

California Department of Fish and Game
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Sacramento, California

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1957 KING SALMON SPAWNING POPULATION
ESTIMATES FOR THE SACRAMENTO-SAN JOAQUIN RIVER SYSTEMS 1/

Marine Resources Branch

INTRODUCTION

The California Department of Fish and Game annually inventories the number of king salmon (*Oncorhynchus tshawytscha*) spawners utilizing streams in the Central Valley. These inventories are made to estimate the number of salmon spawning, their spawning success, distribution on the streams and to note barriers or adverse conditions affecting them.

Information obtained from the surveys aids in formulating fishery regulations and also provides data needed to evaluate proposed water project developments affecting salmon streams.

This report is for the 1957 season and includes salmon spawning population estimates for the streams of the Sacramento-San Joaquin River system.

METHODS

The survey was begun September 24, 1957 and concluded on January 15, 1958.

Population estimates are primarily for fall-run fish. Some overlap in spawning time between fall and spring-run salmon occurs on the upper Sacramento River; therefore, a few spring-run salmon could be included in the counts. On Butte Creek and the Middle Fork of the Feather River the estimates are for spring-run fish.

The size of the salmon run on upper Mill Creek was determined by counting the fish as they passed through the fish ladder at Clough Dam. Similarly, the Mokelumne River spawning population was determined by counts at the fish ladder on Woodbridge Dam.

Those fish taken from the Sacramento River and Battle Creek and spawned artificially at the U. S. Fish and Wildlife Service's Coleman Hatchery, as well as those taken from the American River and spawned at the Department's Nimbus Hatchery, have been included in the totals.

1/ This work was performed in part by Dingell-Johnson Project California F7R, "Sacramento-San Joaquin Salmon and Steelhead Study," supported by Federal Aid to Fish Restoration Funds.

Population estimates for most of the streams were calculated by counting dead salmon carcasses, estimating the percentage of the run that had been counted and then computing the spawning population for the stream or stream section. Factors affecting carcass recovery such as the physical characteristics of the stream, turbidity, volume of flow and number of survey trips were considered in making the estimates. No tagging or marked fish data were used in making the estimates.

Two and three man crews conducted the salmon recovery work. All salmon carcasses found were cut in half with a machete to prevent recounting the same fish on subsequent trips and to determine if the fish had spawned successfully.

Aerial redd counts were used to estimate the spawning population in several sections of the Sacramento River and one section of the Feather River. All spawning areas were surveyed at least once during the season from the air so that the distribution of fish could be noted.

Figures 1, 2, and 3 indicate the streams which were surveyed during the season.

PERSONNEL

The 1957 survey included personnel from Marine Resources Operations, Inland Fisheries Branch, Water Projects Section and Regions 1, 2, 4 and 5.

A total of seventeen men was used to make the counts, Marine Resources provided six, the Dingell-Johnson Project FTR furnished three, Region 1 one, Region 2 three, Region 4 two, Region 5 one, and the staff Water Projects Section one.

Overall coordination was under Marine Resources Operations.

SACRAMENTO RIVER

Population estimates for the Sacramento River are based on both carcass counts and aerial redd counts. Aerial redd counts formed the basis for population estimates on the less utilized sections of the river. Counting trips varied from fourteen on the more heavily used spawning sections of the river to four on the less important.

Recovery conditions ranged from fair to poor during the season. Rains kept the river at a higher than normal stage throughout the counting season which made recovery conditions less than desirable but generally favored spawning.

A total of 864 carcasses was counted on the main stem of the Sacramento River between Redding and Squaw Hill Bridge. Recovery estimates varied with the river sections. Aerial redd counts were used to calculate spawning population estimates for the section between Squaw Hill Bridge and Ord Ferry, the lower limit of salmon spawning on the Sacramento.

The number of king salmon estimated to have spawned in the main stem of the Sacramento River between A.C.I.D. Dam and Ord Ferry is 67,189. This figure includes 7,689 fish trapped at Keswick Dam and spawned at Coleman Hatchery.

A summary of the data pertaining to spawning population estimates in the Sacramento River is presented in Table 1.

TABLE 1

King Salmon Carcass Recovery and Population Estimates for the Sacramento River, 1957

River Section	Distance in miles	No. of counting trips	No. of salmon counted*	Estimated percentage counted	Estimated spawning population
Keswick Dam Fish Trap	--	--	7689**	--	7689**
A.C.I.D. Dam to Highway 44 Bridge	4.0	14	125	2.0	6200
Highway 44 Bridge to Upper Anderson Bridge	9.1	14	144	1.0	14400
Upper Anderson Bridge to Ball's Ferry	8.4	14	488	2.5	19500
Ball's Ferry to Jelly's Ferry	8.5	11	26	0.5	5200
Jelly's Ferry to Iron Canyon	15.0	4	5	0.4	2000
Iron Canyon to Tehama	23.5	7	68	0.75	9100
Tehama to Squaw Hill Bridge	11.0	5	8	0.5	1600
Squaw Hill Bridge to Highway 32 Bridge	17.0	--	--	--	1000***
Highway 32 Bridge to Ord Ferry	18.7	--	--	--	500***
Totals	115.2	--	8553	--	67,189

* Includes skeletons

** Does not include 1540 winter-run fish trapped and later released in Battle Creek

*** Estimates based on redd counts

SACRAMENTO RIVER TRIBUTARIES NORTH OF BUTTE CREEK

Mill Creek

The 1957 run of king salmon in Mill Creek was larger than the 1956 run. The stream section between Clough Dam and the Mill Creek Fisheries Station at Highway 99E was covered eight times by survey crews during the season and the section between the Mill Creek Station and the mouth was surveyed four times. A total of 795 carcasses was recovered which represents an estimated 20 percent of the king salmon spawning in Mill Creek below Clough Dam. The estimated number of king salmon spawning below Clough Dam is 3,975.

The number of king salmon spawning in Mill Creek above Clough Dam was determined by counting the fish as they passed through the fishway on Clough Dam. During the season 1,341 king salmon were counted over Clough Dam.

The total number of king salmon estimated to have spawned in Mill Creek both below and above Clough Dam is 5,316 fish.

Deer Creek

Spawning estimates for 1957 in Deer Creek showed a considerable increase over those of 1956. Ample water flows generally contributed to the good conditions in Deer Creek.

Nine counting trips were made from the County Bridge above Stanford Vina Dam to the mouth. Spot checks and one aerial flight revealed little spawning activity between Deer Creek Canyon and the County Bridge. A total of 439 salmon carcasses was recovered by the crews. It is estimated that this represents 20 percent of the spawning population and that the number of king salmon estimated to have spawned in Deer Creek during the 1957 season is 2,195 fish.

Battle Creek

The 1957 fall-run of king salmon in Battle Creek showed a considerable drop over that of 1956, both in the number of fish spawning in the stream and those entering Coleman Station.

A total of 457 salmon carcasses was recovered in Battle Creek during eleven counting trips. This recovery represents an estimated 20 percent of the run. The number of king salmon spawning in Battle Creek below Coleman Station is estimated to be 2,285 fish.

A total of 3,045 king salmon entered Coleman Station and were artificially spawned.

The total number of king salmon estimated to have spawned in Battle Creek in 1957 including those taken at the hatchery is 5,330 fish. These figures do not include 1,540 winter-run fish trapped at Keswick and later released in Battle Creek.

Antelope Creek

A total of 127 salmon carcasses was recovered in Antelope Creek during five counting trips between the Canyon Mouth and Cone Grove. It is estimated that this recovery represents fifteen percent of the run. The total run is estimated to number 838 salmon.

Cow Creek

Seven counting trips were made on Cow Creek during the season. A total of 70 carcasses was recovered. It is estimated that ten percent of the salmon spawning in Cow Creek were examined and that the size of the run was 700 fish.

Cottonwood Creek

Over 53 miles of stream are available to fall-run salmon on Cottonwood Creek. The main stem carried the largest percentage of salmon utilizing the stream in 1957 with the fish concentrating in two sections: one near the mouth and the other about six miles above the Highway 99 Bridge.

Most of the available spawning gravel in the North Fork was covered by heavy sand and silt, which may account for lack of spawning activity in this section.

The lower section of the Middle Fork was utilized to a great extent, considering the overall small run of salmon in this drainage. The water was clear during the major portion of the spawning season.

Even though the potential spawning capacity of the South Fork of Cottonwood Creek is great and water conditions were good, very few salmon made use of the 25 miles of stream available to them downstream from McCarthy Dam. The total number of salmon estimated to have spawned in Cottonwood Creek in 1957 is 358 fish.

Thomes Creek

During normal years, Thomes Creek does not carry a dependable flow of water for spawning salmon and their progeny. This year, however, water conditions were good. Aerial survey and two carcass cutting trips revealed little spawning activity. Most of the spawning took place between Richfield (Highway 99W) and Paskenta. The king salmon spawning population was estimated at 25 fish.

Clear Creek

A total of 66 salmon carcasses was recovered during six counting trips on Clear Creek. It is estimated that 20 percent of the salmon spawning in Clear Creek were recovered and that the run numbered 330 fish.

Other Tributaries North of Butte Creek

Other tributaries which were surveyed and their king salmon spawning population estimates are: Dye Creek, 25; Stillwater Creek, 140; Ash Creek, 10; Bear Creek, 30; and Chico Creek, 50.

The following streams were surveyed and found to have no salmon spawners: Toomes Creek, Churn Creek, Spring Gulch, Olney Creek, Niles Canyon (China Gulch), Pine Creek, Paynes Creek, Stony Creek, Craig Creek, Spanish Creek, Elder Creek, and Oregon Gulch.

Table 2 summarizes the data on the Sacramento River tributaries north of Butte Creek.

TABLE 2

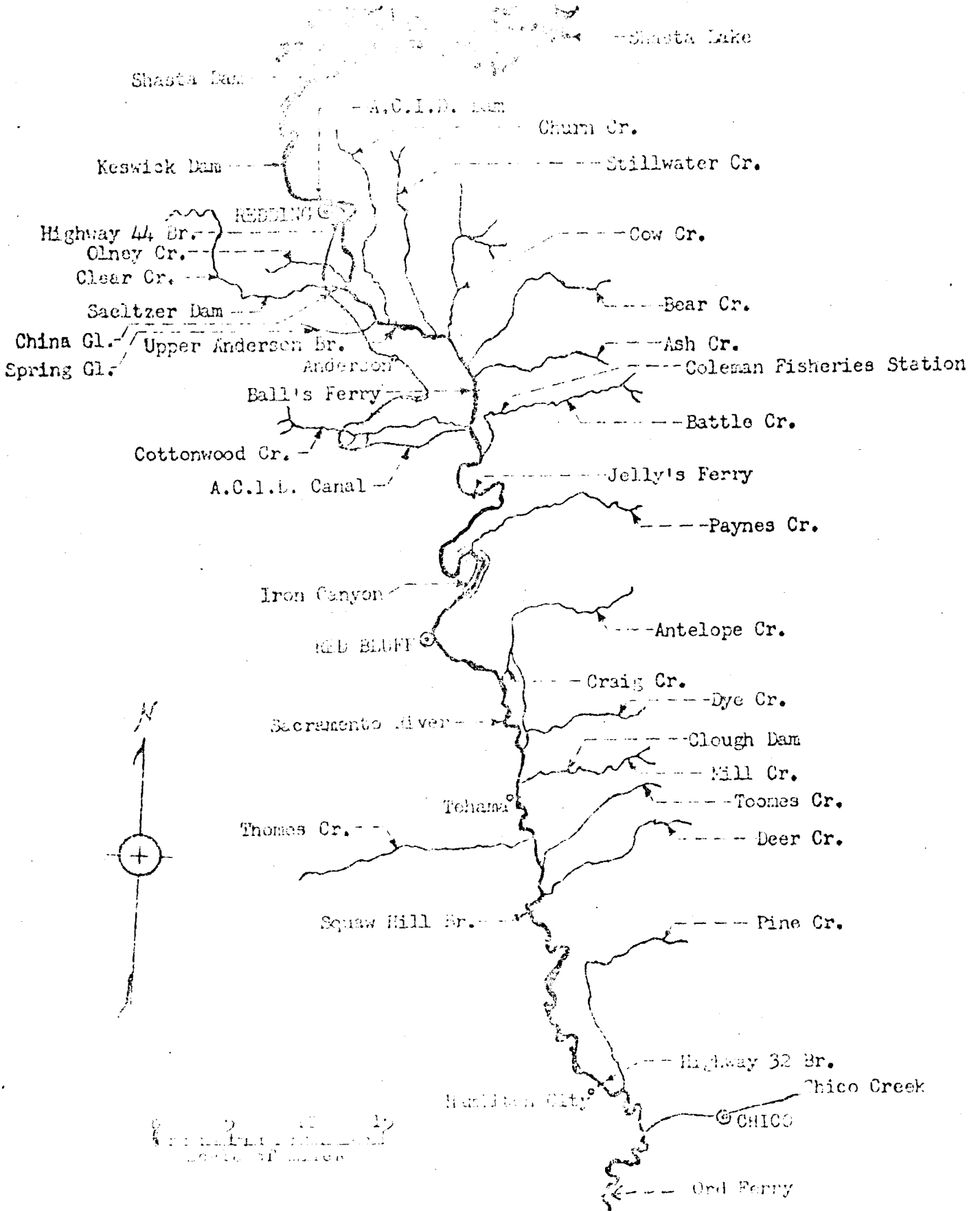
King Salmon Carcass Recovery and Population Estimates
for Sacramento River Tributaries North of Butte Creek

1957

Stream	No. of counting trips	No. of salmon counted*	Estimated percentage counted	Estimated spawning population
Mill Creek (above Clough Dam)	--	1341	--	1341
(below Clough Dam)	12	795	20.0	3975
Deer Creek	9	439	20.0	2195
Toomes Creek	2	0	--	0
Dye Creek	1	5	--	25
Clear Creek	6	66	20.0	330
Cow Creek	6	70	10.0	700
Churn Creek	1	0	--	0
Stillwater Creek	3	14	10.0	140
Ash Creek	2	1	--	10
Bear Creek	4	6	--	30
Thomes Creek	2	3	--	25
Antelope Creek	5	127	15.0	838
Cottonwood Creek	7	43	12.0	358
Spring Gulch	1	0	--	0
Olney Creek	1	0	--	0
Niles Canyon (China Gulch)	1	0	--	0
Pine Creek	1	0	--	0
Paynes Creek	1	0	--	0
Stony Creek	1	0	--	0
Chico Creek	1	1	--	50
Battle Creek (Coleman Hatchery)	--	3045	--	3045
(below Coleman H.)	11	457	20.0	2285**
Totals		6413		15,347

* Includes skeletons

** Does not include 1540 winter-run king salmon
trapped at Keswick and released in Battle Creek



Map of Sacramento River and Tributaries Above Butte Creek Covered during the 1941-42 Survey. Damming Area away.

SACRAMENTO RIVER TRIBUTARIES SOUTH OF CHICO CREEK

Butte Creek

Salmon spawning population estimates for Butte Creek are for spring-run fish. The spawning area for spring-run salmon on Butte Creek extends from DeSabra Dam, the upper limit, to a short distance below Parrot-Phelan Dam.

The section of stream between DeSabra Dam, the upstream barrier to salmon migration, and the Centerville Powerhouse, a distance of seven miles, is characterized by low flows since the main flow is diverted through a ditch from DeSabra to the Centerville Powerhouse. This area is also deficient in suitable spawning gravel and consists largely of bedrock in the upper area. Two counting trips were made in this area and a total of 63 carcasses was recovered.

However, examination disclosed that 25 of the salmon examined here were ripe or partly spent and that because of low flows the live fish were unable to get out of the deeper pools and reach suitable spawning gravel.

Two counting trips were made on the stream section between Centerville Powerhouse and Parrot-Phelan Dam. This stream section has adequate flows since it receives all of the flow which has been diverted through the powerhouse. Suitable gravel, along with good holding pools, is abundant here. One hundred ninety-four carcasses were recovered in this section.

It is estimated that the spring run of king salmon in Butte Creek consisted of 2192 fish.

One survey trip was made to determine if any fall-run salmon were spawning in Butte Creek. None was found.

Feather River

West Branch of the North Fork

Two counting trips and one aerial survey were made on the West Branch. No carcasses were observed nor was there any evidence that spawning had taken place in this tributary.

South Fork

Flows were quite low in the South Fork during the season. Two counting trips were made but no carcasses were recovered. No live fish or redds were seen. The tributary was also surveyed from the air.

North Fork

The North Fork in most years supports a small spring-run in the Big Bend section between the Intake Dam and the Las Plumas Powerhouse. However, in 1957 the stream was so muddy from upstream construction work that survey crews were unable to determine if any spawning had occurred in this tributary. Coverage was made both from the air and on the ground.

Middle Fork

Two counting trips were made on the Middle Fork during the season. The rugged terrain surrounding this stream generally hinders the recovery of carcasses; therefore, the spawning population estimates are based on live fish counts and aerial redd counts. It is estimated that 500 spring-run salmon spawned in the Middle Fork during 1957.

Main Section

The main section of the Feather River between Oroville and the mouth of Honcut Creek is the most important salmon spawning tributary of the Sacramento River. In 1955 an estimated 86,000 salmon spawned here; however, this declined to 18,000 in 1956 and to a new low in 1957.

High waters hampered carcass recovery work early in the season but the river dropped and provided excellent recovery conditions during the peak of the die-off. Spawning conditions were good and the fish were relatively unmolested by poachers who were hindered by the high water conditions.

Counting trips and percentage recovery varied with the stream section. The total number of carcasses recovered was 735 and the estimated number of fall-run king salmon spawning in this portion of the Feather River is 10,250 fish.

Yuba River

The Yuba River contains some of the finest spawning riffles in the Central Valleys; however, low flows (no flows in some years) and unscreened diversions have kept the salmon population far below its potential. 1957 was a particularly poor year; although flows were adequate, salmon were scarce. A total of 154 carcasses was examined on the river between Flue Point Mine and the Baldwin Gravel Plant. The number of king salmon estimated to have spawned in the Yuba River in 1957 is 1205.

To an already depleted run another blow was struck during November. A construction company, earlier in the year, built a check dam across the main channel of the river approximately $\frac{1}{4}$ mile below Daguerre Point Dam so that they could remove gravel from this area. This diverted the river into a side channel which normally is dry except at high water stages. In November the check dam was removed and the stream rediverted into a channel in which the construction company had been removing gravel.

This resulted in a loss in the side channel of the following: 51 completed redds, 15 incompletd redds, 36 ripe or partially spent salmon, 2 steelhead (Salmo gairdneri gairdneri), and a number of other game fish. Another 15 salmon, stranded in deeper holes, were also lost. Because of the nature of the terrain it was not possible to rescue those fish that were found alive.

Bear River

One survey of the spawning area on the Bear River upstream from the Highway 99E Bridge was made. No carcasses were found nor was there any evidence that spawning had taken place.

American River

The 1957 run of king salmon in the American River was comparable in size to that of 1956. Ten counting trips were made on the river between Nimbus Hatchery and the Del Paso Gravel Plant. A total of 1408 carcasses was recovered in this section. In the area between the Nimbus Hatchery racks and Nimbus Dam 1105 carcasses were recovered.

Eight hundred seventy-five salmon entered Nimbus Hatchery and were artificially spawned; this figure includes 258 grilse.

The number of king salmon estimated to have spawned in the American River in 1957 is 7707. This figure includes the fish entering Nimbus Hatchery and spawned artificially.

Although the 1957 run was comparable in size to that of 1956 the eggs after deposition were subject to such adverse conditions that the success of the run was undoubtedly low.

Water temperatures remained above the desirable level for successful salmon spawning until late in November; then, when temperatures dropped to a suitable level, water releases from Nimbus Dam were manipulated to produce flows down to 500 cubic feet per second. Since most of the spawning occurred at flows of 2500 cubic feet per second these smaller releases resulted in the exposure of a number of redds.

Several of the exposed redds were dug up and the eggs examined. The eggs in the upper four inches were found to be dead or dying and those below this depth were in good condition. Since releases were subsequently increased, the damage is difficult to assess.

TABLE 3

King Salmon Carcass Recovery and Population Estimates
for Sacramento River Tributaries South of Butte Creek

1957

Stream and/or stream section	No. of counting trips	No. of salmon counted*	Estimated percentage counted	Estimated spawning population
Butte Creek				
Paradise Flat to Centerville	2	63	25.0	252
Centerville to Parrot-Phelan Dam	2	194	10.0	1940
Bear River	1	--	--	--
Feather River				
Middle Fork	2	1	--	500**
North Fork	1	--	--	0
South Fork	2	--	--	0
West Branch of North Fork	2	--	--	0
Main Section				
Oroville to Sutter Butte Dam	7	173	10.0	1730
Sutter Butte Dam to Gridley	6	469	7.0	6660
Gridley to Honcut Creek	6	93	5.0	1860
				16750
Yuba River				
Blue Pt. Mine to Highway 20 Bridge	4	29	5.0	580
Highway 20 Br. to Baldwin Gravel Pl.	6	125	20.0	625
American River				
Nimbus Hatchery	-	875	--	875***
Nimbus Dam to hatchery racks	-	1105	92.0	1200
Racks to Del Paso Gravel Plant	10	1408	25.0	5632
Totals		4535		21,854

* Includes skeletons

** Based on live fish count and aerial redd count

*** Fish taken at the hatchery to January 17, 1958

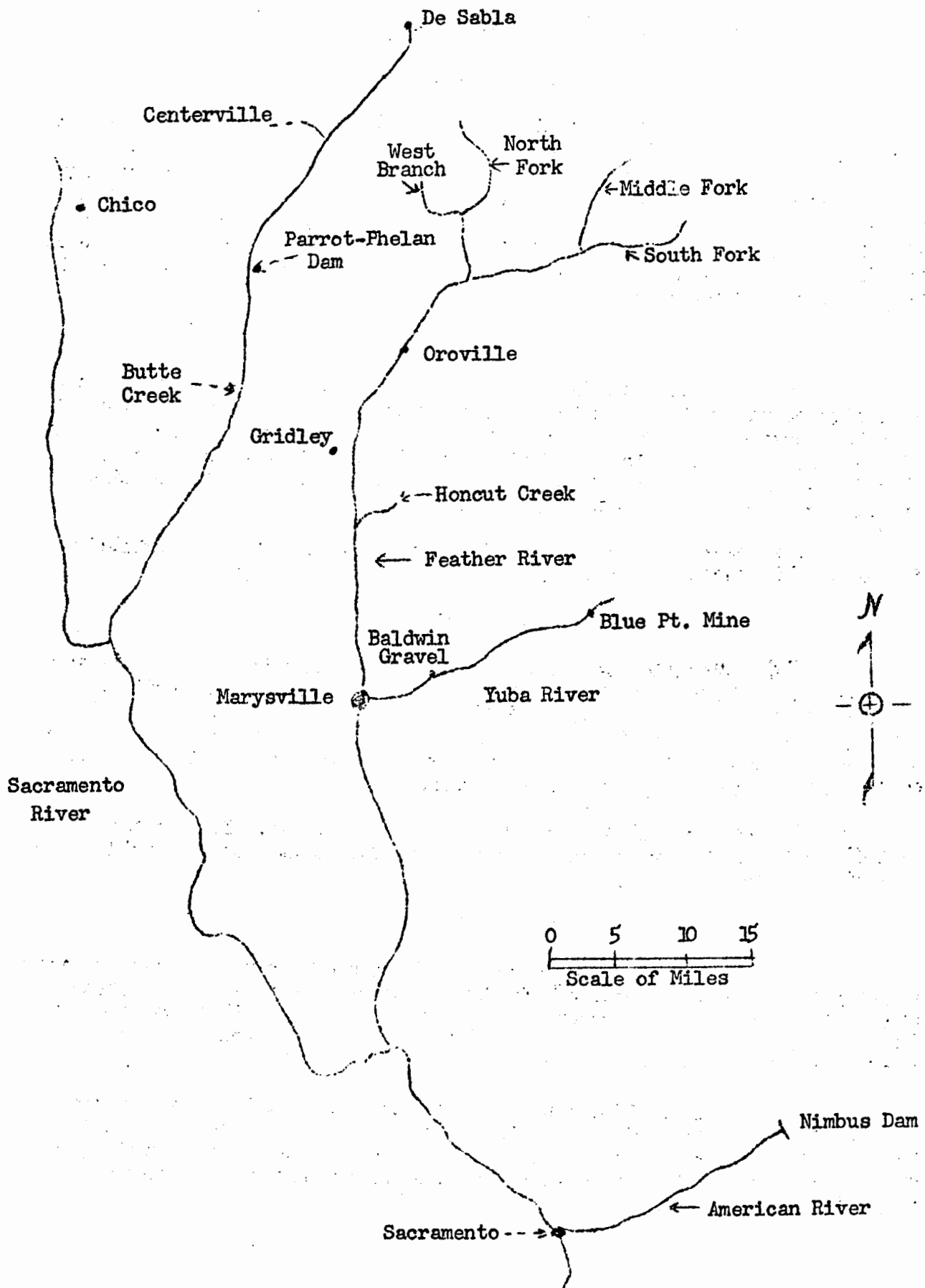


Figure 2. Sacramento River Tributaries South of Chico Creek Covered During the 1957 Spawning Area Survey

SAN JOAQUIN RIVER SYSTEM

Cosumnes River

Flows in the Cosumnes River in most years are hardly sufficient to support a salmon run. In spite of slightly increased flows in 1957 the salmon were unable to reach the spawning areas until the middle of November. Spawning continued from that time until the latter part of December. Nine counting trips were made in the section between Michigan Bar and Bridgehouse and seven trips between Bridgehouse and Sloughouse. A total of 142 carcasses was recovered. It is estimated that the total number of king salmon spawning in the Cosumnes River in 1957 was 642.

Mckelumne River

The size of the Mokelumne River salmon run was determined by counting the fish as they passed through the fishway at Woodbridge Dam. The counting station was opened on October 5 and the first salmon was counted that day. Fish utilized the high ladder until November 20 when the boards were removed from the dam and the lower ladder put into operation. Counting continued until December 27 when the station was closed.

The total number of king salmon counted at Woodbridge fish ladder during the 1957 season was 2400.

Stanislaus River

Eight counting trips were made in the 2-mile bar area and six in each of the other stream sections during the season. Recovery conditions were generally favorable with the silting from gravel operations which had hampered recovery in 1956 alleviated. It was noted, however, that one of the more important spawning riffles in the lower section of the river had been completely destroyed by removal of gravel.

A total of 818 salmon carcasses was recovered. It is estimated that this was a 20 percent recovery and that 4090 salmon spawned in the Stanislaus River in 1957.

Tuolumne River

Eight counting trips were made on each of the three river sections during the season. A total of 1634 carcasses was recovered. It is estimated that the carcasses counted represent 20 percent of the salmon spawning in the Tuolumne River. The 1957 run of salmon in the Tuolumne is estimated to number 8170 fish, an increase over 1956.

Although the 1957 run was larger than that of 1956 it was composed of a large number of grilse thus lowering the spawning effectiveness. Of the total number of carcasses recovered, 847 or 57 percent were grilse, 302 or 20 percent were larger males, and 335 or 21 percent were females; the remainder were skeletons.

Merced River

Four counting trips were made between Shaffer Dam and Cressey Bridge on the Merced River. A total of 19 salmon carcasses was recovered. It was estimated that the 1957 king salmon spawning population on the Merced River consisted of 400 fish. Although this is a small run it is a healthy increase over 1956 when no fish were observed spawning in this stream. However, the run was subjected to extensive poaching. Most spawning riffles on the Merced have well-worn trails leading to them and they appeared to have been heavily used during the season.

TABLE 4

King Salmon Carcass Recovery and Population Estimates
for San Joaquin River Tributaries

Stream and/or stream section	No. of counting trips	No. of salmon counted*	Estimated percentage counted	Estimated spawning population
Cosumnes River				
Michigan Bar to Bridgehouse	9	74	20.0	370
Bridgehouse to Sloughhouse	7	68	25.0	272
Mokelumne River	-	2400	--	2400**
Stanislaus River				
Goodwin Dam to Knights Ferry	8	70	20.0	350
Knights Ferry to Orange Blossom Br.	6	290	20.0	1450
Orange Blossom Br. to Oakdale	6	199	20.0	995
Oakdale to Riverbank	6	259	20.0	1295
Tuolumne River				
La Grange to Rairden's Farm	8	603	20.0	3015
Rairden's to Roberts Ferry Br.	8	529	20.0	2645
Roberts Ferry to Reed Rock Plant	8	502	20.0	2510
Merced River				
Shaffer Dam to Cressey Bridge	4	19	20.0	380
Totals		5013		15,682

* Includes skeletons

** Live fish count

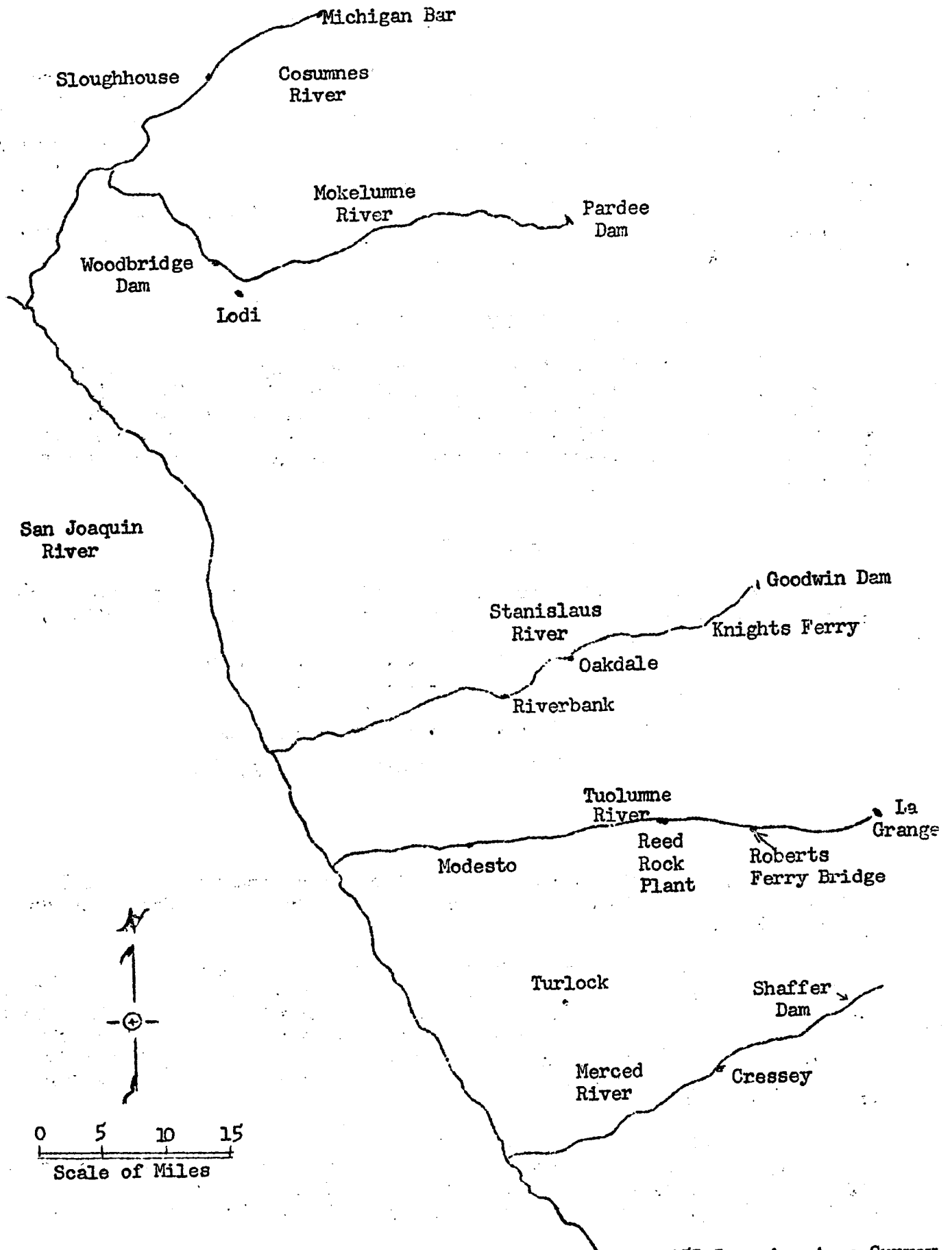


Figure 3. San Joaquin River Tributaries Covered During 1957 Spawning Area Survey

SILVER SALMON

Silver salmon (Oncorhynchus kisutch) were introduced into Mill Creek in 1956; a subsequent plant was made in 1957 in the same stream. Counts at the Clough Dam counting station on Mill Creek indicated that 1523 of these fish returned to spawn in the stream above the dam during 1957. Survey crews recovered the carcasses of an additional 49 silvers which had spawned in Mill Creek below the dam. Other streams from which silvers had been recovered and the number of recoveries are: Deer Creek, 3; Antelope Creek, 5; Sacramento River, 1; Battle Creek below Coleman, 6; Battle Creek, Coleman Hatchery, 900; Mokelumne River, 2; American River, Nimbus Hatchery, 5.

1957 KING SALMON SPAWNING ESTIMATE TOTALS

It is estimated that the total number of king salmon spawning in the Sacramento-San Joaquin River system in 1957 was 120,072; 104,390 in the Sacramento River and tributaries and 15,682 in the San Joaquin tributaries. These estimates are for fall-run fish with the exception of Butte Creek and the Middle Fork of the Feather River where they are entirely for spring-run fish.

SURVEY COST

The following is a cost breakdown of the 1957 salmon spawning stock survey. Figures include salaries of persons employed at counting stations.

Salaries and expenses	\$19,645.00
Supplies and repairs	480.00
Automobile (at 5¢ per mile)	1,805.00
Aerial surveys	<u>335.00</u>
Total	\$22,265.00

SUMMARY

The California Department of Fish and Game conducted its annual inventory of king salmon spawning stock in the Sacramento-San Joaquin River system in 1957.

Spawning population estimates were obtained primarily by counting salmon carcasses, estimating what percentage of the run had been counted, then calculating the total population for each stream or stream section. Live fish counts were made at Clough Dam on Mill Creek, Woodbridge Dam on the Mokelumne River, Coleman Hatchery and Nimbus Hatchery. Aerial redd counts formed the basis for population estimates on one area of the Sacramento River and one of the Feather River.

A total of 24,514 salmon, including live and dead counts, was examined. It is estimated that 120,072 king salmon spawned in the Sacramento-San Joaquin River system during the 1957 season, 104,390 spawning in the Sacramento River and tributaries and 15,682 in the San Joaquin tributaries.