State of California
The Resources Agency
Department of Fish and Game
Anadromous Fisheries Branch
and
Regions 2 and 4

KING (CHINOOK) SALMON SPAWNING STOCKS IN CALIFORNIA'S CENTRAL VALLEY, 1969[1/]

Edited by
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SUMMARY

During 1969, the California Department of Fish and Game conducted its 17th annual king (chinook) salmon (Oncorhynchus tshawytscha) spawning stock inventory of the Sacramento-San Joaquin River System.

Counts of carcasses, live fish, and redds were the base for spawning estimates.

During 1969, an estimated 342,000 (341,768) king salmon spawned in the Sacramento-San Joaquin River System as compared with an estimated 211,000 fish in 1968. Of these, 289,556 (85 percent) spawned in the Sacramento River and its tributaries from the American River north.

King salmon counts and population estimates were as follows:

	Fall Run	Spring Run	Combined
Sacramento, Main Stem	133,252	20,000	153,252
Northern Sacramento River Tributaries (North of Chico Creek)	21,853	No estimate	21,853
Southern Sacramento River Tributaries (Chico Creek and South)	113,393	1,378	114,451
San Joaquin River Tributaries (Including the Mokelumne and Cosumnes rivers)	52,212	None	52,212
TOTAL	320,710	21,378	341,768

Fall-run estimates were made on all major streams and on most minor streams which have a fall run in most years. Some spring-run fish could not be separated from the fall-run and were included in the fall-run estimates.

Spring-run estimates are incomplete; they were made on only four streams.

No winter-run fish are included in any of these estimates.

1/ Anadromous Fisheries Administrative Report No. 70-14
Submitted October 1970

INTRODUCTION

This report covers the 17th annual Central Valley king (chinook) salmon spawning stock inventory. Estimates and counts were principally of fall-run fish; for a few streams, separate spring-run salmon stock estimates were included. Spring-run salmon were included in fall-run estimates for areas of the Feather River where an overlap in time of spawning made it impractical to separate fall- and spring-run stocks. Winter-run salmon began entering the upper Sacramento River just as the survey ended; these fish are almost entirely confined to the main stem of the Sacramento River. The winter-run spawning period extends from April into July; therefore few, if any, winter-run fish were included in the carcass counts. In 1969, the total spawning stock estimate of fall-run king salmon in the Central Valley was 342,000, which was a significant increase over last year's (1968) estimate of 211,000 fish.

A summary of estimates of all streams for years 1953 through 1969 is presented in Table 1.

METHODS

Most population figures were obtained by counting dead salmon and estimating what percentage of the run was counted. Although this method may not give as accurate an estimate of salmon populations as the use of a counting station, it is at present the most economical method for large-scale statewide programs. Dependability and accuracy of this method is based primarily on two factors: (1) The relationship to tag-and-recovery studies on selected streams. In a tag-and-recovery study, fish are usually caught, tagged, and released near the downstream end of a spawning area. After the fish have spawned and died, as many carcasses as possible are recovered, and the ratio of tagged-to-untagged fish is determined. (2) The availability of a well-trained observer who is familiar with methods of evaluation. The tag-and-recovery method has proven quite valuable as a method of training personnel to estimate the size of the run in a stream. After a man has learned from a tagging experiment the proportion of fish he can expect to see under certain conditions such as quantity of flow, amount of turbidity, and weather conditions, he is much better able to estimate the size of the run in a stream where no tagging has been done.

Carcasses were examined for fin marks, tags, sex and completeness of spawning, and were then cut in half to prevent recounting on subsequent trips. Aerial counts of redds and live fish were used in conjunction with carcass recovery for population estimates in some stream sections. Additional counts were made at fishways, hatcheries, and egg-collecting stations.

Regions 2 and 4 surveyed streams in their regions and prepared individual reports. Anadromous Fisheries Branch surveyed streams in Region 1 and also served as liaison between regions to assure uniformity of methods

and compiled the regional reports into this annual report. Spawning stock surveys were conducted by 14 Department of Fish and Game personnel as follows: Afb, four; Region 2, eight; and Region 4, two. This does not include personnel at counting stations.

MAIN STEM OF SACRAMENTO RIVER
(Figure 1)

by

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The Sacramento River spawning stock survey began on October 10, 1969, and ended on January 8, 1970. It included an inventory of salmon that spawned from mid-September through December; i.e., spring-run and fall-run fish.

The area surveyed was from Keswick Dam to Squaw Hill Bridge (Woodson Bridge) near Corning. Although some salmon generally spawn as far downstream as Hamilton City (west of Chico) and below, their numbers are normally so small that no surveys were made below Squaw Hill Bridge.

Fall Run

Water in the Sacramento River below Keswick Dam was clear, and the flow was stabile at about 7,500 cfs during most of the survey period but there were several short deviations from this. The flow was reduced to about 4,000 cfs on November 11 and then returned to 7,500 cfs on November 13. On December 12 the flow was reduced again, this time to 6,000 cfs for a few days. The first significant high flows occurred in mid-December, several weeks after the spawning peak was reached. Approximately 11,000 cfs was released at Keswick at this time. Some stranding of salmon occurred at the reduced flows because they were reduced too rapidly. The decreases in flow provided very good carcass recovery conditions.

A total of 6,370 salmon carcasses were counted between Keswick Dam and Squaw Hill Bridge from October 10, 1969 to January 8, 1970. The coverage ranged from 12 counting trips on four river sections above Red Bluff to two trips in the area immediately below Keswick Dam (Table 2). One aerial redd count was made between Squaw Hill Bridge and Redding on October 28 and 29, 1969 to "firm up" the population estimates. During the flight, 1,780 redds were observed.

Based on the above information, plus 1,052 fish trapped at Kewsick Dam, the estimated number of fall spawners in the main stem Sacramento River was 133,252 (Table 2).

The most noticeable population change between 1968 and 1969 was the increase in numbers of salmon utilizing the area between Redding and Jellys Ferry. The number spawning in this area in 1969 was almost double that of the previous year.

Spring Run

It was estimated that 20,000 spring-run salmon spawned in the main stem Sacramento River above Red Bluff Diversion Dam. This estimate is based on periodic sampling at the U. S. Fish and Wildlife Service's fish trapping facility at Red Bluff Diversion Dam during the spring of 1969, rather than upon any attempt to separate spring-run from fall-run carcasses during early October 1969. Therefore, there is no breakdown of the total spring-run estimate included in Table 2 into numbers that spawned in each river section and no separation of the small numbers which may have spawned in tributaries of the Sacramento River.

Comparison of Salmon Count at Red Bluff Diversion Dam with the Spawning Stock Survey Estimate

A total of 110,253 fall-run salmon were counted past Red Bluff Diversion Dam from July 1, 1969, through January 3, 1970. Interpolation was used to compensate for 12 days when no counter was present and the total was increased to 112,872. Additional compensation of 4.2 percent was made for the nighttime hours when no counting was done, but when the fishway was open. This increases the total to 117,612. In addition to the fall-run salmon there were also 20,000 spring-run salmon that passed the dam during the spring of 1969, and remained in the upper river until fall to spawn. The total fishway counts show 137,612 spring- and fall-run salmon passed the Red Bluff Diversion Dam in 1969.

The spawning stock survey estimate indicates that 154,815 salmon spawned upstream from Red Bluff Diversion Dam in the fall of 1969. This includes the 20,000 spring-run fish counted at Red Bluff Diversion Dam, plus the estimated 115,652 fall spawners in the main stem, and 19,163 fall spawners in the tributaries.

Thus the fishway counts show 137,612 salmon passed Red Bluff Diversion Dam in 1969, and the spawning stock survey estimates show there were 154,815; a difference of 17,206. There are possible sources of error in both the count and the estimate, but the count should be presumed to be more accurate.

SACRAMENTO RIVER TRIBUTARIES NORTH OF CHICO CREEK (Figure 1)

by
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Low flows and high water temperatures prevailed in the upper Sacramento River tributaries in 1969 as they did in 1968. Salmon did not move into the tributaries in significant numbers until early November in both years. In 1969 the total estimate for Sacramento River tributaries north of Chico Creek was 21,853 fall-run salmon (Table 2). This estimate is only slightly less than the 1969 total (24,766).

Clear Creek

Fall Run

Three survey trips were made on Clear Creek from Saeltzer Dam to the mouth. On the first trip (November 7) 12 carcasses were recovered and 100 live salmon observed. On the second trip (November 21st) 75 carcasses were recovered and 45 live salmon observed. On the third trip (January 6) 223 carcasses were recovered and five live salmon observed. On all three trips the water was clear and recovery conditions were good. A total of 310 carcasses and 150 live salmon were counted on Clear Creek. The run was estimated to be 1,240 fish (Table 3).

Spring Run

None.

Cow Creek

Fall Run

Three survey trips were made on the main stem of Cow Creek and on Little (North) Cow Creek. Only one trip was made on South Cow Creek.

The main stem was surveyed from Highway 44 Bridge at Palo Cedro to Dersch Road Bridge, which is about one mile above the mouth. On the first trip (November 12) 53 carcasses were recovered and 75 live salmon counted. On the second trip (November 25) 137 carcasses were recovered and 90 live salmon counted. On the third trip (December 16) 30 carcasses were recovered and 15 live salmon counted. During the first two trips the water was clear and on the third trip the water was high and slightly murky.

A five mile section at Little (North) Cow Creek was surveyed from below Bella Vista to the confluence of Main Cow Creek (Highway 44 Bridge). On the first trip (November 14) 40 carcasses were recovered and 30 live salmon counted. On the second trip (December 1) 88 carcasses were recovered and 10 live salmon counted. On the third trip (December 15) 72 carcasses were recovered and 12 live salmon counted. On the first two trips the water was low and clear, and on the third trip the water was high and slightly murky.

Only one trip was made on South Cow Creek. The area covered was a ten mile section above the confluence of Little (North) Cow Creek. On December 4 and 5, a total of 137 carcasses were recovered and 36 live salmon counted. The water was clear and recovery conditions were good.

A total of 557 carcasses and 268 live salmon were counted on Cow Creek. The run was estimated to be 5,570 (Table 3).

Spring Run

No estimate was made in 1969.

Cottonwood Creek

Fall Run

Because of its considerable length, the main stem of Cottonwood Creek was divided into two sections to facilitate carcass recovery. The upper section, about 6 miles in length, comprised the area from the confluence of the North Fork to the confluence of Dry Creek. The lower section included the area from the confluence of Dry Creek to the mouth, approximately 13 miles. The upper section was surveyed only once, on November 18. On this date 24 carcasses were recovered and 20 live fish observed. The water was clear and low. Three trips were made on the lower section. On the first trip (November 6) 26 carcasses were counted and 200 live salmon observed. On the second trip (November 19) 131 carcasses were recovered and 65 live salmon observed. On the third trip (December 17) 13 carcasses were recovered and eight live salmon observed. On the first two trips the water was clear, but on the last trip the water was high and murky.

The North Fork of Cottonwood Creek was surveyed twice from the second bridge above the mouth (Sullivan Place) to its confluence with the Middle Fork. This is about a four mile section of river. Trips were made on November 4 and 18, but no carcasses or live salmon were observed. Water conditions were low and clear during both trips. Few if any salmon made their way up the North Fork this season.

The Middle Fork of Cottonwood Creek from Hickman Road gaging station to the confluence of the North Fork, a distance of about five miles, was surveyed twice. Three carcasses were counted on November 4 and two on November 18. No live fish were observed on either day. On both trips the water was low and clear.

The South Fork of Cottonwood Creek from Farquhar Road to the mouth, a distance of 7 miles, was surveyed only once, on November 17. Three carcasses were recovered and seven redds observed. No live salmon were observed. The water was low and clear during this trip.

A total of 202 carcasses and 300 live salmon were counted on Cottonwood Creek and its tributaries. The run was estimated to be 4,967 fish (Table 3).

Spring Run

No estimate was made. Spring-run fish are known to enter Cottonwood Creek, but the population size is unknown.

Antelope Creek

Fall Run

Antelope Creek was surveyed three times from the mouth to about nine miles upstream. On the first trip (November 14) no carcasses were recovered, but five live salmon and six redds were counted. The water was low and clear. On the second trip (January 9) eight carcasses were recovered but no live salmon observed. On the third trip (January 13) eight carcasses were recovered but no live salmon observed. The water was high and murky.

Totals of 16 carcasses and five live salmon were counted on Antelope Creek. The run was estimated to be 180 fish (Table 3).

Spring Run

No estimate was made. Spring-run fish are known to enter Antelope Creek, but the population size is unknown.

Mill Creek

Fall Run

Three survey trips were made from October 30 to December 18. Streamflow was low and clear during the first two trips. During the last trip, which was five days after a major storm, the water was clear and the flow almost down to normal. The recovery rate was good on the first two trips and fair on the last trip.

A total of 103 carcasses and 46 live salmon were counted on the three survey trips of Mill Creek. The run was estimated to be 1,700 salmon (Table 3).

Spring Run

No estimate was made in 1969. Spring-run salmon normally spawn in Mill Creek.

Inks Creek

Fall Run

One survey trip was made on January 13, 1970. The survey covered a two-mile section extending from the mouth upstream. Many redds were observed, indicating that more salmon had spawned than would have been shown by carcass recoveries alone. Recovery conditions were poor because of high murky water.

Seven carcasses and three live salmon were counted. The run in Inks Creek was estimated to be 230 salmon (Table 3).

Spring Run

None.

Stillwater Creek

Fall Run

One survey trip, from the mouth to Highway 44 Bridge, was made on January 6 and 7. The water was low and clear, and the streambed was predominantly silt in this section. Three carcasses were recovered, but no redds or live salmon were observed. The run in Stillwater Creek was estimated to be 150 salmon (Table 3).

Spring Run

None.

Ash Creek

Fall Run

One survey trip was made on December 30 from the mouth upstream four and one-half miles. The water was low and clear, and recovery conditions were fair.

Eight carcasses were recovered and 47 live salmon counted. The run in Ash Creek was estimated at 320 salmon (Table 3).

Spring Run

None.

Deer Creek

Fall Run

Three survey trips were made on Deer Creek: October 31, November 20, and December 18. Recovery conditions were good on the first two trips. The last trip was made five days after a heavy storm which had raised

the stream elevation three to four feet above normal. However, the water was clear and low again when the last trip was made so recovery conditions were fair.

A total of 60 carcasses and 43 live salmon were counted on the three surveys. An estimated 750 salmon spawned in Deer Creek (Table 3).

Spring Run

No estimate was made in 1969. Spring-run salmon normally spawn in Deer Creek.

Bear Creek

Fall Run

Two survey trips were made on Bear Creek: November 18, 1969 and January 7, 1970. On the first trip, the area between Highway 44 Bridge and Parkville Road Bridge (one mile above the mouth) was surveyed, and 38 carcasses were found. The second survey was made between Dersch Road and the mouth where 18 carcasses were recovered. The water was low and clear on the first trip and high and clear on the last trip.

A total of 56 carcasses were counted during the two trips. The run on Bear Creek was estimated to be 560 salmon (Table 3).

Spring Run

None.

Dye Creek

Fall Run

One survey trip (January 13, 1970) was made on Dye Creek between Shasta Boulevard and the mouth, a distance of 3 miles. The water was high but clear which made recovery conditions fair. One carcass, no live salmon, and five redds were observed. The run in Dye Creek was estimated to be 20 salmon (Table 3).

Toomes Creek

Fall Run

One survey trip (January 2, 1970) was made on Toomes Creek from the mouth to approximately two and one-half miles upstream. Water conditions

were low and clear, making recovery conditions good. All spawning apparently took place above Highway 99 Bridge where two carcasses and 15 live salmon were counted. The run was estimated to be 40 salmon (Table 3).

Spring Run

None.

Paynes Creek

Fall Run

One survey trip (December 31, 1969) was made from the mouth to the intersection of Highway 36. Water conditions were low and fairly clear making recovery conditions good. Six carcasses and 25 live salmon were counted. Most of the live salmon were still over the redds. The run was estimated to be 300 salmon (Table 3).

Spring Run

None.

Battle Creek

Fall Run

Ten survey trips were made on Battle Creek in the period October 10, 1969 through January 8, 1970, from Coleman National Fish Hatchery to the mouth. Recovery conditions were good prior to December 11; however, trips made between December 11 and January 8 were made when recovery conditions were poor because of high, murky water.

Bulldozer work was done in the streambed in the summer of 1969 from just below Coleman Hatchery to the old federal hatchery site. This work appeared to have caused more salmon than usual to spawn naturally in the creek this year rather than entering the hatchery.

The total carcass count was 1,922. With an estimated 60 percent carcass recovery, the run below the hatchery was calculated to be 3,200. Another 2,626 salmon entered Coleman Hatchery bringing the estimated total run for Battle Creek to 5,826 fish (Table 3).

Spring Run

No estimate was made. Spring-run fish are known to enter Battle Creek.

SACRAMENTO RIVER TRIBUTARIES, CHICO CREEK AND SOUTHWARD
(Figure 2)

by
Charles Young, Lynn Wixom, and Russ Wickwire - Region 2

Chico Creek

Fall Run

No estimate. (The fall run in Chico Creek is zero in some years and very small in others.)

Spring Run

One survey trip (October 14) was made on Chico Creek from Higgins Hole to just below Ponderosa Way Bridge. The water, as usual, was low and clear, and spawning activity was in progress. Six redds and 13 live salmon were counted below Higgins Hole.

Thirteen carcasses were recovered. The population estimate based on carcass recoveries, live fish, and redd counts was 200 fish (Table 4).

Butte Creek

Fall Run

No estimate. (In some years a few fall spawners have been observed below Highway 99 Bridge.)

Spring Run

Two survey trips were made on Butte Creek between the Centerville Power House and the Covered Bridge in early and mid-October. Only one trip was made between the Covered Bridge and the Paradise Highway Bridge. This section was surveyed only because a heavy rain caused postponement at the mid-point of the second survey. Recovery conditions were poor throughout the survey period because of muddy water.

Butte Creek above the Centerville Power House was also surveyed on August 13 and 14. At this time 23 salmon were counted in holding pools. Spawning may have been somewhat successful this year as there was more water, about 12 cfs, than usual in this section.

Ninety carcasses were recovered in Butte Creek on the two trips. Based on recovered carcasses, live fish, and redd counts the spawning population was 830 fish (Table 4).

Feather River

Fall Run

This is the second year that Oroville Dam has had a major effect on downstream flows. River flows were constant and recovery conditions were good throughout the survey period. Flows were 400 cfs from the Fish Barrier Dam to Thermalito Outfall and 3,000 cfs from Thermalito Outfall to Honcut Creek.

There were eight fin-marked salmon (Ad-RP) recovered in the river. These were all males from 12 to 16 inches long and were released as yearlings from the Feather River Hatchery in January 1969.

Ten survey trips were made on the Feather River from October 13 to December 17, 1969. A total of 14,867 carcasses were recovered from an estimated 56,400 spawners. Combining this figure with 4,378 fish taken at the Feather River Hatchery gives a total run of 60,578 fall-run salmon.

Spring Run

The number of spring-run salmon taken at the Feather River Hatchery was 348 fish. A few may have spawned in the river, but no attempt was made to separate them from fall-run fish.

The total combined run of fall- and spring-run salmon in the Feather River was estimated to be 60,900 (60,926) fish (Table 4).

Yuba River

Fall Run

Spawning activity was minimal throughout the season due to low flows and warm water temperatures. Carcass recovery conditions were favorable during the inventory period which ran from November 17 through December 16, 1969. Flows were from 295 to 335 cfs above Daguerre Point Dam and from 168 to 320 cfs below the dam.

A tagging study, using spaghetti-type tags, was conducted to estimate the salmon population in the Yuba River this season. The number of carcasses recovered was expanded using the ratio of tagged fish recovered to tagged fish released. Of 430 tagged fish released from a trap at Walnut Avenue near Teichert Gravel Plant 88 were recovered.

Five inventory trips were made on the Yuba River and 1,071 carcasses were recovered for an estimated spawning population of 5,230 fish (Table 4).

Spring Run

It is felt that this run is extinct, but there should be a further examination of the river system.

American River

Fall Run

Carcass recovery conditions were favorable in the American River. The water was fairly constant and clear throughout the survey period.

Seven survey trips were made from the Nimbus racks to the Carmichael pumps and six trips from the pumps to the Watt Avenue Bridge.

The number of carcasses recovered below the Nimbus racks was 9,561. Based on this, the estimated population in this section was 38,200 salmon. From the upper side of the Nimbus racks, 5,119 carcasses were recovered. Based on about an 85 percent recovery, the population between the racks and Nimbus Dam was estimated to be 6,000 salmon.

There were 3,065 salmon that entered Nimbus Hatchery, bringing the total population estimate in the American River to 47,200 (47,265) fish (Table 4).

Spring Run

Extinct.

LOWER SAN JOAQUIN RIVER TRIBUTARIES
(Figure 3)

by
Charles Young - Region 2

Cosumnes River

Fall Run

Survey conditions were good on the Cosumnes River as the water was low and clear most of the season. The survey was extended farther upstream this season than in the past. The stream section between Michigan Bar Bridge and Latrobe Bridge was surveyed on December 18, 1969. About one and one-half miles below the Latrobe Bridge is a water fall which is a complete barrier to upstream salmon migration. From the falls downstream to about one mile above Michigan Bar Bridge spawning was fairly heavy.

In this section, 23 carcasses were recovered and 30 live fish seen. Several good spawning riffles are located in this section. Spawning probably takes place in this area every year.

Six survey trips were made between Michigan Bar Bridge and Meiss Road Bridge, plus the one trip above Michigan Bar Bridge. Altogether, 1,327 carcasses were recovered, and the run was estimated to be 4,400 fish (Table 5).

Spring Run

None.

Mokelumne River

Fall Run

The high flows in the Mokelumne River in October attracted salmon up the river earlier than usual. The flow was reduced to 75 cfs for a period of time from November 3 through November 6 so that the Irrigation District could work on Woodbridge Dam. After November 6 it was increased to about 300 cfs for the remainder of the migration season.

During the period when the flashboards in the dam were being removed, about 100 salmon went over the dam. About 30 other salmon died in the rocks at the base of the dam. Before the trap was installed, an estimated 500 salmon went through the ladder. This estimate was based on observations of fish jumping in the pool below the dam and the ones observed going through the ladder at various periods of time by Fish and Game personnel working at the dam prior to installation of the trap. It was also based on the number of fish counted on the first day the trap was installed. All of the salmon ascending the fishway from October 23 through December 8 were trapped and counted; this count amounted to 2,085 fish.

The number of Mokelumne River salmon passing over Woodbridge Dam not including the ones lost in the riprap below the dam, was estimated to be 2,700 (2,685) fish (Table 5).

LOWER SAN JOAQUIN RIVER TRIBUTARIES
(Figure 3)

by
Jerry Goertzen - Region 4

The salmon survey for this area was conducted from November 10, 1969 to January 12, 1970.

Due to a regional budget cut this year, total survey effort was reduced compared to past season's effort. The number of runs on the Stanislaus and Tuolumne rivers was cut from six to four. Effort on the Merced River was increased slightly because of salmon enhancement features under the Davis-Grunsky Grant with Merced Irrigation District.

Stanislaus River

Fall Run

The salmon run in the Stanislaus River was earlier than normal this season. Fish were seen spawning as early as October 23, 1969. Heavy spawning was observed on the first run (November 17-19). Spawning peaked in the lower section about late November and in the upper area about mid-December. Some spawning was still taking place on January 7 and 8, 1970. Carcass recovery conditions ranged from poor to good.

Pre-season flows averaged 600 cfs at Orange Blossom Bridge. On November 2, 1969, the flow was lowered to 120 cfs so a trap could be installed above Orange Blossom Bridge. The flow was then raised slightly to 195 cfs for the operation of the trap. After the trap was removed, the flow was increased to 660 cfs. On December 25 the flow was increased to 2,000 cfs where it remained until January 2. On this date it was lowered to about 950 cfs. For a period of 36 hours, beginning on January 7, the flow was 63 cfs. During this time about 20 percent of the redds were exposed. A few newly emerged fry were seen in a number of shallow pools. Some of the fry, and some planted yearlings were found temporarily stranded; a few were found dead. No adult salmon were seen stranded.

A trap for capturing adult salmon was installed and operated by Region 4 personnel from Moccasin Creek Hatchery. The trap was located about one-half mile above Orange Blossom Bridge and operated from November 7 to 20, 1969. A total of 227 salmon were trapped, of which 143 were females.

Six fin-marked salmon were recovered in the Stanislaus River this season. One Ad-An from the 1967 brood year was from a Feather River Hatchery plant at Rio Vista. One RV from the 1966 brood year was from the Stanislaus River strain and planted in the Merced River. Four LV from the 1966 brood year were from the Stanislaus River strain planted in the Stanislaus River. All of these were planted as yearlings.

Four survey trips were made on the Stanislaus River, and 1,120 carcasses were recovered. The spawning population was estimated to be 12,300 (12,327) fish, including 227 salmon taken at the trap near the Orange Blossom Bridge.

Spring Run

Extinct.

A total of 249,994 yearling salmon (1968 brood-Stanislaus River strain) were planted in the Stanislaus River at Knights Ferry during September and November 1969. These yearlings were seen throughout the survey period (through January 9, 1970) in the vicinity of Knights Ferry, and in most pools as far downstream as Riverbank.

Tuolumne River

Fall Run

The flow in the Tuolumne River fluctuated daily between 700 and 1,800 cfs. Releases were high during the day for electrical power and low at night. On weekends the flow was usually a constant minimum release of about 700 cfs. Water clarity was poor all season but because of the relatively low flows, recovery conditions were considered good all season.

The construction company working on New Don Pedro Dam has leveled dredger tailings along the river from LaGrange to about Turlock State Park. In a few cases this work caused the river to be rechanneled and some split channels have been blocked off.

One fin-marked salmon was recovered from the Tuolumne River this season. It was an Ad-An from the 1967 brood year from a Feather River Hatchery plant at Rio Vista.

Four survey trips were made on the Tuolumne River and 5,885 carcasses recovered for an estimated total population of 32,200 fish.

Spring Run

Extinct.

Merced River

Fall Run

The pre-season flow in the Merced River was 2,000 cfs. The flow was between 2,000 and 3,000 cfs from November 10, 1969 to January 6, 1970. Because of high murky water, recovery conditions ranged from fair to poor. The flooded peripheral areas were too brushy for boat access and too deep for wading, so much of the river could not be checked for carcasses.

Four survey trips were made on the Merced River and 32 carcasses recovered from an estimated spawning population of 600 fish.

Spring Run

Extinct.

A total of 127,004 yearling salmon (Stanislaus River strain - 1968 brood year) were planted in the river at the Bettencourt Ranch at Shaffer Bridge. Plants were made on September 24 and November 18 and 19. Many of these fish were seen throughout the survey period (through January 6, 1970) in pools from the planting site as far downstream as Cressey.

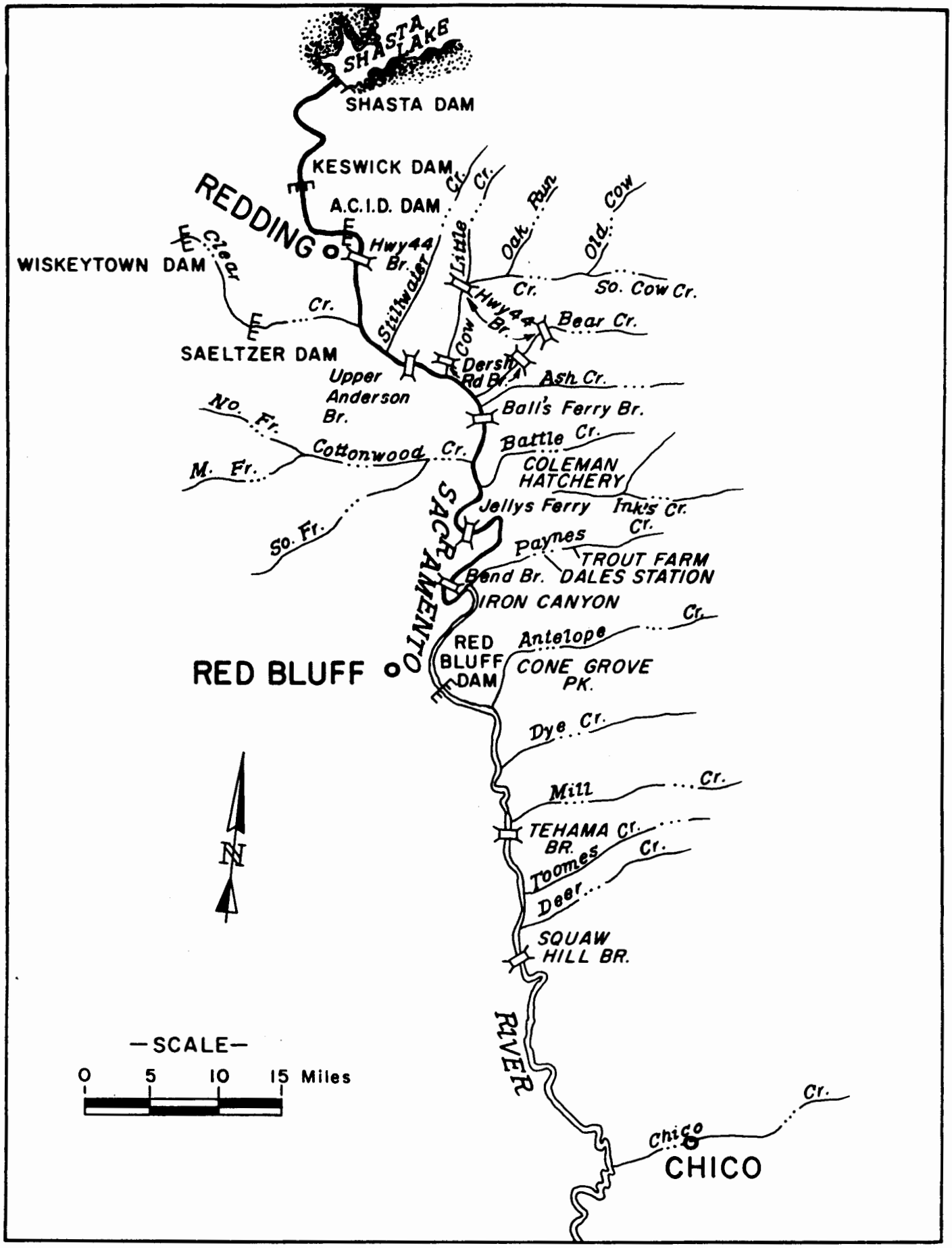

Figure 1. Upper Sacramento River and tributaries above Chico Creek covered during the 1969 king salmon spawning stock survey.

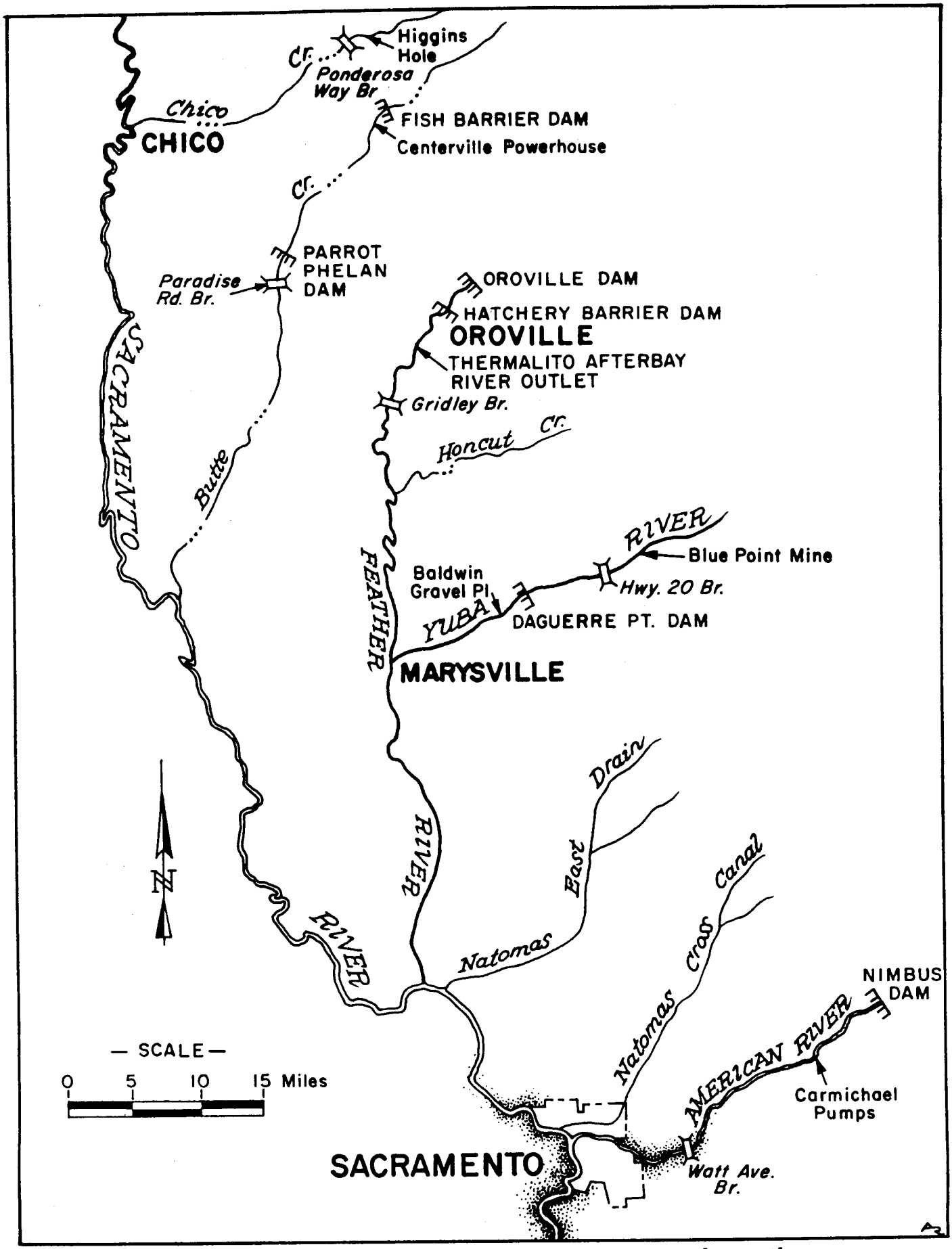

Figure 2. Sacramento River Tributaries from Chico Creek, south, covered during the 1969 King Salmon Spawning Stock Survey.

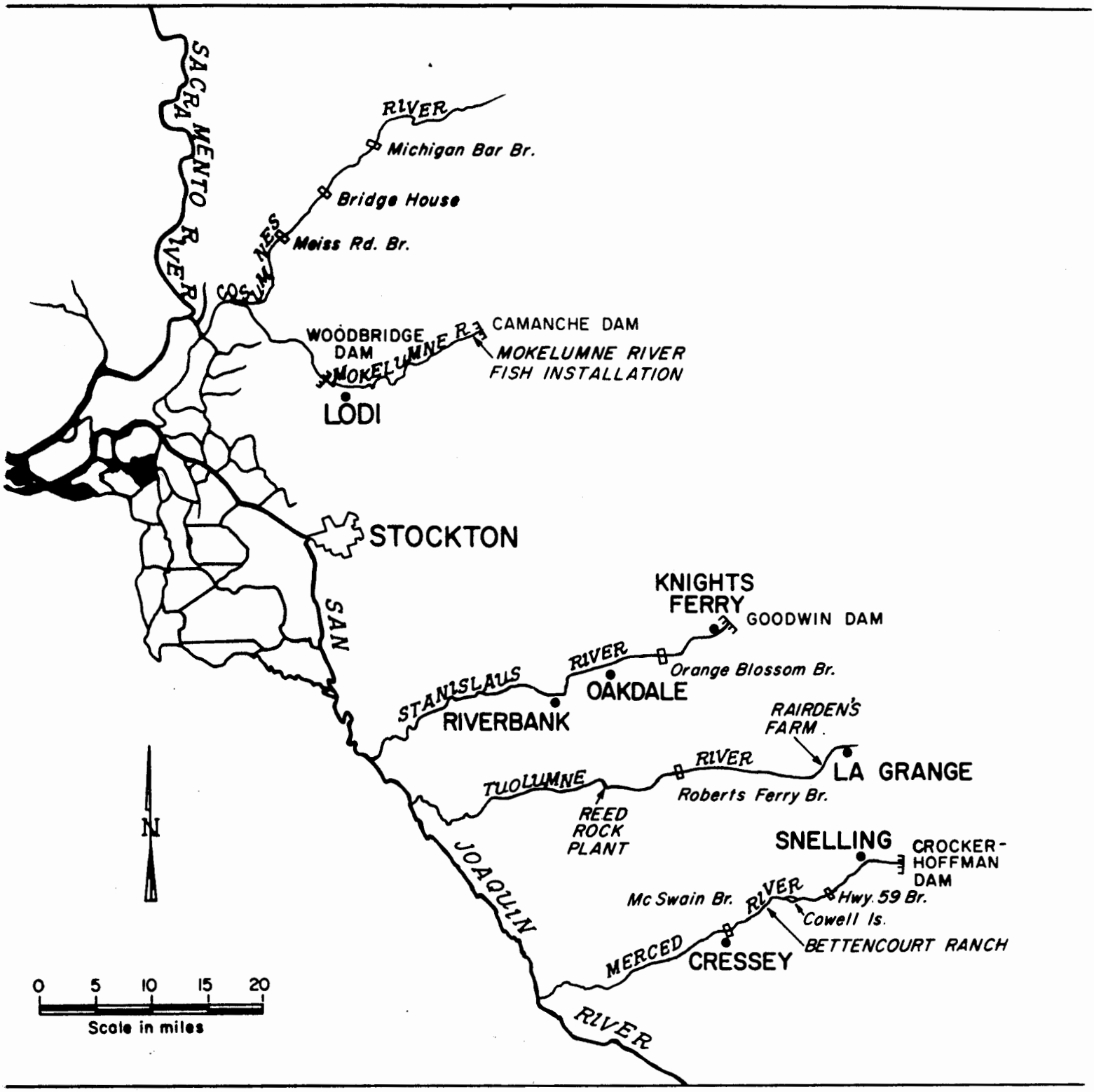

Figure 3. San Joaquin River Tributaries covered during the 1969 King Salmon Spawning Stock Survey.

LIST OF TABLES

TABLE 1

Sacramento-San Joaquin Valley King Salmon
Spawning Stock Estimates, Major Streams, 1953 - 1969
(In thousands of fish)

Year	Main Stem Sacramento River	Clear Creek	Cow Creek	Bear Creek	Cottonwood Creek	Battle Creek	Antelope Creek	Mill Creek	Deer Creek	Chico Creek
1953	408 a + 8 c	- b	- b	- b	- b	16 b + 2 c	- b	10 b + 3 c	4 b + 2 c	- c
1954	276 a + 9 c	- b	- b	- b	- b	12 b + 2 c	- b	7 b + 2 c	3 b + 2 c	- c
1955	231 a + 17 c	- b	- b	- b	- b	26 b + 2 c	- b	3 b + 3 c	* + 3 c	- c
1956	94 a + 7 c	- b	- b	- b	- b	21 b + 2 c	- b	0.9 b + 2 c	0.1 b + 3 c	- c
1957	68 a + - c	0.3 b	0.7 b	* b	0.4 b	5 b + - c	0.8 b	5 b + 1 c	2 b + - c	0.1 c
1958	128 a + - c	1.6 b	3 b	0.2 b	0.6 b	29 b + - c	0.4 b	4 b + 2 c	1.3 b + - c	1 c
1959	267 a + - c	0.8 b	0.7 b	* b	3 b	30 b + - c	- b	0.8 b + 1.6 c	* b + - c	0.2 c
1960	283 a + - c	0.9 b	0.6 b	0.1 b	0.4 b	24 b + - c	0.2 b	0.9 b + 2 c	0.8 b + - c	- c
1961	150 a + - c	- b	- b	- b	1.5 b	20 b + - c	- b	1.7 b + 1 c	- b + - c	- c
1962	139 a + - c	5 b	1.5 b	- b	6 b	13 b + - c	0.8 b	4 b + 2 c	2 b + - c	0.2 c
1963	146 a + - c	10 b	- b	- b	4 b	17 b + - c	0.3 b	1.3 b + 1.3 c	1.2 b + 1.7 c	0.3 c
1964	148 a + - c	2 b	1 b	0.1 b	3 b	16 b + - c	0.1 b	0.4 b + 1.5 c	0.1 b + 3 c	0.1 c
1965	103 a + - c	2 b	1 b	0.4 b	0.9 b	9 b + - c	0.1 b	0.2 b + - c	0.2 b + - c	0.1 c
1966	115 a + - c	0.9 b	8 b	0.4 b	3 b	3 b + - c	0.2 b	0.5 b + - c	0.1 b + - c	0.1 c
1967	92 a + - c	0.4 b	0.4 b	* b	0.6 b	5 b + - c	0.1 b	0.5 b + - c	0.1 b + - c	0.2 c
1968	110 a + - c	0.8 b	8 b	0.3 b	8 b	6 b + - c	0.1 b	0.8 b + - c	0.3 b + - c	0.2 c
1969	133 b + 20 c	1.2 b	6 b	0.6 b	5 b	6 b + - c	0.2 b	1.7 b + - c	0.8 b + - c	0.2 c

Year	Butte Creek	Feather River	Yuba River	American River	Cosumnes River	Mokelumne River	Stanislaus River	Tuolumne River	Merced River	Others	Total
1953	- c	28 a + - c	6 b	28 b	2 b	2 b	35 b	45 b	- b	13	612
1954	- c	68 a + 3 c	5 b	29 b	5 b	4 b	22 b	40 b	4 b	12	505
1955	0.4 c	86 a + 1 c	2 b	17 b	2 b	2 b	7 b	20 b	- b	4	426
1956	3 c	18 a + 2 c	5 b	6 b	1 b	0.5 b	5 b	6 b	0.0 b	9	185
1957	2 c	10 a + 0.5 c	1 b	8 b	1 b	2 b	4 b	8 b	0.4 b	0.2	120
1958	1 c	31 a + 3 d	8 b	27 b	1 b	7 b	6 b	32 b	0.5 b	0.2	288
1959	0.5 c	76 a + 4 d	10 b	31 b	0.0 b	2 b	4 b	46 b	0.4 b	1	479
1960	7 c	80 a + 4 d	20 b	54 b	1 b	2 b	8 b	45 b	0.4 b	*	484
1961	3 c	44 a + - c	9 b	25 b	- b	0.1 b	2 b	0.5 b	0.05 b	1	259
1962	2 c	19 a + - c	34 b	27 b	1 b	0.2 b	0.3 b	0.2 b	0.06 b	-	257
1963	5 c	34 a + 0.6 c	37 b	41 b	1 b	0.5 b	0.2 b	0.1 b	0.02 b	0.5	303
1964	0.6 c	38 a + 3 c	35 b	59 b	2 b	2 b	4 b	2 b	0.04 b	1	322
1965	1 c	23 a + 0.7 c	10 b	39 b	0.8 b	1.3 b	2 b	3 b	0.09 b	0.2	198
1966	0.1 c	21 a + 0.3 c	8 b	27 b	0.6 b	0.7 b	3 b	5 b	0.04 b	0.3	197
1967	0.2 c	12 a + 0.1 c	24 b	23 b	0.5 b	3 b	12 b	7 b	0.6 b	-	182
1968	0.3 c	18 a + 0.2 c	7 b	31 b	1.5 b	1.7 b	6 b	9 b	0.5 b	0.1	210
1969	0.8 c	61 a + 0.3 c	5 b	47 b	4 b	3 b	12 b	32 b	0.6 b	1.1	341

a Mostly fall-run; a few spring-run fish may have been included.

b Fall-run only.

c Spring-run only.

d Mostly spring-run but may include some fall-run fish.

- No estimate.

* Less than 50 fish.

TABLE 2

Fall Spawning King Salmon Counts and Population Estimates
Main Stem of Sacramento River, 1969-70

River Sections	Estimated Recovery Rate (Percent)	Number of Counting Trips	Number of Carcasses Recovered	Estimated Spawning Population
Keswick Dam to A.C.I.D. Dam	1.0	2	66	700
A.C.I.D. Dam to Highway #44	5.0	12	1,421	28,400
Highway #44 to Upper Anderson Bridge	5.0	12	2,015	40,300
Upper Anderson Bridge to Balls Ferry	5.0	12	2,236	44,700
Balls Ferry to Jellys Ferry	2.0	12	241	12,100
Jellys Ferry to Bend Bridge	2.0	8	118	5,900
Bend Bridge to Red Bluff	2.0	8	41	2,500
Red Bluff to Tehama Bridge	1.5	10	168	11,200
Tehama Bridge to Squaw Hill Bridge	1.0	11	64	6,400
Keswick Dam Fish Trap	0.0	-	-	1,052**
Sacramento River Main Stem (Total)			6,370	153,252*

* This figure includes 20,000 spring salmon that spawned in the fall of 1969 above Red Bluff.
** This figure includes fish trapped from October 10th through December 29th, 1969.

TABLE 3

Fall Spawning King Salmon Counts and Population Estimates
Sacramento River Tributaries North of Chico Creek, 1969-70

Streams or Stream Section	Estimated Recovery Rate (Percent)	Number of Counting Trips	Number of Carcasses Recovered	Estimated Spawning Spring Run	Fall Run	Population Total Run
Clear Creek	25.0	3.0	310	None	1,240	1,240
Cow Creek			557	None	5,570	5,570
South Cow	10.0	1.0	(137)		(1,370)	
Old Cow	0.0	0.0	(0)		No. Est.	
Oak Run	0.0	0.0	(0)		No. Est.	
Little (North) Cow	10.0	3.0	(200)		(2,000)	
Main Stem	10.0	3.0	(220)		(2,200)	
Cottonwood Creek (Total)			202		4,967	4,967
Main Stem	4.0	1.3	(194)	None	(4,850)	
North Fork	No. Est.	2.0	(0)	None	No. Est.	
Middle Fork	12.0	2.0	(5)	No. Est.	(42)	
South Fork	4.0	1.0	(3)	No. Est.	(75)	
Bear Creek	10.0	2.0	56	None	560	560
[illegible]ctle Creek (Total)			1,922	No. Est.	5,826	5,826
Coleman Hatchery					(2,626)*	
Below Hatchery	60.0	10.0	(1,922)		(3,200)	
Antelope Creek	6.0	1.3	16	No. Est.	180	180
Mill Creek	6.0	3.0	103	No. Est.	1,700	1,700
Deer Creek	8.0	3.0	60	No. Est.	750	750
Paynes Creek	2.0	1.0	6	None	300	300
Stillwater Creek	2.0	1.0	3	None	150	150
Ash Creek	2.5	1.0	8	None	320	320
Inks Creek	3.0	1.0	7	None	230	230
Dye Creek	0.5	1.0	1	None	20	20
Toomes Creek	0.5	1.0	2	None	40	40
Total Northern Sacramento River Tributaries			3,253			21,853

*[illegible]ttle Creek trap total for operation from 10/10/69 to 12/29/69.

TABLE 4

King Salmon Counts and Population Estimates Southern Sacramento River Tributaries (Chico Creek and South) 1969-70

Stream or Stream Section	Number of Counting Trips	Carcasses and Skeletons Counted	Estimated Spawning Population		
			Spring Run	Fall Run	Total Run
Chico Creek	1	13	200	No. Est.	200
Butte Creek	2	90	830	No. Est.	830
Feather River (Total)	10	14,867	348	60,578	60,926
Oroville Barrier to Thermalito Outlet	(10)	(9,244)	No. Est.	(18,500)	
Thermalito Outlet to Gridley Bridge	(10)	(4,485)	No. Est.	(30,200)	
Gridley Bridge to Honcut Creek	(10)	(1,138)	No. Est.	(7,500)	
Oroville Hatchery	-	-	(348)	(4,378)	
Yuba River (Total)	5	1,071	Extinct	5,230	5,230
Blue Pt. Mine to Hwy. 20 Bridge	(5)	(30)	Extinct	150	
Hwy. 20 Bridge to Daguerre Pt. Dam	(5)	(230)	Extinct	(1,120)	
Daguerre Pt. Dam to Baldwin Gravel Pl.	(4)	(483)	Extinct	(2,360)	
Baldwin Gravel Pl. to Marysville	(2)	(328)	Extinct	(1,600)	
American River (Total)	7	14,680	Extinct	47,265	47,265
Nimbus Racks to Carmichael Pumps	(7)	(6,400)	Extinct	(25,600)	
Carmichael Pumps to Watt Avenue Bridge	(6)	(3,161)	Extinct	(12,600)	
Above Nimbus Racks	-	(5,119)	Extinct	(6,000)	
Nimbus Hatchery	-	-	Extinct	(3,065)	
Natomas Drainage	-	-	None	No. Est.	
Total, Southern Sacramento River Tributaries		30,721	1,378	113,073	114,451

TABLE 5

Fall-Run King Salmon Counts and Population Estimates
San Joaquin River Tributaries* 1969-70

Stream or Stream Section	Number of Counting Trips	Number of Carcasses and Skeletons Counted	Estimated Spawning Population
Cosumnes River (Total)	6	1,327	4,400
Michigan Bar to Bridge House	(6)	(846)	(2,800)
Bridge House to Meiss Road Bridge	(6)	(481)	(1,600)
Mokelumne River	-	-	2,685**
Stanislaus River (Total)	4	1,120	12,327
Goodwin Dam to Knights Ferry	(4)	(71)	(1,000)
Knights Ferry to Orange Blossom Bridge	(4)	(590)	(5,900)
Trap near Orange Blossom Bridge	(-)	-	(227)***
Orange Blossom Bridge to Oakdale	(4)	(399)	(4,000)
Oakdale to Riverbank	(4)	(60)	(1,200)
Tuolumne River (Total)	4	5,885	32,200
La Grange to Rairden's Farm	(4)	(3,200)	(14,500)
Rairden's Farm to Roberts Ferry Bridge	(4)	(2,068)	(11,500)
Roberts Ferry Bridge to Reed Rock Plant	(4)	(617)	(6,200)
Merced River (Total)	4	32	600
Crocker-Hoffman Dam to Highway 59 Bridge	(4)	(24)	(350)
Highway 59 Bridge to Bettencourt's Ranch	(4)	(6)	(150)
Bettencourt's Ranch to Cressey Bridge (McSwain)	(4)	(2)	(100)
Total, San Joaquin River Tributaries		8,364	52,212

* No spring-run fish entered these streams.
** This figure is the count made at Woodbridge Dam.
*** These fish were trapped near Orange Blossom Bridge, and the fish were spawned and their progeny are being reared to yearling size at Moccasin Creek Hatchery.