Rubicon

Rises northeast of Pyramid Peak in El Dorado County at an elevation of 8,700 feet. It flows through a broad valley for 20 miles and then a narrow canyon before joining the Middle Fork of the American River. Nearly 50 miles long, it forms the border between Placer and El Dorado counties. It falls 6,500 feet, at an average of 130 feet per mile. The upper portion of the drainage basin contains many small glacial lakes.

Salmon

Many creeks feed this river and its North and South forks before it joins the Klamath near the boundary of Humboldt and Siskiyou counties. Including its major windings it extends for 46 miles.

The name Salmon has been applied to many creeks in California.

RUGGED SISKIYOU County mountains form a backdrop for the Salmon River as it flows toward its confluence with the Klamath River at the Humboldt County border.

San Antonio

Rises in Monterey National Park and flows southeastward about 40 miles in a course parallel to but directly opposite to that of the Salinas River. It then turns abruptly and flows six miles north-eastward into the Salinas before it discharges into the Pacific at Monterey Bay.

It was named for Saint Anthony of Padua, patron saint of the Franciscan Order. The name was given to the river for Father Serra even before he founded the mission of the same name on July 14, 1771. (Monterey County)

San Benito

Rises in Diablo Range in southern San Benito County. It flows 70 miles northwest between the Gabilan Mountains on the west and Diablo Range on the east and joins the Pajaro River west of Hollister. It was named for Saint Benedict, founder of the Benedictine Order, on his feast day, March 21, 1772, by Father Crespi of the Anza Expedition.



San Diego

Starts 25 miles east of Escondido in the Cuyamaca Mountains on the west slope of the Coast Range at 5,000 feet elevation. It flows 52 miles southwest before emptying into Mission Bay at San Diego Bay. Its various tributaries plunge down rocky canyons. It serves as the city water supply through El Capitan Dam and San Vicente Dam. It was named for San Diego Bay which in turn was named in 1602 by Vizcaino to honor San Diego de Alcalde Henares (Saint Didacus). (San Diego County)

San Dieguito

Rises in Volcan Mountains at altitudes above 5,000 feet and flows westward and southwestward to enter the Pacific about 20 miles north of San Diego Bay. Following a Mexican custom in which a stream was often given different names at various points, stretches of this river have been known as the Bernardo, San Pasqual and Santa Ysabel creeks. The name is probably a Spanish diminutive for San Diego to distinguish it from the nearby San Diego River. (San Diego County)

San Gabriel

It is formed in the San Gabriel Mountains northeast of Los Angeles by three forks at elevations of more than 10,000 feet. Flows south, southwest from their junction, spreading in a broad wash at the base of the mountains to Alamitos Bay just east of Long Beach. Because it is subject to torrential floods it has been made a part of the Comprehensive Plan for Flood Control in Los Angeles County. The San Gabriel is controlled by Cogswell and San Gabriel dams in the San Gabriel Mountains, Santa Fe Dam and Whittier Narrows Dam on the valley floor and by extensive levees. Morris Dam forms the water supply reservoir for Pasadena. In addition to controlling floods, the dams help regulate flows for release to water conservation facilities. As a result, less than five per cent of the rainfall above Whittier Narrows Dam is wasted to the ocean. The river was named for the Archangel Saint Gabriel.

San Gorgonio

Rises in the mountainous region south of San Gorgonio Mountain at an elevation of about 9,000 feet. It flows southwestward six miles, then turns to the south and southeast and discharges into the western end of San Gorgonio Pass, which slopes eastward from a point near Beaumont to the Colorado Desert. San Gorgonio was a cattle ranch of Mission San Gabriel in 1824 and was named for St. Gorgonius, a third-century martyr. (San Bernardino and Riverside counties)



THE GENTLE San Diego River drops one mile in its 52 mile course from the Cuyamaca Mountains to San Diego Bay. It provides water for the City of San Diego. (Photos from Historical Collection, Union Title Insurance Co., San Diego).



WINDING ITS WAY through the San Gabriel Mountains northeast of Los Angeles, the San Gabriel River drops more than 10,000 feet toward Alamitos Bay east of Long Beach.

San Jacinto

The headwaters of this uncertain stream are located on the slopes of the San Jacinto Mountains at elevations of almost 10,000 feet. The upper tributaries are flowing streams but much of the water sinks in sands of the river channel during dry seasons. The river empties into Lake Elsinore and an old channel connects the lake with Temescal Wash, which discharges into the Santa Ana River. The name honors Saint Hyacinth, a Silesian-born Dominican priest. (Riverside County)



FERN CANYON, a mile north of Orrick in upper coastal Humboldt County, is one of the scenic highlights of the Redwood Empire. Thousands of verdant ferns line the canyon's sides, giving it a cool splendor. (Redwood Empire Association photo).

San Luis Rey

Formed by the headstreams south of Mt. Palomar, at an elevation of 5,300 feet above sea level, it flows 55 miles northwest, then southwest in San Diego County to the Pacific Ocean at Oceanside. Its drainage area comprises 575 square miles. The river is formed by many small streams which rise in the higher parts of the Coast Range. It was named for Mission San Luis Rey which in turn was named for Saint Louis, King of France.

Santa Ana

An intermittent stream which rises in the San Bernardino Mountains east of San Bernardino at elevations of 9,250 feet. It flows 90 miles past Riverside and Santa Ana to the Pacific Ocean north of Newport Beach. There is a continuous flow from the mountains to the sea only during winter floods. The Portola Expedition camped along the stream on July 28, 1769, and the padres called it El Dulcísimo Nombre de Jesus de los Temblores (The Most Sweet Name of Jesus of the Earthquakes) for the earthquakes they felt in the area. However, the soldiers in the expedition called the river for Saint Anne, mother of the Blessed Virgin, and that designation survived. (San Bernardino, Riverside and Orange counties)

Santa Clara

Originating on the north slope of the San Gabriel Mountains north of Los Angeles, the Santa Clara flows intermittently for 65 miles to the Pacific Ocean, three miles south of Ventura. Much of the channel of this 75-mile long stream is dry in the summer months but its seasonal flow furnishes water for one of the state's richest agricultural areas—the so-called Oxnard Plain. The Portola Expedition rested on the river on August 9, 1769, three days before the feast day of Saint Clare of Assisi, for whom it was named by Father Crespi. Piru Lake was created by the construction of Santa Felicia Dam on Piru Creek, a major tributary. (Los Angeles and Ventura counties)

Santa Margarita

This short river rises on the western slope of the San Jacinto Mountains in the northwestern part of San Diego County. After flowing briefly through Riverside County it returns to San Diego County and discharges into the Pacific four miles northwest of Oceanside. It was named by the Portola Expedition on July 20, 1769, feast day of Saint Margaret of Antioch.

Santa Maria

Originating in Los Padres National Forest, the Santa Maria flows irregularly for 110 miles, discharging into the Pacific at Guadalupe, 11 miles west of Santa Maria. It is called Cuyama River above its junction with the Sisquoc, its principal tributary. (San Luis Obispo, Santa Barbara and Ventura counties)

Santa Ynez

The point of origin of this Santa Barbara County river is near the boundary line between Santa Barbara and Ventura counties where the San Rafael and Santa Ynez mountains merge. It flows nearly due west and enters the Pacific Ocean at Surf, eight miles northeast of Point Arguello lighthouse. A reservoir formed by Gibraltar, Juncal and Cachuma dams supplies water to Santa Barbara City and the surrounding coastal plain. The basin covers 900 square miles, nearly half of which is in a national forest and it is sparsely covered with brush and small trees.

Scott

A tributary of the Klamath River, it is named for John W. Scott, who discovered gold in the area in 1850. Length from the Klamath to the end of the longest branch is 68 miles. (Siskiyou County)



ONE OF MANY tributaries that feed the Klamath River, the Scott River is seen west of Yreka in Siskiyou County. It was named for John W. Scott who found gold in the area.

Shasta

The Little Shasta River joins the Shasta River southeast of Yreka and flows into the Klamath a short distance northeast of that city. The name is a derivation of that of a tribe of Indians that inhabited the region in the early nineteenth century. It is fed by springs issuing from lava beds at the north base of Mount Shasta. (Shasta County)

Sisquoc

An intermittent stream that rises in the Santa Barbara National Forest at an altitude of 6,000 feet. It flows northwestward to its junction with the Santa Maria River in Santa Maria Valley. The river is 45 miles long and the drainage basin lies almost entirely in the San Rafael Mountains. (Santa Barbara County)

WENDING ITS WAY to join the Klamath River north of Yreka, the Shasta River is shown near the latter community. Springs from the lava beds of Mount Shasta feed this stream.



Big and Little Sur

The Big and Little Sur rivers are short streams which discharge into the Pacific from the Padres National Park. Big Sur, larger of the two, passes through Pfeiffer State Redwood Park. It was shown on early Spanish maps as Rio Grande del Sur (Big River of the South).

The name El Sur, "the South" (of Monterey) was applied to Juan B. Alvarado's land grant, dated July 30, 1834. This gave rise to the designation "big" to many points in the area. (Monterey County)

Ten Mile

This Mendocino County river, which flows into the Pacific, was named in 1850 because of its distance from Noyo Harbor, mouth of the Noyo River.

CALLED RIO GRANDE DEL SUR by the Spanish, Big Sur, south of Carmel is one of the shortest and most picturesque of California's streams.



Susan

Rises among small lakes north of Caribou Lake at an elevation of 5,900 feet and flows 50 miles southwesterly until it enters Honey Lake, of which it is the principal feeder. Isaac Roop, a pioneer in the Honey Lake District, named the river and the town of Susanville in honor of his daughter. (Lassen County)

Sweetwater

This 55-mile long river rises on the east and south slopes of Cuyamaca Mountains of the Coast Range and flows into San Diego Bay, south of National City. (San Diego County)

Tia Juana

An international river 85 miles in length, the Tia Juana supplies the Mexican City of Tijuana with water through Rodriguez Reservoir. It originates in Baja California with tributaries entering Mexico from the southern part of San Diego County. It crosses the border into the United States and discharges into the Pacific Ocean about a mile north of the Mexican line. Although known as the Tia Juana River in the United States, it is called Rio Tijuana, Rio Tecate and Rio Las Palmas on the southern side of the border.

Van Duzen

This 60-mile long tributary of the Eel River originates in Trinity County and flows also in Humboldt County. It was named in 1849 for a member of the Josiah Gregg party but the spelling has been listed variously on maps as Van Dusen and Vandusen.



THE SMOOTH SURFACE of the Van Duzen reflects lofty evergreens south of Fortuna. A tributary of the Eel, the Van Duzen passes through Trinity and Humboldt counties.

Ventura

Thirty miles in length, it rises in the eastern part of Santa Barbara County at an altitude of 5,500 feet and flows southeastward to the upper end of the Ojai Valley then southward to the point where it enters the Pacific near the city of Ventura. The name is in honor of Saint Bonaventure, 13th century Franciscan scholar. Two reservoirs have been created on tributaries of the Ventura River, Matilya on Matilya Creek near Ojai and Casitas on Coyote Creek between Ventura and Ojai. (Ventura and Santa Barbara counties)

Walker

The California section of the Walker River consists of two separate watercourses.

The East Walker, which is formed by the junction of Virginia, Green, Robinson, Buckeye and Swager creeks in Bridgeport valley, drains an area on the east slopes of Dunderberg Peak on the south, through Eagle Peak and Rickey Peak to the Sweetwaters on the north. Bridgeport Valley is a natural meadow of about 25,000 acres at nearly 6,500 feet elevation, irrigated by these streams before they flow into Bridgeport Lake. This meadow grazes several thousand cattle and sheep. Jeffrey pine from the ridges is trucked to Bishop, Inyo County, for milling.

The East Walker proper flows from Bridgeport Lake, which is a Walker River Irrigation District reservoir, in a northeasterly direction about fifteen miles to the Nevada state line. In Nevada it runs some forty miles to its junction with the West Walker in Mason Valley.

The West Walker River is formed along the east slopes of the Sierra, from Hanging Valley ridge on the south, through Leavitt Peak and Sonora Peak to White Mountain on the north.

Leavitt Creek, West Fork, and Little Walker River, all lake and glacial-fed, combine at an elevation of nearly 7,000 feet to form the West Walker proper, which flows northeast through Walker canyon and Antelope Valley into Topaz Lake, a Walker River Irrigation District reservoir, on the California-Nevada boundary.

Below Topaz Lake the West Walker flows north and east through Smith Valley and Wilson Canyon to its junction with the East Walker in Mason Valley.

The combined streams, now the Walker River, flows past Yerington, on out of Mason Valley past the Indian Agency at Schurz and into Walker Lake, which is second only in size to Pyramid Lake of all the Nevada Lakes.

Walker River, Walker Pass and Walker Lake all commemorate Joseph R. Walker, one of the great pathfinders of the west. (Mono County).

Whitewater

It originates in the San Gorgonio Mountains, northwest of the Salton Sea, and disappears near the San Bernardino County line in the Colorado Desert at the northern end of the Salton Sink. It was named because of the milky appearance caused by deep fine sand. It has an estimated mean natural seasonal runoff of about 62,000 acre feet. (San Bernardino and Riverside counties)

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