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KING (CHINOOK) SALMON SPAWNING STOCKS IN CALIFORNIA'S CENTRAL VALLEY, 1972

Edited by

Steven N. Taylor

Anadromous Fisheries Branch

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Administrative Report No. 74-6

1974

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ABSTRACT

This report covers the 20th annual (1972) inventory of king salmon (Oncorhynchus tshawytscha) spawning populations in the Sacramento-San Joaquin River system. It is a compilation of estimates of fall-, spring-, late fall-, and winter-run king salmon spawning populations for every part of the Sacramento-San Joaquin system which supports a significant spawning run.

Estimates are made from counts of carcasses and live fish on spawning areas, aerial redd counts, and counts of fish migrating past Red Bluff Diversion Dam.

The 1972 Sacramento-San Joaquin system spawning escapement of spring- and fall-run fish was 162,000. In only one year in the last 20 has the fall- plus spring-run escapement been lower (in 1957 it was 120,000 fish). The average for the previous 19 years is 308,000. A total of 67,000 late-fall plus winter-run fish spawned in the system in 1972, compared to 70,000 in 1971.

Appendix tables present fall- and spring-run spawning escapements by stream for every year since 1953.

1/ Anadromous Fisheries Branch Administrative Report No. 74-6. Submitted for publication March 1973.

INTRODUCTION

This report covers the 20th annual California Central Valley king salmon spawning stock inventory.

The California Central Valley (Sacramento-San Joaquin River system) is the principal producer of king salmon caught in California's ocean fisheries. Central Valley king salmon also contribute significantly to the ocean fisheries of Oregon and Washington.

Four different "runs" or "races" of king salmon are recognized in the Central Valley. These are:

(1) The fall run. These are the most numerous and the most ubiquitous salmon in the Valley. All but two streams that have regular salmon runs of any type have an annual fall run. Most of these fish spawn from the middle of October through December.

(2) The late-fall run. These fish are largely confined to the upper part of the Sacramento's main stem. They are usually larger than fish of either the fall or winter runs. Most spawn from January through March.

(3) The winter run. These fish are almost entirely confined to the main stem Sacramento and most of them spawn above Red Bluff Dam. Spawning occurs from April into July.

(4) The spring run. Spring-run salmon were once widespread in the Valley but have disappeared from many of the streams they once utilized. Most of them spawn in September or early October.

All Central Valley streams known to support sizeable salmon runs were either surveyed, or the numbers of fish were estimated by counting at some point downstream from the spawning areas. Survey effort is generally concentrated in areas which are known to support the biggest runs.

Construction of Red Bluff Diversion Dam has made it possible since 1970 to count salmon as they migrate upstream past the dam. Personnel of the U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife (BSFW) make the counts. Counts are made year-around except during periods of high or turbid water. Although the counts are not complete, they provide a basis for estimating the total numbers of all four runs of salmon migrating past that point.

PRIOR TO 1970, THE DEPARTMENT OF FISH AND GAME'S ANNUAL ESTIMATES OF SPAWNING ESCAPEMENT IN THE CENTRAL VALLEY INCLUDED ONLY SPRING-, AND FALL-RUN FISH. Late fall- and winter-run fish were not included in estimates before 1970 because they spawned in January and later, and money and manpower limitations prevented extending the surveys much beyond January 1. Late

fall- and winter-run spawners comprise about one-fifth of the total Central Valley escapement and one half the escapement above Red Bluff Diversion Dam. The reader should therefore exercise caution in comparing escapements in years since 1970 with those of prior years.

METHODS

San Joaquin Tributaries and the Sacramento System below Red Bluff Diversion Dam

The 1972 fall- and spring-run king salmon spawning escapement estimates in the Sacramento River system south of Red Bluff Diversion Dam and in the San Joaquin system were based primarily on spawning-bed surveys and carcass counts. The maximum number of survey trips that money and manpower limitations permitted was made on each stream. Unless otherwise stated (or if only one survey trip was made), all counted carcasses were cut in half to prevent recounting on subsequent trips. Surveys were sometimes supplemented by aerial redd counts. More details and special methods are presented under individual stream headings.

Sacramento River from Keswick Dam to Red Bluff Diversion Dam

Estimates of the total numbers of salmon utilizing the Sacramento River and its tributaries upstream from Red Bluff Diversion Dam during 1972 were based on daily counts made by the BSFW at Red Bluff Diversion Dam. The counts were obtained by closed circuit television, coupled with a video tape recording system. Salmon passing through the fishway activate the system. The tapes are later viewed and interpreted. A portion of the passing fish are regularly diverted to the trapping facility adjacent to the east bank fishway, examined for stage of sexual maturity, and released. Each salmon checked was assigned to a particular run by estimating when it would spawn based on the examination.

Weekly counts were adjusted for periods when the fishway remained open but no counts were made: during periods when the river was turbid, when flood conditions made it necessary to open the gates of the dam, and during night hours when the television system was turned off. Count adjustments for the daytime lapses were made by interpolation. Adjustment for the "night factor" consisted of multiplying the day counts by 1.042 (Hallock, 1972).

The adjusted weekly counts were then separated into numbers of late fall-, winter-, spring-, and fall-run salmon according to the data gathered from the fish examined as they passed the dam.

The sport catch was then subtracted from the counts to obtain estimates of spawning populations.

SACRAMENTO RIVER SYSTEM FROM KESWICK DAM TO CHICO CREEK (FIGURE 1)

by

Richard J. Hallock and Ronald J. Decoto

Sacramento River from Keswick Dam to Red Bluff Diversion Dam

From January 2 through December 30, 1972, a total of 91,731 king salmon were counted as they passed Red Bluff Diversion Dam. Adjusting for periods when no counts were made and for the numbers of salmon trapped and hauled by the BSFW to the Tehama-Colusa Spawning Channel increased this total to 105,847.

During the counting period, 14,544 salmon were examined and released at the trapping facility in the east bank fishway. Sampling results indicated that the adjusted calendar year count consisted of 7,346 spring-, 42,503 fall-, 19,997 late fall- (13,688 1971-72 late-fall run plus 6,309 1972-73 late-fall run) and 36,001 winter-run salmon (35,874 1971-72 winter run, plus 127 1972-73 winter run) (Table 1 and Appendix Table 2).

All spring- and fall-run king salmon destined to spawn in 1972 passed the dam and were counted in that year. However, some fish of both the late-fall and winter runs that were destined to spawn in that year passed the dam prior to January 1, 1972. Therefore, to arrive at the total numbers of salmon of these runs destined to spawn during 1972, we combined appropriate parts of the 1972 calendar year counts with counts for these runs dating back to October 10, 1971 for late fall- and December 5, 1971 for winter-run salmon. When this was done, the numbers of salmon in each of the four runs passing the dam, and that were destined to spawn, during 1972 became 32,651 late fall-, 37,133 winter-, 7,346 spring-, and 42,503 fall-run salmon (Table 1). THESE NUMBERS REPRESENT THE SIZES OF THE FOUR 1972 SALMON RUNS THAT PASSED RED BLUFF DIVERSION DAM, BUT NOT THEIR SPAWNING POPULATIONS. (Some are caught by sport fishermen before they have a chance to spawn.)

We estimate the numbers of salmon landed by sportsmen in the Sacramento River each year by using a combination creel census and resort catch report method similar to that used by Van Woert (1966). To break down the monthly catch above Red Bluff into the numbers caught from each of the four runs, we assumed that salmon from the various runs are landed in proportion to their abundance.

Catch and sampling data indicate that a total of 4,626 of the prospective 1972 spawners (1,092 late-fall, 1,204 winter-, 308 spring-, and 2,022 fall-run) were caught by sportsmen above Red Bluff (Table 1).

Table 1

Calculation of Spawning Populations from Counts at Red Bluff Diversion Dam

	Fish passing Red Bluff Diversion Dam in calendar year 1971		Fish passing Red Bluff Diversion Dam in calendar year 1972		Total fish in run		Sport catch above the dam in 1971 and 1972		Total 1972 spawning population by race
Late-fall run 1971-72	18,963	+	13,688	=	32,651	-	1,092	=	31,559
Winter run 1971-72	1,259	+	35,874	=	37,133	-	1,204	=	35,929
Spring run 1972	0	+	7,346	=	7,346	-	308	=	7,038
Fall run 1972	0	+	42,503	=	42,503	-	2,022	=	40,481
Late-fall run 1972-73	0		6,309		*		57*		0*
Winter run 1972-73	0		127		*		0*		0*
TOTALS			105,847		119,633				115,007

* This run was not completed in December 1972. Fish in this run spawn in 1973, not 1972. Additional fish will be added to both the sport catch and the spawning population early in 1973.

The sport catch was then subtracted from the numbers of fish passing the dam to estimate the population spawning between Red Bluff and Keswick Dam. THE ESTIMATED NUMBERS OF SPAWNERS, BY RACE, WERE: 31,559 late fall-, 35,929 winter-, 7,038 spring-, and 40,481 fall-run fish (Table 1).

Natural mortality occurring between passing the dam and spawning was not included in our calculations. It is probably insignificant: 98% of the 30,360 carcasses examined in the main stem from 1957 through 1966 were spent.

Main Stem Sacramento River, and all Tributaries above Red Bluff Diversion Dam Except Battle Creek

The Distribution of Salmon above Red Bluff Diversion Dam

Some late fall- and winter-run salmon spawn in upper Sacramento River tributaries, but these races are primarily main-stem spawners. No surveys were conducted in any tributary during the period they may have been spawning there. Therefore, all are included in the main-stem estimates.

All fall- and spring-run salmon spawning in tributaries other than Battle Creek, are combined in this report with those spawning in the main stem of the Sacramento River. Battle Creek was the only tributary surveyed above the dam in 1972. Data from past years (1965-1969) indicate that the numbers of salmon spawning in other tributaries vary considerably among years (2 to 14% of the total fall run spawning above Red Bluff) (Taylor, 1972). For this reason, an estimate for those spawning there in 1972 based on past data was not attempted.

Data collected during airplane flights over the main stem Sacramento River October 31 and December 8, 1972 showed the general salmon redd distribution of fall-spawning (fall- and some spring-run) salmon in the main stem Sacramento above Red Bluff (Appendix Table 5).

Fall Run

An estimated 35,629 fall-run salmon spawned above Red Bluff Diversion Dam in the Sacramento River system (excluding Battle Creek) during 1972 (Appendix Table 3). This total was obtained by subtracting 2,022 salmon caught by sportsmen above Red Bluff, and 4,852 salmon that spawned in Battle Creek[2/], from the 42,503 fall-run salmon migrating above Red Bluff Diversion Dam in 1972. The 35,629 total includes 399 fish trapped at Keswick Dam that were hauled to Coleman Hatchery for artificial spawning, and 1,671 salmon trapped at Red Bluff Diversion Dam and hauled to the Tehama-Colusa Spawning Channel by the BSFW where they were allowed to spawn naturally.

2/ The Battle Creek total includes 2,822 salmon that were spawned artificially at Coleman Hatchery.

Spring, Late-fall, and Winter Runs

All are assumed to have spawned in the main stem. Estimated spawning populations are as follows: spring-run, 7,038; late fall-run, 31,559; winter-run, 35,929 (Table 1 and Appendix Table 3).

Battle Creek

Fall Run

An estimated 4,852 fall-run salmon spawned in Battle Creek during 1972. This total includes 2,822 salmon that entered Coleman Hatchery and were spawned artificially, and 2,030 that spawned in Battle Creek between Coleman Hatchery and the Sacramento River. It does not include 399 salmon trapped at Keswick Dam on the upper Sacramento River and hauled to Coleman Hatchery for artificial spawning (Appendix Table 4).

Battle Creek, below Coleman Hatchery, was the only tributary upstream from Red Bluff Diversion Dam which was surveyed in 1972. The estimate of numbers of salmon spawning in Battle Creek below Coleman Hatchery was made from carcass recovery data. Fourteen trips were made on lower Battle Creek from October 7, 1972 through January 6, 1973. Carcass recovery conditions were good during most recovery trips, however there were short periods of high, murky water which at times reduced carcass recovery efficiency. A total of 812 carcasses was recovered; the estimated recovery rate was 40% (Appendix Table 4).

Spring Run

No estimate, although several were observed at the Coleman Hatchery fish diversion dam in June 1972.

Late-fall Run

No estimate, but some fish spawn in Battle Creek in most years.

Winter Run

No estimate, but few, if any, spawned in Battle Creek in 1972. Occasionally, some winter-run salmon are observed spawning downstream from Coleman Hatchery in June.

Sacramento River
from Red Bluff Diversion Dam to Chico Creek

Spawning ground surveys are the basis used for estimating numbers of fall- and spring-run salmon spawning in the Sacramento River and its tributaries downstream from Red Bluff Diversion Dam. These surveys include both carcass

and live fish counts on the ground, as well as aerial redd and live fish counts. Some late fall- and winter-run salmon are known to spawn in the Sacramento River downstream from Red Bluff between January and July, particularly between Red Bluff and Los Molinos. However, no estimates were made of their abundance in this area during 1972 due to money and manpower limitations.

Main Stem, Sacramento River

Stream flows in the upper Sacramento River during fall 1972 were good for salmon carcass recovery in that there were no extended periods of high water. However, several survey trips were made when the water was murky due to tributary runoff, so the overall rating for recovery conditions is only "fair". The mean weekly Sacramento River flow at Bend Bridge (near Red Bluff) ranged between 183 and 263 m^3/sec (6,550-9,400 cfs) from early October through mid-November, and between 245 and 756 m^3/sec (8,753-27,000 cfs) from mid-November through December. In spite of the greater range in flows after mid-November, there were only three days when the mean flow was greater than 448 m^3/sec (16,000 cfs).

Red Bluff Diversion Dam to Tehama

Fall Run. An estimated 12,060 fall-run salmon spawned in the main Sacramento River between Red Bluff Diversion Dam and Tehama during 1972. This included 110 fish that entered the Tehama-Colusa Spawning Channel via Coyote Creek, and spawned in the channel (Appendix Table 3).

Spawning stock surveys in the main stem Sacramento River between Red Bluff and Tehama began October 18, 1972 and ended January 4, 1973. During this period, 12 complete trips were made, and 239 salmon carcasses were recovered. Based on survey effort (including two airplane flights), water conditions and carcass counts, it is estimated that the carcass recovery rate was two percent.

Spring Run. Some spring-run salmon normally spawn in this section of the river. We did not attempt to separate the spring-run fish from fall-run fish. They are included in the fall-run population estimate.

Late-fall Run. Late fall-run salmon were observed spawning in this river section on riffles just downstream from Red Bluff Diversion Dam during February 1973. No estimate of their numbers or of the extent of their spawning area was made.

Winter Run. Winter-run salmon were observed spawning on the riffles immediately downstream from Red Bluff Diversion Dam in May and June of 1972, but no estimate of their numbers or of the extent of their spawning area was made.

Tehama to Woodson Bridge

Fall Run. An estimated 3,400 fall-run salmon spawned in the main stem Sacramento River between Tehama and Woodson Bridge during 1972 (Appendix Table 3). Spawning stock surveys in this river section began October 19, 1972 and ended January 5, 1973. Twelve complete trips were made, and 68 salmon carcasses were recovered. Based on survey effort (including two airplane flights), water conditions and carcass counts, the estimated rate of recovery was two percent.

Spring, Late-fall and Winter Runs. Some fish from these three runs probably spawned between Tehama and Woodson Bridge, but their numbers were apparently small. No estimates were made.

Woodson Bridge to Chico Creek

Few salmon have spawned in the area from Woodson Bridge to Chico Creek in recent years. This area was not surveyed in 1972.

Sacramento River Tributaries from Red Bluff to Chico Creek

Stream Conditions

Rainfall in the upper Sacramento Valley was greater than normal during the fall of 1972. This resulted in greater than normal flows as well as considerable flow fluctuation and turbidity in tributaries to the upper Sacramento River. As a result fall-run salmon not only spawned in regularly-used tributaries such as Antelope, Mill and Deer Creeks, but also in some tributaries such as Dry (Toomes) and Singer Creeks where spawning is more dependent on the timing and amount of runoff. In general, fall 1972 recovery conditions were only fair. However, increased recovery effort during key low flow periods resulted in good carcass recovery rates.

Antelope Creek

Fall Run. Nine survey trips were made on Antelope Creek between the canyon mouth (United States Geological Survey Gaging Station) and Highway 99-E from October 24 through December 26, 1973. Fifty-five salmon carcasses were recovered. The fall run was estimated to be 275 fish (Appendix Table 4).

Spring Run. No estimate was made. Spring-run salmon are known to enter Antelope Creek regularly but the population is unknown.

Mill Creek

Fall Run. Between October 24, 1972 and January 31, 1973, 18 survey trips were made on Mill Creek from the Los Molinos Mutual Water Company's Upper Diversion Dam to Mill Creek's confluence with the Sacramento River. A total of 221 salmon carcasses was recovered. The fall run was estimated to be 631 salmon (Appendix Table 4).

Spring Run. Six days (October 2-7) were spent surveying upper Mill Creek from 3 miles above Black Rock to Pape Place near the mouth of Little Mill Creek. This 6-day survey resulted in one complete trip through a very rugged section of Mill Creek Canyon. The water was low and clear, making observation and salmon carcass recovery conditions good. However, only 12 carcasses were recovered. Eight live salmon were also observed. The spring run in Mill Creek was estimated to be 500 fish in this stream section (Appendix Table 4).

Late-fall Run. No estimate was made. Forty-four late fall-run salmon were observed spawning in Mill Creek below Clough Dam in January and February, 1973.

Winter Run. No estimate was made. From time to time, small numbers of winter-run salmon have been observed spawning in Mill Creek, usually in June, between Ward and Clough Dams.

Deer Creek

Fall Run. Eight survey trips were made on lower Deer Creek between October 26, 1972 and January 3, 1973. The principal area covered was from the mouth of Deer Creek to the county road bridge, which is located about 2 miles upstream from the Stanford-Vina Dam. During three of the survey trips, the area covered was extended upstream to about two miles above the county road bridge. Seventy-six salmon carcasses were recovered. The fall run was estimated to be 304 salmon (Appendix Table 4).

Spring Run. Sixteen days between September 3 and 26 were spent surveying the rugged upper Deer Creek Canyon from one mile below the new PG&E power line crossing (about 10 miles upstream from Highway 99-E) to upper Deer Creek falls. Salmon were seen spawning as early as September 3 at the Ponderosa Way Road Bridge, and as late as September 27 at the Diamond International Corporation "A" line road crossing. The creek was low and clear during the entire survey period, making observation and carcass recovery conditions good. Nine live salmon and six redds were observed; two carcasses were recovered. The spring-run was estimated to be 400 fish (Appendix Table 4).

Late-fall Run. No estimate was made. Small numbers of late fall-run salmon have been observed spawning in lower Deer Creek during some years.

Dry (Toomes) Creek

Fall Run. Eight survey trips were made on Dry Creek between October 24, 1972 and February 21, 1973. The stream area covered was from the canyon mouth (Favinger Place) downstream to its confluence with the Sacramento River. Eight live salmon were observed, and five carcasses were recovered. The fall-run was estimated to be 25 salmon (Appendix Table 4).

Late-fall Run. No estimate was made. A small number of late fall-run salmon often spawn in Dry Creek if water conditions are suitable. Five live salmon in spawning condition were observed near the Favinger Place in February 1973.

Dye Creek

Fall Run. Six survey trips were made on Dye Creek between October 30 and December 19. The area covered was from the canyon mouth (Dye Creek Ranch) downstream to Highway 99-E. Ten salmon carcasses were recovered. The fall run was estimated to be 50 salmon (Appendix Table 4).

Salt Creek

Fall Run. Two survey trips were made on Salt Creek; one on October 31 and the other on November 20. The area covered was from the canyon mouth downstream to Highway 99-E. Fifteen live salmon were observed over redds, but no carcasses were recovered. The fall run was estimated to be 30 salmon (Appendix Table 4).

Late-fall Run. No estimate was made. Seven late fall-run salmon were observed in mid-February 1973 near the Tuscan Springs road crossing.

Singer Creek

Fall Run. Six survey trips were made on Singer Creek between October 30, 1972 and January 2, 1973. The area covered was from 2 miles above the Lassen Road crossing downstream to 2 miles below the Highway 99-E crossing. Three live salmon were observed and three carcasses were recovered. The fall run was estimated to be 15 salmon (Appendix Table 4).

SACRAMENTO RIVER AND TRIBUTARIES, CHICO CREEK AND SOUTHWARD

Chico Creek

Spring and Fall Run

No survey was conducted in 1972.

Butte Creek

by

Richard Flint
Region 2

Spring Run

Butte Creek, from the Centerville Head Dam to the Centerville Powerhouse, was surveyed by foot on September 29. One live fish and one single redd were counted. Butte Creek, from the Centerville Powerhouse to the Paradise Highway Bridge was surveyed by boat and on foot October 4-5 and again October 17-18. Sixteen carcasses, 14 live fish, 20 single redds, and 10 multiple redds were counted on the first 2-day survey. Recovery conditions were good for carcasses, but some live fish may have been missed

in the Centerville-to-Covered Bridge section because of poor light and slightly murky water. The second survey revealed one live fish and two carcasses, but no new redds. Additionally, two carcasses were seen immediately above the Centerville fish barrier. Recovery conditions were good. The total count below the barrier was 18 carcasses, 20 single redds, 10 multiple redds, and one live fish remaining. An estimated 150 spring-run salmon spawned in Butte Creek in 1972 (Appendix Table 6).

Fall Run

Butte Creek, from Midway Road to Adam's Dam, and upstream for 1 mile from the Durham-Oroville Highway, was surveyed from the bank November 30. The water was high, but fairly clear. Nineteen carcasses were counted. Butte Creek, from Western Canal Dam to Midway Road, was surveyed from the bank December 5. Sixty-eight carcasses and 4 skeletons were counted. The estimated fall run in Butte Creek was 450 fish (Appendix Table 6).

Feather River

by

Lynn Wixom
Region 2

Fall Run

Twelve weekly survey trips were conducted in the Feather River from Oroville Barrier to Honcut Creek between October 16, 1972 and January 3, 1973. On the last two trips, we surveyed only the upper river section, from Oroville Barrier to Thermalito Outlet.

Recovery conditions were good throughout the study area. They were judged to be the same as last year upstream from Thermalito Outlet. Downstream from Thermalito Outlet, conditions were judged to be 20% better than last year, because of lower flows during November and December. We counted 13,714 carcasses.

The estimated population of fall-run king salmon utilizing the Feather River from Oroville to Honcut Creek was 43,200 fish. Combining this with 3,635 fish taken at Feather River Hatchery gives a total run of 46,835 fall-run salmon (Appendix Table 1). This total compares with 47,041 fish in 1971.

Marked Fish

We recovered 116 fin-clipped salmon during the carcass surveys. Of these, 105 were recovered in the upper river section. The remaining 11 were recovered upstream from Gridley Bridge (see following table).

Marked King Salmon Recovered during
Feather River Spawning Stock Surveys,
1972-73 Season

Mark	Adult females	Adult males	Grilse	Total
Ad-RV	16	8		24
Ad-RP	6	1	1	8
An-LP	33	14	1	48
LP	3	1	3	7
Ad	18	2		20
RP		1		1
RV	1	3	2	6
An		1		1
LV		1		1

Spring Run

Nine weekly survey trips were conducted between July 9 and September 5, 1972, from the fish barrier dam to the foot of Montgomery Street, to evaluate the summer loss of spring-run salmon. We found five carcasses. This is the largest number of carcasses we have found since 1968 when we began the summer surveys.

Two hundred and fifty-six spring-run salmon entered Feather River Hatchery.

We found an additional 32 spring-run salmon carcasses on the first day of our fall surveys. Aside from these fish, we made no attempt to separate spring-run from fall-run fish during the fall surveys. The fall-run escapement estimate includes a few spring-run fish.

Yuba River

by

Eric Gerstung
Region 2

Fall Run

Six survey trips were made on the Yuba River between Highway 20 and a point 0.7 miles downstream from Hallwood Avenue; and one trip was made between Blue Point Mine and Highway 20. All surveys were conducted between November 9 and December 15, 1972.

Flows ranged from 65 to 116 m^3/sec (2,300-4,100 cfs) and averaged about 79 m^3/sec (2,800 cfs). The water was murky during the first two survey trips, but was clear on subsequent ones.

There were 2,161 carcasses recovered; 40% were grilse. An estimated 9,258 fall-run salmon spawned in the Yuba River in 1972 (Appendix Table 1).

Aerial photographs taken in December indicated most of the redds were concentrated in an area near Walnut Avenue (approximately 2 miles below Daguerre Point Dam). This is in the section of the river where most carcasses were observed (Appendix Table 6).

Spring Run

Residents observed a few spring-run salmon below Englebright Dam. We made no estimate of the spring run, but believe it to be small.

American River

by

Robert Reavis
Region 2

Fall Run

We surveyed American River spawning areas by walking the banks or floating and counting carcasses. To prevent recounting carcasses on consecutive survey trips, we did not count badly decayed ones. (We did not cut carcasses in the American River because of the excessive man-hours it would require.)

We made five survey trips from the Nimbus racks to Watt Avenue from November 6 to December 29, 1972. Survey conditions were good; flows ranged from about 57 to 142 m^3/sec (2,000-5,000 cfs) and the water was clear.

We surveyed both sides of the river from the Nimbus racks to Sunrise Boulevard. We observed 1,102 carcasses in this area. Assuming a 15% recovery rate, the spawning population in this area was 7,347 fish.

We surveyed one side of the river from Sunrise Boulevard to Watt Avenue. We counted 567 carcasses in this area. Assuming a 7.5% recovery rate, the estimate for this area is 7,560 fish.

Hatchery personnel removed 2,169 carcasses from the upstream side of the Nimbus racks. Assuming an 85% recovery rate, 2,552 fish had gotten past the racks.

A total of 7,042 king salmon entered Nimbus Hatchery. These, plus the river spawners and the fish escapement past the racks, bring the total estimated run in the American River to 24,501 fish (Appendix Table 1).

Spring Run

Extinct.

UPPER SAN JOAQUIN RIVER TRIBUTARIES
(Figure 3)

by

Jerry Goertzen
Region 4

Stanislaus River

Fall Run

The salmon run in the Stanislaus River was smaller this year than it has been in any of the last five years.

Salmon were first observed October 20, 1972, and first observed actively spawning November 20.

An adult salmon trap was again installed and operated by Moccasin Creek Fish Hatchery personnel. The trap was located one-half mile upstream from Orange Blossom Bridge, and operated from October 28 to November 18, 1972. They trapped 293 salmon. They spawned 86 females and 74 males, and released the rest. A total of 461,654 eggs was taken.

On October 20, 1972 the flow was 5.3 m^3/sec (190 cfs) in the Stanislaus at Orange Blossom. The flow was lowered to 2.1 m^3/sec (75 cfs) for installation of the salmon trap, then gradually increased to 5.1 m^3/sec (180 cfs) for trapping. After the trap was removed, about November 18, 1972, the flow was increased to 13 m^3/sec (464 cfs) and held at about that level until early January, when it went up to 27 m^3/sec (946 cfs) and eventually to 72 m^3/sec (2,550 cfs) by mid-January.

Poachers were active in the upper sections of the river this season, during the period flows were lowered for trapping. Few fish were in the river when the flows were low.

We conducted carcass surveys in the following sections of the Stanislaus River:

Section 1: Goodwin Dam to Knight's Ferry
Section 2: Knights Ferry to Orange Blossom Bridge
Section 3: Orange Blossom Bridge to Oakdale
Section 4: Oakdale to Riverbank

From November 15, 1972, to January 18, 1973, we made four trips in Sections 1, 3, and 4, and five trips in Section 2. Water clarity ranged from good to poor until January 16. After that, visibility dropped to 15 cm (6 inches), and we found no more carcasses.

Sections 2 and 3 received the heaviest spawning activity. Most of the spawning in Section 3 occurred in the area immediately below the trap, while the trap was in operation. Few fish spawned in Section 4. The gravel in this section is heavily silted and overgrown with aquatic plants.

We recovered 253 carcasses in 1972. The estimated spawning population was 4,298 fish, including 160 captured at the Orange Blossom trap and held for artificial spawning (Appendix Table 7).

Ten percent of the run was small fish. Of these, 17% were females. An estimated 62% of the large fish--more than 60.6 cm (23 7/8 inches) FL--were females.

Tuolumne River

We made six survey trips on the Tuolumne River from November 13, 1972 to January 24, 1973. Our survey area was comprised of the three following sections:

Section 1: La Grange to Rairdens Farm
Section 2: Rairdens Farm to Roberts Ferry Bridge
Section 3: Roberts Ferry Bridge to Reed Rock Plant

The salmon run was later than usual this year, and of short duration. Fewer carcasses were observed this year (537) than last (2,283). Forty-six percent of the carcasses were recovered in Section 1, which is the upstream end of our survey area. The estimated Tuolumne River spawning population was 5,100 fish (Appendix Table 7). This is the smallest run since 1966 (Appendix Table 1).

Of the identifiable carcasses, 52% were females, and 48% were males. Seventeen percent of the carcasses were small fish--less than 60.6 cm (23 7/8 inches) FL. Twenty-two percent of the small fish were females.

In compliance with a Davis-Grunsky Grant Contract, riffle restoration is continuing in the Tuolumne. However, our observations indicate this work has not resulted in increased spawning use of the restored riffles. Several riffles above Basso Bridge were restored in 1971, but few salmon used them for spawning the following fall. As a result, they were reworked in 1972. Also, two riffles below Basso Bridge were restored for the first time in 1972. No salmon spawned in the restored area below the bridge in 1972. Above the bridge, 31% of the run used the restored area in 1972, and 30% in 1971. In 1970, before restoration, 53% of the run spawned in the area above the bridge.

Merced River

Fall Run

The Merced River salmon run was lower this year than last (2,648 fish compared to 3,651 in 1971). However, this year's run was well above the last 20 years' average (see Appendix Table 1).

Preseason flows in the Merced River were higher this year than last. Flows near Snelling were approximately 76 m^3/sec (2,700 cfs) from September 5 to September 21, 1972. The maximum flow last September was 38 m^3/sec (1,350 cfs).

The high flows alleviated the water hyacinth problem, by tearing loose blocks of plant growth and washing them downstream. There were only a few minor blocks left when we started our survey trips.

Flows in our survey areas during the surveys ranged from about 5.7 to 8.5 m^3/sec (200-300 cfs).

We conducted carcass surveys in the following sections of the Merced River:

Section 1: Crocker-Huffman Dam to Highway 59 Bridge
Section 2: Highway 59 Bridge to Bettencourt's Ranch
Section 3: Bettencourt's Ranch to Cressey Bridge

Four survey trips were made in each section from November 20, 1972 to January 10, 1973.

Survey conditions were generally good in the upper half of our survey area until rains muddied the river about mid-December. Conditions were fair to poor in the lower half all season because gravel plant operations and agricultural work kept the river muddy.

We observed a total of 329 carcasses, and estimate that 2,528 salmon spawned in the Merced River. Most of the fish spawned in Section 1. We saw 222 carcasses (67%) in Section 1. This section represents only 1/3 of the total area surveyed (Appendix Table 7).

An additional 44 fish were recovered, and 51 redds were observed in the Merced River Spawning Channel. An estimated 120 spawners used the channel. These, plus the 2,528 fish spawning in the river, bring the total estimated Merced River spawning escapement to 2,648 salmon.

The estimated sex composition was 50% males and 50% females. Seventeen percent of the fish observed were small fish--less than 60.6 cm (23 7/8 inches) FL. Twenty-five percent of the small fish were females.

Spring Run

None.

LOWER SAN JOAQUIN RIVER TRIBUTARIES
(Figure 3)

Mokelumne River

by

Robert Gervais
Region 2

Fall Run

Prior to 1972, spawning escapements in the Mokelumne River were determined by counts at Woodbridge Fish Ladder. We discontinued the counting program at Woodbridge this year because of the cost of stationing personnel at the ladder. This year we used carcass counts to estimate the spawning population.

Stream conditions were good for carcass recovery. Mokelumne River flows near Camanche Dam averaged 32 m^3/sec (1,128 cfs) in October, 8.5 m^3/sec (299 cfs) in November, and 3.8 m^3/sec (135 cfs) in December. The water was clear on every survey trip.

Our survey area was from Camanche Dam to 5.6 km (3.5 miles) downstream from the dam. This area includes about 95% of the suitable Mokelumne River salmon spawning habitat.

Each survey consisted of walking both banks of the river, counting and sexing carcasses, and cutting them in half to prevent recounting.

We counted a total of 150 carcasses on six weekly trips between November 1 and December 14. Of these, 67 were adult males, 29 adult females and 54 grilse. We assume we observed 20% of the spawning population. Expanding the counts yields an estimate of 750 spawners. An additional 352 fish entered the Mokelumne River Spawning Channel; hence, the total 1972 run was 1,102 salmon (Appendix Table 7).

Spring Run

None.

Cosumnes River

by

Robert Reavis
Region 2

We made two survey trips between Michigan Bar and Bridgehouse on November 21 and December 11; and two trips from Bridgehouse to the Meiss Road Bridge on November 28 and December 12. The flow was approximately 1.4 m^3/sec (50 cfs) on all trips, and the water was clear.

We chopped all carcasses to avoid future duplication of counts.

We counted a total of 320 carcasses. Assuming a 20% rate of recovery, the run was 1,600 adult fall-run salmon. This is considerably above the runs for the last two years (Appendix Table 1).

Calaveras River

by

Bob Gervais

Spring Run

In March 1972 a number of spring run salmon unexpectedly entered the lower Calaveras River. This was the first year in recent history that a sizeable run of these fish is known to have entered the river. The fishes' upstream migration was blocked by numerous irrigation diversion dams, so they were rescued and hauled upriver and released in an area where they could reach suitable spawning gravels. During a 7-day period, 236 were transferred; 16 of these died in transit. Some fish were taken by poachers before the rescue operation began. The run was estimated at 500 salmon (Appendix Table 7).

SUMMARY

During 1972 the California Department of Fish and Game conducted its 20th annual king salmon spawning stock inventory of the Sacramento-San Joaquin River system.

Four races, or runs, of king salmon are included in this report: The fall, late-fall, winter, and spring runs. Only the fall and spring runs were included in reports of this series prior to 1970. Caution should therefore be exercized in comparing 1970-1972 reports with earlier ones.

In the San Joaquin system and the lower Sacramento River, spawning stock estimates were done by the California Department of Fish and Game. These estimates were based on carcass counts, aerial redd counts, and live fish counts. Estimates for the Sacramento River above Red Bluff Diversion Dam were based primarily on BSFW counts of fish passing the dam, and on Department of Fish and Game sampling at the dam.

The fall- plus spring-run Central Valley king salmon spawning population was estimated to be 162,000 fish (Table 2). This is far below the 308,000-fish average for the previous 19 years, and down 35% from 1971[3/]. In fact, in only one year in the last 20 has the fall- plus spring-run spawning escapement been lower--1953, when the estimate was 120,000 salmon.

Table 2

Estimated King Salmon Spawning Populations
in the Sacramento-San Joaquin River System, 1972*

Spawning area	Spring run	Fall run	Late-fall run	Winter run	Combined
Sacramento Main Stem	7,038**	51,089**	31,559	35,929	125,615
Sacramento tributaries	1,311	87,226	No est.	No est.	88,537
San Joaquin tributaries including Mokelumne River system	500	14,747	None	None	15,247
TOTALS	8,849	153,062	31,559	35,929	229,399

* Includes late fall- and winter-run fish entering the river in both 1971 and 1972, and spawning in 1972. Does not include late fall- and winter-run fish entering the river in 1972 and spawning in 1973.

** Includes some fish spawning in tributaries above Red Bluff Diversion Dam.

Winter-run populations were also down in 1972--35,929 fish, compared to 53,089 in 1971. The late-fall run population was up from last year--35,559 compared to 16,741 in 1971, but the late-fall run makes up only a small proportion of total Central Valley spawning escapement.

The total escapement in the Central Valley was down 28% from 1971; and 1971 was a "below average" year.

3/ Estimates for years 1971 and 1972 are not fully comparable--1972 spawning stock estimates do not include fish caught in the sport catch above Red Bluff Diversion Dam; 1971 estimates do. The sport catch above the dam, however, represents only a small proportion of the fish involved--2% of the total Central Valley escapement, and 4% of the fish passing the dam.

REFERENCES

Hallock, Richard J. 1972. A summary of salmon counts at Red Bluff Diversion Dam, November 2, 1969 through April 15, 1972, p. 21-22. In Steven N. Taylor (Editor) King (chinook) salmon spawning stocks in California's Central Valley, 1971. Calif. Dep. Fish and Game, Anad. Fish. Admin. Rep. 73-2, 36 p.

Taylor, Steven N. (Editor). 1972. King (chinook) salmon spawning stocks in California's Central Valley, 1971. Calif. Dep. Fish and Game, Anad. Fish Admin. Rep. 73-2, 36 p.

Van Woert, William. 1966. Central Valley salmon and steelhead catch, 1964-65. Calif. Dep. Fish and Game, Marine Res. Admin. Rep. 66-5, 7 p.

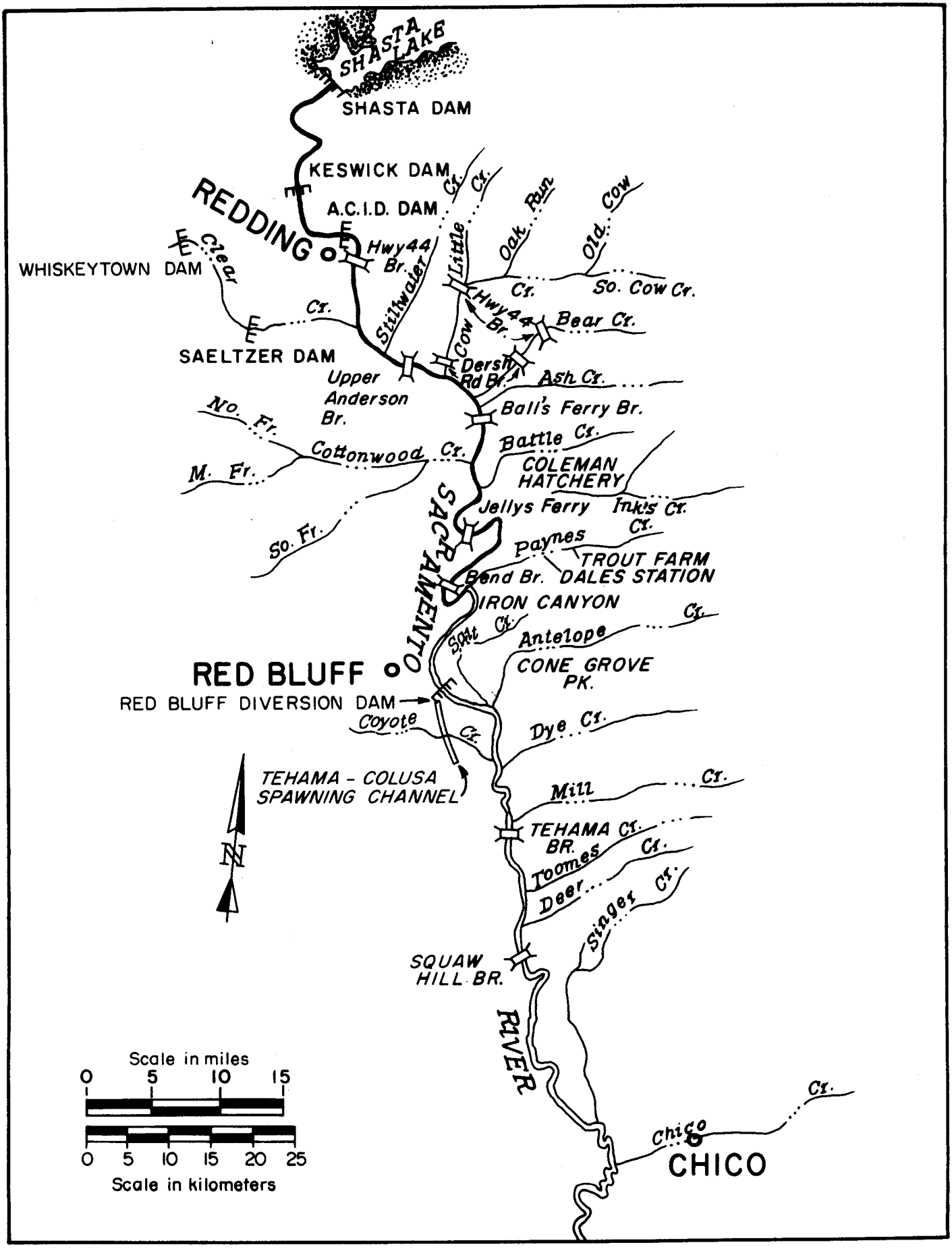

Figure 1. Upper Sacramento River and tributaries above Chico Creek covered during the 1972 king salmon spawning stock survey.

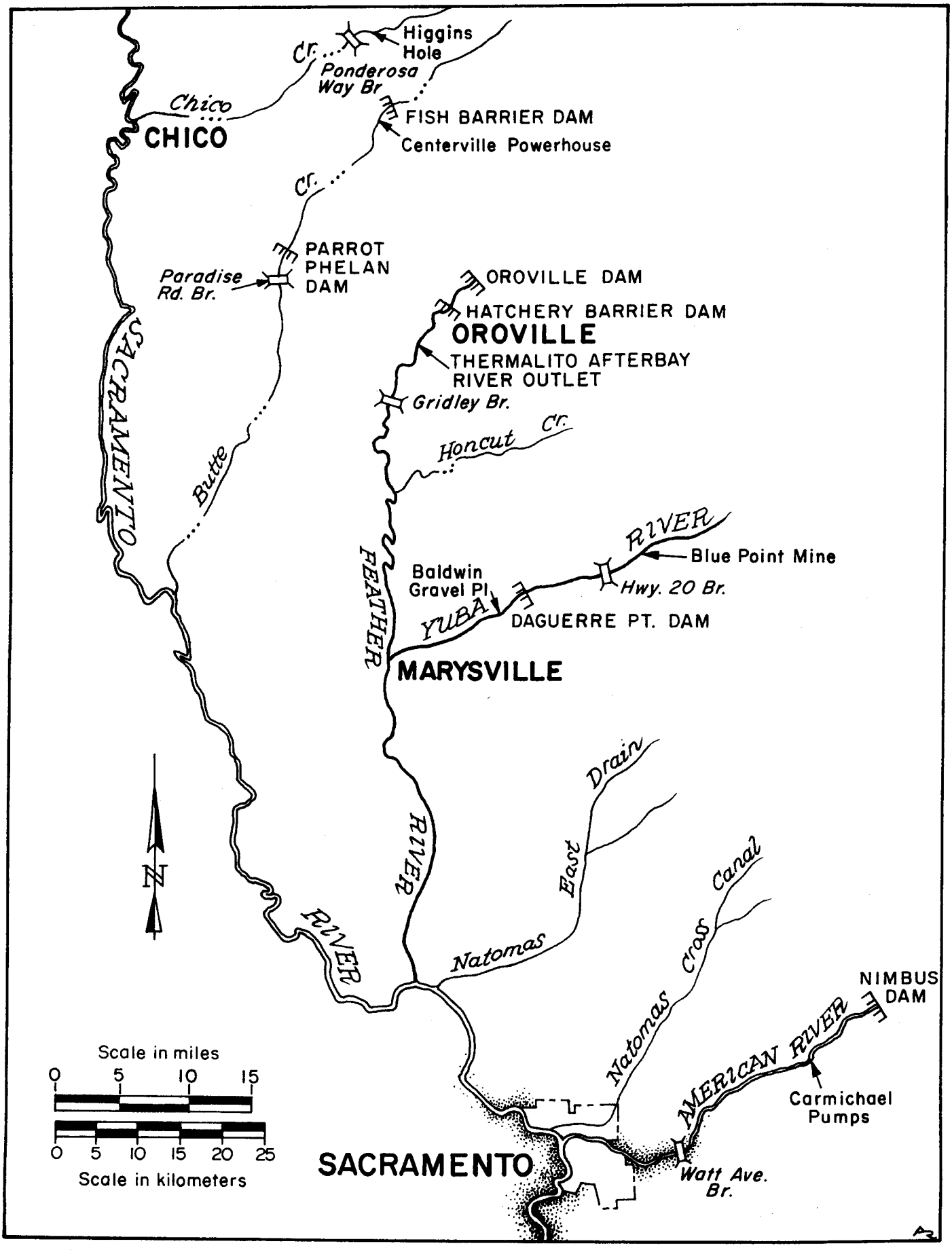

Figure 2. Sacramento River Tributaries from Chico Creek, south, covered during the 1972 king salmon spawning stock survey.

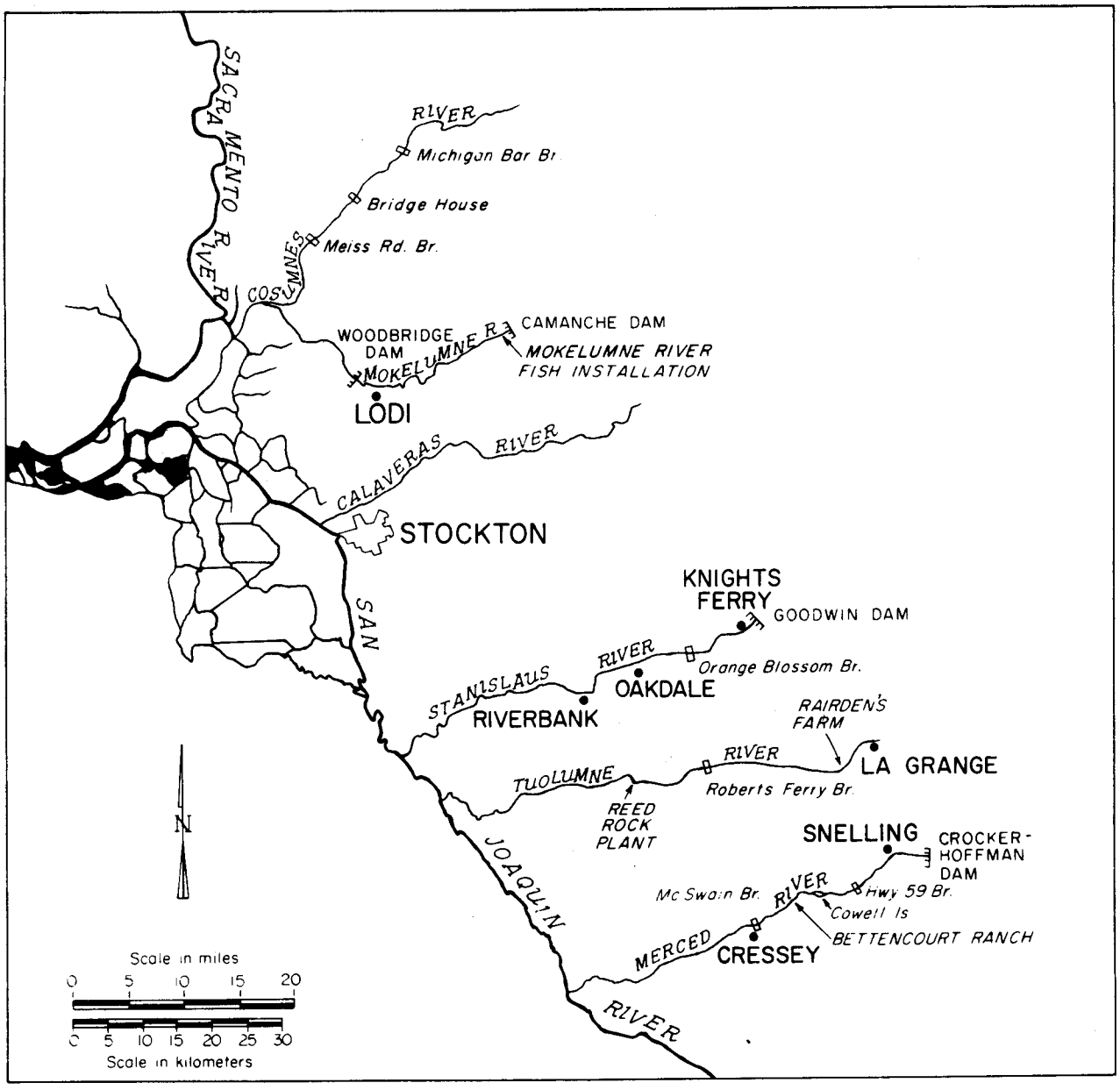

Figure 3. San Joaquin River tributaries covered during the 1972 king salmon spawning stock survey.

List of Appendix Tables

Appendix Table 1

Sacramento-San Joaquin Valley Fall- and Spring-Run King Salmon Spawning Stock Estimates, Major Streams, 1953-1972 (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	233 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	0.5 c
1964	148 a + - c	2 b	1 b	0.1 b	3 b	16 b + - c	0.1 b	0.4 b + 1.6 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
1970	51 b + 4 c	- b	- b	- b	- b	7 b + - c	0.4 b	0.7 b + 1.5 c	0.5 b + 2 c	0.0 c
1971	82 b + 6 c	- b	- b	- b	- b	5 b + - c	0.2 b + - c	1 b + 1 c	0.2 b + 1.5 c	0.0 c
1972	51 b + 7 c	- b	- b	- b	- b	5 b + - c	0.3 b + - c	0.6 b + 0.5 c	0.3 b + 0.4 c	- c

Year	Butte Creek	Feather River	Yuba River	American River	Cosumnes River	Mokelumne River	Stanislaus River	Tuolumne River	Merced River	Others	Total	% SJ river
1953	- c	28 a + - c	6 b	28 b	2 b	2 b	35 b	45 b	- b	13	612	15.1
1954	- c	68 a + 3 c	5 b	29 b	5 b	4 b	22 b	40 b	4 b	12	505	15.1
1955	0.4 c	86 a + 1 c	2 b	17 b	2 b	2 b	7 b	20 b	- b	4	426	5.5
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	5.9
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	10.3
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	13.4
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	8.4
1960	7 c	80 a + 4 d	20 b	54 b	1 b	2 b	8 b	45 b	0.4 b	*	484	11.0
1961	3 c	44 a + - c	9 b	25 b	- b	0.1 b	2 b	0.5 b	0.05 b	1	259	1.0
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	0.2
1963	3 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	0.1
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	1.9
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	2.6
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	4.5
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	10.8
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	7.4
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	13.1
1970	0.3 c	62 a + 0.2 c	14 b	37 b	0.6 b	5 b	9 b	18 b	5 b	5 **	243	13.2
1971	0.6b+0.5c	47 a + 0.5 c	6 b	52 b	0.5 b	5 b	14 b	22 b	4 b	0.1	248	6.1
1972	0.5b+0.2c	47 a + 0.3 c	9b+-c	25 b	1.6 b	1.1 b	4 b	5 b	3 b	0.6	162	7.2
1973											288.1	
										1974	239.5	
										1975		

(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.
** Combined estimate of Clear, Cow, Bear, Cottonwood, and Dye Creeks.

Appendix Table 2

Red Bluff Diversion Dam Weekly Adjusted
King Salmon Counts, January 2 - December 30, 1972

Week	Adjusted salmon count	Number sampled	Late-fall Run Percent	Late-fall Run Number	Winter Run Percent	Winter Run Number	Spring Run Percent	Spring Run Number	Fall Run Percent	Fall Run Number
1971										
Oct. 10, 1971 - Jan. 1, 1972				18,963[1]						
Dec. 5, 1971 - Jan. 1, 1972						1,259[1]				
1972										
Jan. 2- 8	413	11	63.6	263	36.4	150				
9-15	1,389	138	88.4	1,228	11.6	161				
16-22	1,315	204	35.5	467	64.5	848				
23-29	833	1[2]	58.4	486	41.6	347				
Jan. 30-Feb. 5	889	173	85.5	760	14.5	129				
Feb. 6-12	1,751	203	60.6	1,061	39.4	690				
13-19	5,878	676	35.5	2,087	64.5	3,791				
20-26	4,485	211	45.0	2,018	55.0	2,467				
Feb. 27-Mar. 4	2,061	44	47.7	983	52.3	1,078				
Mar. 5-11	564	22	59.1	333	40.9	231				
12-18	599	69	26.1	156	73.9	443				
19-25	12,737	534	21.1	2,700	78.8	10,037				
Mar. 26-Apr. 1	4,427	307	17.9	792	78.2	3,462	3.9	173		
2- 8	3,230	76	9.2	297	85.5	2,762	5.3	171		
9-15	628	11	9.1	57	63.6	400	27.3	171		
16-22	1,515	19		32,651	100.0	1,515				
23-29	1,373	141			99.3	1,363	0.7	10		
Apr. 30-May 6	1,224	146			87.7	1,073	12.3	151		
May 7-13	491	0[2]			93.4	459	6.6	32		
14-20	549	0[2]			79.6	437	20.4	112		
21-27	2,236	285			86.7	1,939	13.3	297		
May 28-June 3	714	170			67.6	483	32.4	231		
June 4-10	599	104			69.2	415	30.8	184		
11-17	857	239			65.7	563	34.3	294		
18-24	571[3]	143			31.5	181	68.5	393		
June 25-July 1	572	55			36.4	208	63.6	364		
July 2-8	553	126			21.4	118	78.6	435		
9-15	690	134			11.9	82	88.1	608		
16-22	887	202			3.5	31	75.7	671	20.8	185
23-29	649	111			1.8	11	79.3	515	18.9	123
July 30-Aug. 5	739	146				37,133	61.6	455	38.4	284
Aug. 6-12	1,959	188					53.7	1,052	46.3	907
13-19	916	19					47.4	434	52.6	482
20-26	958	100					23.0	220	77.0	738
Aug. 27-Sept. 2	1,350	84					15.5	209	84.5	1,141
Sept. 3- 9	1,259	69					13.0	164	87.0	1,095
10-16	1,783	551						7,346	100	1,783
17-23	3,685	1,094							100	3,685
24-30	4,604	931							100	4,604
Oct. 1- 7	4,783	403							100	4,783
8-14	6,489	1,086							100	6,489
15-21	4,282	845							100	4,282
22-28	3,029[4]	808	5.0	151					95.0	2,878
Oct. 29-Nov. 4	2,672	572	11.5	307					88.5	2,365
Nov. 5-11	2,593	1,055	12.4	322					87.6	2,271
12-18	1,271	295	5.8	74					94.2	1,197
19-25	1,695	634	8.2	139					91.8	1,556
Nov. 26-Dec. 2	1,169	525	29.3	343					70.7	826
Dec. 3- 9	1,296	229	61.6	798					38.4	498
10-16	1,196	142	87.3	1,044	2.1	25			10.6	127
17-23	2,264	144	91.0	2,060					9.0	204
24-30	1,173	69	91.3	1,071	8.7	102				42,503
Total 1972	105,847	14,544		19,997		36,001		7,346		42,503

1/ Portions of late-fall and winter runs passing dam during previous calendar year. For weekly numbers see "King (Chinook) Salmon Spawning Stocks in California's Central Valley, 1971" (AFB Admin. Rept. No. 73-2).
2/ Percentages and numbers of fish by run determined by interpolation.
3/ 16-hour counts daily from July 18 through December 30; night factor applied.
4/ Adjusted count October 22 through December 2 includes 1,671 salmon hauled from east bank fishway to Tehama-Colusa Spawning Channel.

[ ] Total annual run passing Red Bluff Diversion Dam.

Appendix Table 3

King Salmon Spawning Populations,
Main Stem Sacramento River, 1972

	Spring run	Fall run	Late-fall run	Winter run	TOTAL
Trapped at Keswick Dam		399			399
Keswick Dam to Red Bluff Diversion Dam[1/]	7,038	33,559	31,559	35,929	108,085
Tehama Colusa Spawning Channel (trapped at Red Bluff Diversion Dam)		1,671			1,671
Tehama Colusa Spawning Channel (entered via Coyote Creek)		110			110
Red Bluff Diversion Dam to Tehama	No est.	11,950	No est.	No est.	11,950
Tehama to Woodson Bridge		3,400	No est.	No est.	3,400
Woodson Bridge to Chico Creek	No est.	No est.	No est.	No est.	
TOTAL, SACRAMENTO MAIN STEM	7,038	51,089	31,559	35,929	125,615

1/ Includes some fish spawning in tributaries above Red Bluff Diversion Dam.

Appendix Table 4
Fall- and Spring-Run King Salmon Counts and Spawning Population Estimates
Upper Sacramento River Tributaries (North of Chico Creek)
1972

Stream or stream section	Estimated recovery rate (%)	Counting trips	Carcasses recovered	Estimated spawning population		Fall plus spring run
				Spring run	Fall run	
Battle Creek						
Coleman Hatchery	40	14	812	-	2,822	
Below Coleman Hatchery					2,030	
TOTAL, Battle Creek					4,852	4,852
Other tributaries,						
Keswick Dam to Red Bluff*				No est.*	No est.*	No est.*
Antelope Creek	20	9	55		275	275
Dry Creek	20	8	5		25	25
Dye Creek	20	6	10		50	50
Deer Creek (lower)	25	8	76		304	304
Deer Creek (upper)		3	2	400		400
Mill Creek (lower)	35	18	221		631	631
Mill Creek (upper)		1	12	500		500
Salt Creek	50	2	15**		30	30
Singer Creek	20	6	3		15	15
TOTAL, Sacramento River tributaries north of Chico Creek				900*	6,182*	7,082

* Fish spawning in tributaries above Red Bluff Diversion Dam, except Butte Creek, are included in the main stem estimate (Appendix Table 3).

** Live fish only.

Appendix Table 5

Distribution of Fall Spawning King Salmon Redds,
Main Stem Sacramento River Above Red Bluff Diversion Dam, 1972

Area	Percentage of Redds in Each Area*
Keswick Dam to A.C.I.D. Dam	10.5
A.C.I.D. Dam to Highway 44	7.3
Highway 44 to Upper Anderson Bridge	23.5
Upper Anderson Bridge to Balls Ferry	23.5
Balls Ferry to Jellys Ferry	17.0
Jerrys Ferry to Bend Bridge	15.8
Bend Bridge to Red Bluff Diversion Dam	2.4
TOTAL	100.0

* Percent of salmon redds observed between Red Bluff and Keswick Dam on two airplane flights; October 31 and December 8, 1972. Includes fall and some spring-run salmon redds.

Appendix Table 6

Fall- and Spring-run King Salmon Counts and Population Estimates, Lower Sacramento River Tributaries (Chico Creek and South) 1972

Stream or stream section	Number of counting trips	Carcasses and skeletons counted	Estimated Spawning Population		
			Spring run	Fall run	Total run
Butte Creek (early surveys)	2	20	(150)		(150)
" (late surveys)	2	19		(450)	(450)
Feather River (Total)		(13,714)	(288)	(46,835)	(47,123)
Oroville Barrier to Thermalito Outlet	12	9,231	No est.	16,800	
Thermalito Outlet to Gridley Bridge	10	3,834	No est.	22,700	
Gridley Bridge to Honcut Creek	10	649	No est.	3,700	
Oroville Hatchery	-	-	256	3,635	
Yuba River (Total)	(6)	(2,161)	Few	(9,258)	(9,258)
Blue Pt. Mine to Hwy. 20 Bridge	1	29	Few	580	
Hwy. 20 Bridge to Daguerre Pt. Dam	6	550		2,750	
Daguerre Pt. Dam to Hallwood Avenue	6	1,139		4,556	
To 0.7 mi. below Hallwood Avenue	6	443		1,372	
American River (Total)	(5)	(3,838)	Extinct	(24,501)	(24,501)
Nimbus Racks to Watt Avenue Bridge	5	1,669		14,907	
Above Nimbus Racks	-	2,169		2,552	
Nimbus Hatchery	-	-		7,042	
Natomas Drainage	-	-	None	No est.	
Total, Southern Sacramento River Tributaries		19,752	438	81,044	81,482

Appendix Table 7

King Salmon Counts and Population Estimates,
San Joaquin River Tributaries, 1972

Stream of stream section	Number of counting trips	Carcasses and skeletons counted	Estimated spawning population
Calaveras River (Total)[1/]	-	236	(500)
Cosumnes River (Total)			(1,600)
Michigan Bar to Bridge House	2	180	900
Bridge House to Meiss Road Bridge	2	140	700
Mokelumne River (Total)			(1,102)
River	6	150	750
Hatchery	-	352	352
Stanislaus River (Total)			(4,298)
Goodwin Dam to Knight's Ferry	4	29	580
Knight's Ferry to Orange Blossom Bridge	5	130	1,625
Orange Blossom Bridge to Oakdale	4	72	1,200
Oakdale to Riverbank	4	22	733
Trapped at Orange Blossom Bridge	-		160
Tuolumne River (Total)			(5,100)
La Grange to Rairden's Farm	6	245	1,885
Rairden's Farm to Robert's Ferry Bridge	6	174	1,740
Robert's Ferry Bridge to Reed Rock Plant	6	118	1,475
Merced River (Total)			(2,648)
Crocker-Huffman Dam to Highway 59 Bridge	4	222	1,233
Highway 59 Bridge to Bettencourt's Ranch	4	92	920
Bettencourt's Ranch to Cressey Bridge	4	15	375
Merced River Spawning Channel	-	44	120
TOTAL, SAN JOAQUIN RIVER TRIBUTARIES			15,248

[1/] These were spring-run fish. All other estimates for San Joaquin tributaries are of fall-run fish.