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ANNUAL REPORT  
CHINOOK SALMON SPAWNING STOCKS IN CALIFORNIA'S CENTRAL VALLEY, 1983

Edited  
by

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ABSTRACT

This report covers the 31st annual inventory of chinook salmon, Oncorhynchus tshawytscha, spawning populations in the Sacramento-San Joaquin River system. It is a compilation of estimates of fall- and spring-run chinook salmon spawning populations for every stream in the Sacramento-San Joaquin system which supports a significant spawning run, and partial counts of late-fall- and winter-run chinook salmon.

Estimates are made from counts of fish entering hatcheries and spawning channels, fish migrating past dams, carcasses and live fish on spawning areas, and aerial redd counts.

The estimated 1983 total escapement of chinook salmon in the Central Valley was 230,164. This total includes 205,290 fall-, 7,958 spring-, 1,827 winter- and 15,089 late-fall-run spawners. Of the total, 180,519 spawned in the Sacramento River system and 49,645 in the San Joaquin River system. All of the spring, winter and late-fall salmon, as well as 155,645 of the fall-run salmon spawned in the Sacramento River system. All salmon that spawned in the San Joaquin River system were fall-run fish.

The estimated 1983 escapement of fall spawning (fall plus spring run) chinook salmon in the Central Valley was 213,248; this figure is 65,452 less than the historic average (1953-1982) of 278,700 and 48,036 less than the the 1982 estimate of 261,284.

The runs in the upper Sacramento, Feather, and American rivers were down from previous years, while runs in the San Joaquin River system were up considerably. Grilse of fall-run salmon made up the following varying portions of spawning populations: 27% in Battle Creek, 41% at Red Bluff Diversion Dam, 36% at the Tehama-Colusa Spawning Channel, 20% in the Feather River, 17% in the Yuba River, 75% in the Tuolumne River and 85% in the Merced River.

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## INTRODUCTION

This report covers the 31st annual chinook salmon spawning stock inventory for the California Central Valley (Figure 1). The Sacramento-San Joaquin River system, which flows through the valley, is the principle producer of chinook salmon caught in California's ocean fisheries and also contributes significantly to the ocean fisheries of Oregon and Washington. Spring and fall runs have been monitored since 1953 and late-fall and winter runs have been monitored since 1971. The four runs are described as follows:

- 1) Late-fall run. These fish are mainly confined to the upper Sacramento River, which they enter from early November through February and spawn from January through early April. They are usually larger than the fall- and winter-run fish spawning in the same area.
- 2) Winter run. Most are confined to the upper Sacramento River, which they enter from early January through mid-June and then spawn from April to early August.
- 3) Spring run. Once widespread in the Central Valley, these fish have disappeared from many of the streams as a result of dam construction. Spring run enter the Sacramento River from March to July and spawn from late August to early October.
- 4) Fall run. These are presently the most numerous and widely distributed salmon in the Central Valley. They enter the river from July through November and spawn from mid-October through early January.

Monitoring of salmon spawning escapement in the Central Valley is an important component of the Department of Fish and Game's fishery management effort. The primary objectives of this work are to determine size and sex composition of spawning populations and to recover tagged or marked salmon to determine their contribution to river spawning escapement. Other objectives are to observe any changes in spawning distribution and habitat conditions that may adversely affect salmon and determine if corrective action is necessary.

Salmon counts of all four races at Red Bluff Diversion Dam and their sport catches above the dam are shown in Appendix Tables 1 and 2, respectively. Spawning populations for all Central Valley streams are summarized in Appendix Tables 3 - 5. Fin mark and coded-wire tag recoveries are presented in Appendix Tables 6 and 7.

## GENERAL METHODS

During 1983, spawning stock data were collected on most Central Valley streams known to support sizeable chinook salmon runs by observing potential spawners passing through fishways, conducting stream surveys where numbers of live fish, carcasses, and redds were enumerated, and

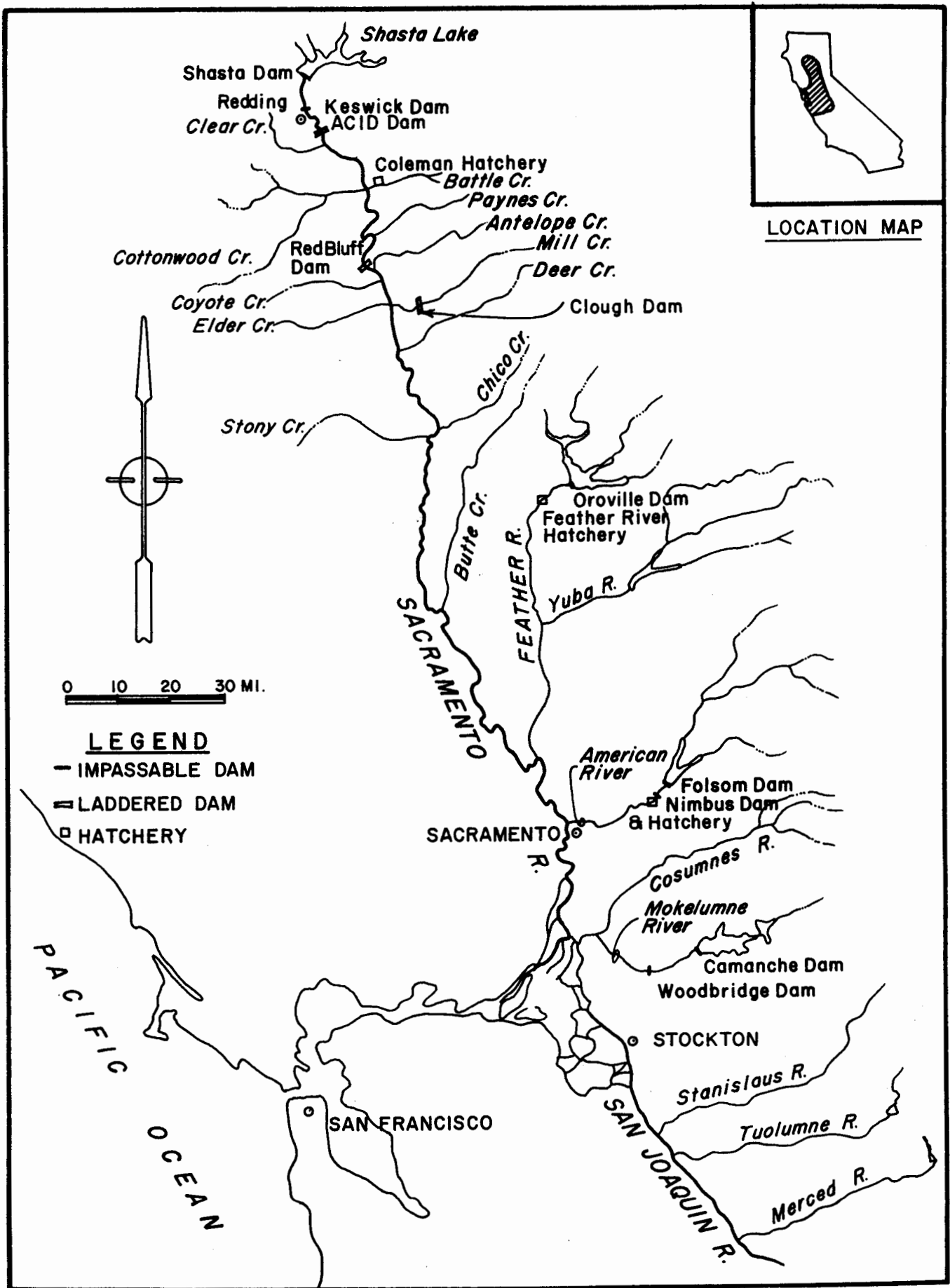


FIGURE 1. Salmon streams in the California Central Valley.

making aerial redd counts. In some streams, carcasses were tagged and released and subsequent recovery rates of tagged carcasses were used in estimating spawning populations. Unless otherwise stated, all counted carcasses were cut in half or tagged to prevent recounting on subsequent trips. Specific methods and results are presented under the individual stream headings.

## CHINOOK SALMON SPAWNING POPULATIONS FOR THE SACRAMENTO RIVER SYSTEM

Keswick Dam to Red Bluff Diversion Dam

by

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Estimates were made of all four spawning populations in the upper Sacramento River main stem using fish counts at Red Bluff Diversion Dam (Figure 2). In addition, fall run population estimates were made for Battle, Paynes, and Cottonwood creeks using carcass counts and returns to Coleman Hatchery. Aerial redd counts were conducted to determine spawning distribution in the Sacramento River main stem.

A total of 62,079 salmon spawned in the Sacramento River system between Keswick Dam and Red Bluff in 1983 including 41,309 fall-, 15,089 late-fall-, 1,827 winter- and 3,854 spring-run fish (Table 1). Since no tributaries were surveyed at the time they spawned, all spring- and winter-run fish were assigned to the main stem. A total of 26,226 fall- and 14,984 late-fall-run salmon spawned in the main stem, while 15,083 and 105, respectively, of the same groups spawned in the tributaries (Appendix Table 3).

### Sacramento River Main Stem

Estimates of the total numbers of salmon utilizing the Sacramento River and its tributaries upstream from Red Bluff Diversion Dam during 1983 were based on daily counts made by the U.S. Fish and Wildlife Service and the Department of Fish and Game at Red Bluff Diversion Dam. The counts were obtained by closed circuit television observations of salmon passing through the fishways (Appendix Table 1).

Weekly counts were adjusted for periods when the fishways 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 no counts were made. Count adjustments for the daytime lapses were made by interpolation. Adjustment for the nighttime hours consisted of multiplying the 14-h day counts by a "night factor" developed from weekly night counts.

The adjusted weekly totals were separated into numbers of late-fall-, winter-, spring-, and fall-run salmon by examining fish entering the trapping facility adjacent to the east bank fishway and estimating, by

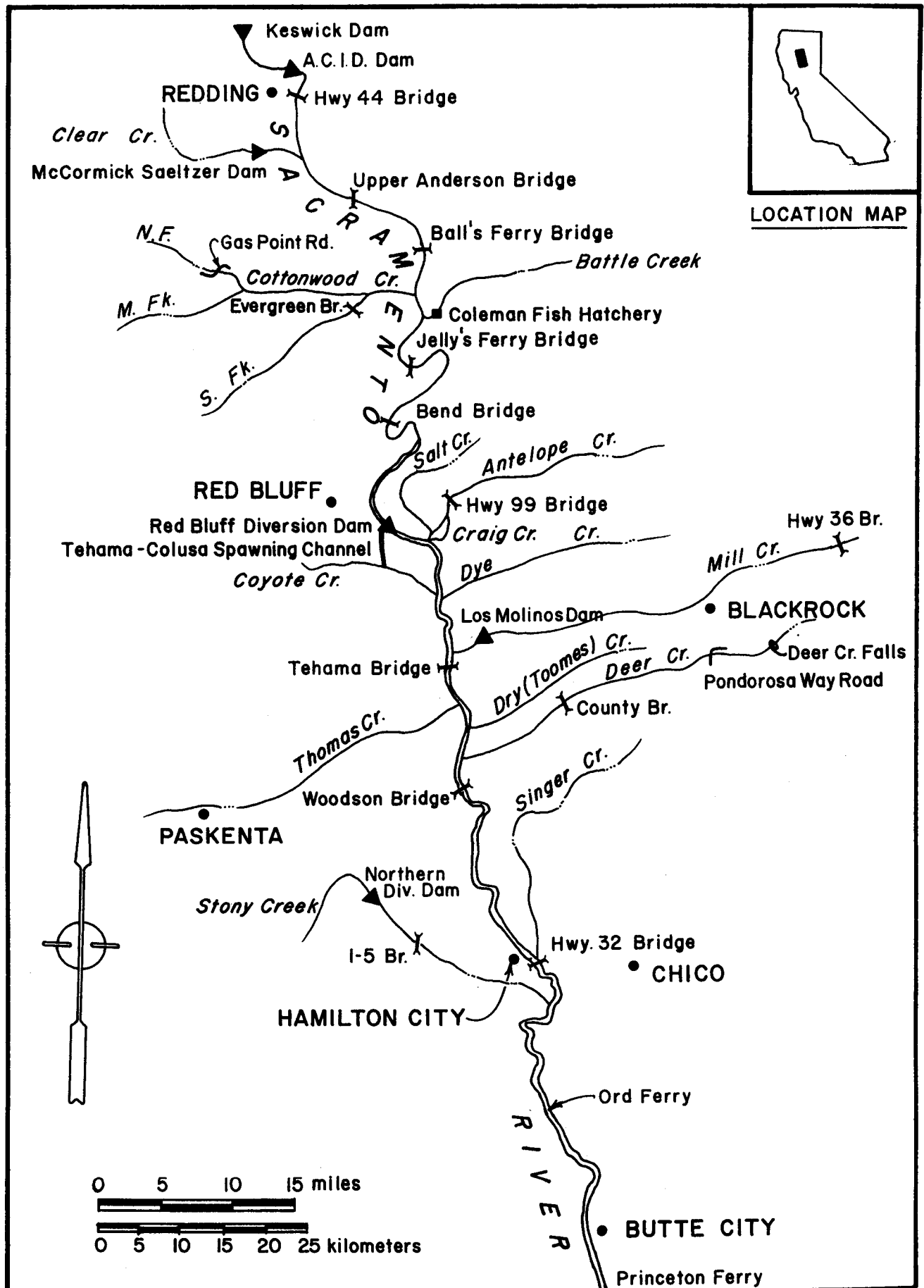


FIGURE 2. Upper Sacramento River above Redwood Ferry.

TABLE 1. Calculation of Chinook Salmon Runs and Spawning Populations, Sacramento River System above Red Bluff Diversion Dam, 1983

Run	Fish passing dam in calendar year				Potential 1983 Spawners (runs)		Estimated 1981-82 sport catch above dam		Estimated 1983 spawning populations
	1982		1983						
Late-fall 1982-83	5,926	+	9,264	=	15,190*	-	101	=	15,089
Winter 1982-83	37	+	1,794	=	1,831*	-	4	=	1,827
Spring 1983	0	+	3,931	=	3,931	-	77	=	3,854
Fall 1983	0	+	42,046	=	42,046	-	737	≠	41,309
Totals	5,963		57,035		62,998		919		62,079

\* A total of 4,009 late-fall-run salmon and 137 winter-run salmon passed the dam in the latter part of 1983, but will not spawn until 1984.

their degree of ripeness, when they would spawn. To convert the adjusted numbers of salmon in each of the four runs passing the dam into the numbers that actually spawned, the estimated number of salmon landed by sportsmen in the Sacramento River between Keswick Dam and Red Bluff was subtracted from each corresponding run (Table 1 and Appendix Table 2). No attempt was made to measure any other forms of mortality in the upper river prior to spawning.

The estimated salmon sport catch at resorts was obtained by visiting all fishing resorts once every other week to obtain the number of salmon landed during the previous 2 weeks. To estimate the total catch, the resort catch was multiplied by 1.5944, a factor derived from sampling resorts and public boat launching ramps in the area during the 8-year period from 1967-74. Practically all salmon caught in this section of the river are landed at either the resorts or public boat launching ramps. To breakdown the total catch into the numbers landed from each of the four runs, it was assumed that salmon from the various runs are caught in proportion to their abundance, as indicated by counts at Red Bluff Diversion Dam (Table 1 and Appendix Table 2).

While a calendar year count includes total annual runs passing the dam for spring- and fall-run salmon, it represents only part of the total annual run of late-fall salmon and often only part of the winter-run salmon since both of these runs usually begin passing Red Bluff in one calendar year and finish in the next. Generally, a calendar year count of the late-fall run will include approximately the latter half of one run during the first part of the year, and the first half of the next late-fall run at the end of the year.

The same calendar year will usually include most of a winter run early in the year and the first small portion of the subsequent winter run at the end of the year. Accordingly, about 39% of the 1982-83 late-fall-run salmon (all destined to spawn in 1983) passed Red Bluff in 1982. Only 9% of the 1982-83 winter run occurred during 1982. To arrive at the total numbers of 1983 spawners in these two runs, it is necessary to add the appropriate portion of the 1982 calendar year count that would spawn in 1983 and delete that portion of the 1983 calendar year count which will spawn in 1984.

To obtain the Sacramento River main stem spawning population above Red Bluff, estimates for Battle, Paynes, and Cottonwood creeks were subtracted from runs passing Red Bluff Diversion Dam (Figure 2). Salmon that spawned in all unsurveyed tributaries are included in the main stem estimate.

Late-Fall Run. An estimated 14,984 late-fall-run salmon spawned in the Sacramento River system upstream from Red Bluff during 1983 (Table 1 and Appendix Table 3). Included in this total are 204 trapped at Keswick Dam and 343 at Red Bluff Diversion Dam in the winter of 1982-83 and hauled to Coleman Hatchery to be spawned. Although some late-fall-run salmon may have spawned in tributaries to the Sacramento River, no spawning stock surveys were made in these streams at the time they spawned and all late-fall-run salmon, except the 105 that entered Coleman Hatchery, are considered in this report to have spawned in the main stem of the



Sacramento River. Counts at Red Bluff Diversion Dam were interrupted by high flows. The number of salmon migrating over the dam during such periods was estimated by averaging the number of salmon that migrated over the dam on the same dates during the previous 10 years.

Winter Run. An estimated 1,827 winter-run salmon spawned in the Sacramento River above Red Bluff in 1983. Even though some winter-run salmon have been known to spawn in tributaries such as Battle Creek, this race spawns primarily in the main stem of the Sacramento River. Counts at Red Bluff Diversion Dam were interrupted by high flows. The number of salmon migrating over the dam during such periods was estimated by averaging the number of salmon that migrated over the dam on the same dates during the previous 10 years.

Spring Run. An estimated 3,854 spring-run salmon spawned in the Sacramento River system above Red Bluff during 1983. Although some spring-run salmon spawn in tributaries of this section to the Sacramento River, especially Battle and Cottonwood creeks, no spawning stock surveys were made in these streams at the time they spawned, and all spring-run salmon above Red Bluff were assigned in this report to the main stem.

Fall Run. An estimated 26,226 fall-run salmon spawned in or were assigned to the main stem of the Sacramento River above Red Bluff Diversion Dam during 1983. Of this total, 212 salmon from Keswick Dam and 6 salmon from Red Bluff Diversion Dam were trapped and hauled to Coleman Hatchery where they were spawned. The main stem total was derived from the 42,046 total fall run migrating over Red Bluff Diversion Dam by subtracting 737 salmon caught by sportsmen above Red Bluff, 13,983 that entered Battle Creek (including 8,756 entering Coleman Hatchery and 5,227 spawning naturally), and 1,100 that spawned in Cottonwood and Paynes creeks.

Above Red Bluff Diversion Dam all fall-run salmon that spawned in tributaries, other than Battle, Cottonwood, and Paynes creeks are combined with those that spawned in the main stem of the Sacramento River. No estimates were made for several other tributaries above Red Bluff which usually account for a portion of the fall run escapement.

#### Spawning Distribution

Data collected during four airplane flights (25 August, 19 September, 7 and 27 October 1983) over the main stem of the Sacramento River showed the general salmon redd distribution of fall spawning salmon and indicated the relative number of salmon that spawned on the riffles above Princeton Ferry (Table 2 and Figure 2). Redd counts showed 47.5% of the main stem fall spawning activity occurred upstream from Red Bluff Diversion Dam. This is slightly less than the 50.7% average for the previous 9 years (aerial surveys were started in 1974).

#### Battle Creek

Late-fall, winter, and spring runs. Small numbers of all three runs are known to spawn in Battle Creek, but no surveys or population estimates were made during 1983. There were 105 late-fall-run salmon that entered

TABLE 2. Estimated Redd Distribution of Fall Spawning Chinook Salmon  
(Fall and Spring Run) Main Stem of Sacramento River, Keswick  
Dam to Princeton Ferry, Based on Aerial Redd Counts, 1983

	Spring run				Fall run			
	Aug 25	Sept 19	Average redds		Oct 7	Oct 27	Average redds	
			Number	Percent			Number	Percent
Keswick to A.C.I.D. Dam	0	0	0	0	0	0	0	0
A.C.I.D. Dam to Highway 44	6	23	14.5	54.7	36	64	50.0	8.7
Highway 44 to Upper Anderson Bridge	0	0	0	0	17	78	47.5	8.2
Upper Anderson Bridge to Balls Ferry	1	0	0.5	1.9	33	108	70.5	12.2
Balls Ferry to Jellys Ferry	0	5	2.5	9.4	15	117	66.0	11.5
Jellys Ferry to Bend Bridge	0	0	0	0	3	71	37.0	6.4
Bend Bridge to Red Bluff Diversion Dam	0	0	0	0	1	5	3.0	0.5
Red Bluff Diversion Dam to Tehama	1	4	2.5	9.4	77	424	250.5	43.5
Tehama to Woodson Bridge	1	0	0.5	1.9	0	72	36.0	6.2
Woodson Bridge to Hamilton City	11	0	5.5	20.8	4	24	14.0	2.4
Hamilton City to Ord Ferry	0	0	0	0	0	1	0.5	0.2
Ord Ferry to Princeton Ferry	0	1	0.5	1.9	0	1	0.5	0.2
Totals			26.5	100.0			575.5	100.0

Coleman Hatchery in January and February 1983. An additional 204 from Keswick Dam and 343 from Red Bluff Diversion Dam were hauled to Coleman Hatchery.

Fall run. An estimated 13,983 fall-run salmon spawned in Battle Creek during 1983. This total includes 8,756 salmon handled at Coleman Hatchery, and 5,227 that spawned in Battle Creek between Coleman Hatchery and the Sacramento River (Figure 2).

Carcass recovery data were used to estimate the numbers of salmon that spawned in Battle Creek below Coleman Hatchery. Thirteen survey trips were made on lower Battle Creek from 5 October 1983 through 5 January 1984. Carcass recovery conditions were good during the early part of the recovery period, but poor in November and December 1983. A total of 1,568 carcasses was recovered, at an estimated overall efficiency rate of 30%.

#### Cottonwood Creek

Fall run. One aerial survey was made (27 October 1983). A total of 105 redds was counted (18 in the North Fork, 1 in the South Fork and 86 between the mouth of the South Fork and the Sacramento River) (Figure 2). The spawning population was estimated to be 1,000.

#### Paynes Creek

Fall run. Two survey trips were made along the lower 8 km (5 miles) of Paynes Creek on 11 November and 20 December 1983. A total of 7 redds and 11 live salmon was observed. The spawning population was estimated to be 100 salmon.

#### Red Bluff Diversion Dam to Princeton Ferry

by

Richard J. Hallock  
Anadromous Fisheries Branch

Spawning populations in the Sacramento River main stem were estimated by carcass count surveys and aerial redd counts. Carcass counts were conducted and spawning escapement was estimated on the following tributary streams: Salt, Antelope, Craig, Dye, Mill, Toomes, and Deer creeks (Figure 2).

A total of 35,110 chinook salmon spawned in the Sacramento River system between Red Bluff and Princeton Ferry (Chico Creek) in 1983. This total included 2,352 spring run and 32,758 fall run. The spring run consisted of 1,793 that spawned in the main stem and 559 that spawned in the tributaries. The fall run consisted of 32,018 that spawned in the main stem, and 740 that spawned in various tributaries. Of the main stem spawners, 1,267 spawned in the Tehama-Colusa Spawning Channel.

Flow in the upper Sacramento River at Red Bluff was high in October 1983, averaging  $246 \text{ m}^3/\text{s}$  (8,700 cfs). From mid-November until the end of the month flows were greater than  $453 \text{ m}^3/\text{s}$  (16,000 cfs). In December the flow at Red Bluff was never less than  $566 \text{ m}^3/\text{s}$  (20,000 cfs); it did fluctuate to over  $1,416 \text{ m}^3/\text{s}$  (50,000 cfs) six times.

Precipitation and run off in the upper Sacramento Valley were moderate during the early part of the 1983 fall spawning season. Low flows existed in most tributaries to the upper Sacramento River until early November. From early November through December there were considerable fluctuations and high stream flows, which made spawning stock surveys difficult.

#### Sacramento River Main Stem

Late fall and winter runs. It is likely some fish from these runs spawned below Red Bluff. No spawning population estimates were made for 1983.

Spring run. Spring-run salmon normally spawn in this section of the river, although no population estimates have been made during recent years. Estimates were based on two aerial surveys (25 August and 19 September 1983). An estimated 1,793 spring-run salmon spawned in the main stem Sacramento River between Red Bluff Diversion Dam and Princeton Ferry (Figure 2 and Appendix Table 3). Of this total, 499 spawned between Red Bluff Diversion Dam and Tehama; 100 spawned between Tehama and Woodson Bridge; 1,094 spawned between Woodson Bridge and Hamilton City; and 100 spawned between Ord Ferry and Princeton Ferry. No spring-run salmon redds were observed between Hamilton City and Ord Ferry.

Fall run. An estimated 26,821 fall-run salmon spawned in the main stem of the Sacramento River between Red Bluff Diversion Dam and Tehama during 1983 (Figure 2 and Appendix Table 3). This total includes 25,554 that spawned in the river and 1,267 that entered the Tehama-Colusa Spawning Channel via Coyote Creek.

An estimated 3,659 salmon spawned between Tehama and Woodson Bridge. Another 1,538 salmon spawned between Woodson Bridge and Princeton Ferry (Woodson Bridge to Hamilton City -- 1,414, Hamilton City to Ord Ferry -- 62, and Ord Ferry to Princeton Ferry -- 62).

A total of 32,018 fall-run salmon spawned in the Sacramento River main stem between Red Bluff and Princeton Ferry.

#### Spawning Distribution

Data collected during four airplane flights (25 August, 19 September, 7 and 27 October 1983) over the main stem of the Sacramento River showed the general salmon redd distribution of all spawning salmon and indicated the relative number of salmon that spawned on the riffles above Princeton Ferry (Figure 2 and Table 2). Redd counts showed that 52.5% of the main stem fall spawning activity occurred downstream from Red Bluff Diversion Dam. This is slightly greater than the 49.3% average for the previous 9 years (aerial surveys were started in 1974).

### Salt Creek

Fall run. Five survey trips were made between 21 November 1983 and 9 January 1984 in the Tuscan Spring Bridge area (Figure 2). Only two live salmon and one salmon carcass were observed. The spawning population was estimated to be 15.

### Antelope Creek

Spring run. No population estimate for spring-run salmon was made by Department of Fish and Game for 1983. U.S. Forest Service estimated the population to be about 59 on Forest Service land; this was based on observation of 20 live fish.

Fall run. Seven survey trips were made on Antelope Creek from Cone Grove Park to the 99-E Highway Bridge (Figure 2). Only six carcasses were recovered. Based on an estimated recovery rate of 10%, the salmon population totaled 60 fish in the area surveyed.

### Craig Creek

Fall run. Craig Creek is an overflow channel from lower Antelope Creek (Figure 2). Six survey trips between 1 December 1983 and 9 January 1984 were made. Six salmon carcasses were recovered and 32 live salmon were counted. Based on an estimated recovery rate of 10%, the spawning population totaled 60 fish.

### Dye Creek

Fall run. Two survey trips were made on Dye Creek between Highway 99-E and the county road crossing located 2 miles upstream (Figure 2). Surveys were made on 18 November 1983 and 12 January 1984. Two live fish and two redds were observed. The population was estimated to be 20 fish.

### Mill Creek

Late fall and winter runs. Some fish of these races are known to have spawned in this stream in previous years. No surveys or estimates were made for 1983.

Spring run. Only one salmon carcass was observed during the four survey trips for spring run in upper Mill Creek. The area from Highway 36 to 2 miles below Blackrock was surveyed (Figure 2). No population estimate was made.

Fall run. Between 22 October 1983 and 5 January 1984, 10 survey trips were made on lower Mill Creek from the Los Molinos Mutual Water Company's upper diversion dam to the confluence with the Sacramento River. A total of 20 carcasses were recovered and 56 live salmon were observed. The fall run was estimated to be 200 spawners.

### Toomes Creek

Fall run. Four survey trips were made on lower Toomes Creek near the Tehama-Vina Road crossing between 1 November and 15 December 1983 (Figure 2). Six live salmon were observed and one carcass was recovered. The spawning population was estimated to be 15.

### Deer Creek

Spring run. Eleven survey trips were made to count spring-run salmon on upper Deer Creek between 12 September and 11 October 1983. The area partially covered was from upper Deer Creek Falls to Ponderosa Way Road crossing (Figure 2). Ninety redds and 16 live salmon were observed. The spawning population was estimated to be 500.

Fall run. Twelve survey trips were made on lower Deer Creek between 28 October 1983 and 3 January 1984. The area between the mouth and the county bridge located 3.2 km (2 miles) above Stanford-Vina Dam was surveyed (Figure 2). A total of 37 salmon carcasses were recovered. The estimated fall run totaled 370 spawners.

### Butte Creek to American River

Spawning escapement surveys were conducted and population estimates were made on the following streams: Big Chico Creek, Butte Creek, Feather River, Yuba River, and American River (Figure 3). Surveys were also made on the following streams in Butte County: Little Dry, Honcut, Rock, Singer and Pine creeks; observations of these streams indicated occasional spawners stray into them, but no self-sustaining runs exist.

Flows and water clarity were normal when the fall run escapement surveys began. Starting in mid-November, heavy precipitation and high flows hampered survey efforts on the Feather, Yuba, and American rivers. Flows stayed high for the remainder of the survey season.

### Butte Creek - by Lawrence G. Preston

Spring run. Spring run population was estimated to be about 50 spawners. Conditions for upstream migration were good due to 1983 being one of the wettest years of record and the absence of any barriers. On 5 October 1983 a survey was conducted on two sections of stream. The sections surveyed were from Centerville Powerhouse downstream to 0.4 km (1/4 mile) above the Covered Bridge, and from Parrot-Phelan Dam downstream to 0.4 km (1/4 mile) below the haul road bridge site located between Skyway Bridge and Durham Mutual Dam (Figure 3). The flow was  $2.1 \text{ m}^3/\text{s}$  (75 cfs) and clear, which provided good recovery conditions. A total of 6 live fish, 5 carcasses, 9 single redds, and 3 multiple redds was observed. Spawning activity was dispersed throughout the sections surveyed.

Fall run. Fall-run population was estimated to be 1,000 spawners. Surveys were conducted by canoe on 30 and 31 November 1983 from Parrot-Phelan Dam to Goodspeed-Watt Road. The creek was flowing  $11.9 \text{ m}^3/\text{s}$  (420 cfs) and was clear. A total of 11 live salmon, 49 carcasses, 7 single

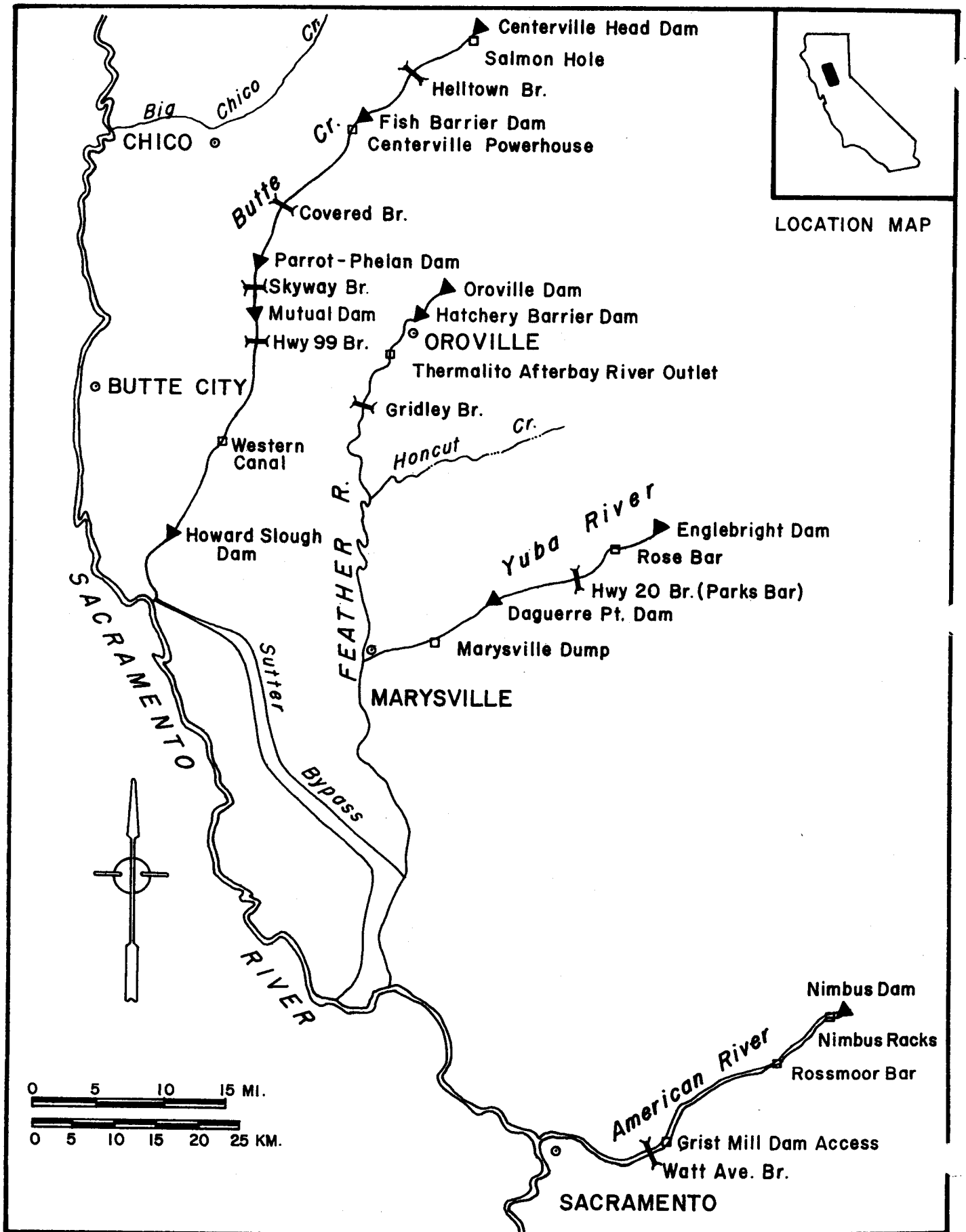


FIGURE 3. Sacramento River tributaries from Chico Creek south.

redds, and 23 multiple redds was counted. Most of the spawning activity occurred between Durham and the Western Canal Dam.

Big Chico Creek - by Lawrence G. Preston

Spring run. No population estimate was made. Survey efforts were limited to a few observations. One spring-run carcass was seen by Warden Will Bishop in early summer. No salmon were seen during a face plate survey below Higgins Hole (Figure 3). Higgins Hole has been a barrier in past years, but high flow conditions during 1983 may have permitted passage, although U.S. Forest Service personnel did not observe any salmon while making fish surveys near Soda Springs. The surveys indicated the spawning population was insignificant.

Fall run. An estimated 500 fall-run salmon spawned during 1983. On 23 November 1983 the section of stream between Manzanita Ave. and Mangrove Blvd. (7.2 km or 4 1/2 miles) was surveyed on foot, and 15 live salmon, 10 carcasses and 3 redds were observed. On 29 November 1983 the section of stream between Mangrove Blvd. and Nord Ave. was surveyed by canoe and only one carcasses was seen.

Lindo Channel, a flood control bypass channel which diverts water from Big Chico Creek during high flows, was surveyed. No salmon were seen on 22 November 1983 between Five Mile Dam (where water is diverted from Big Chico Creek) and Esplanade Blvd. A total of 24 live salmon and 8 carcasses was seen on 7 and 8 December 1983 during a canoe survey from Esplanade Blvd. to the location where Lindo Channel reenters Big Chico Creek.

Feather River by Lawrence G. Preston

Spring run. A total of 1,702 spring-run salmon entered Feather River Hatchery from 1 to 30 September 1983. This total was comprised of 714 adult males (FL  $\geq 60.7$  cm or 23.9 inches), 916 adult females, and 72 grilse (FL  $< 60.7$  cm or 23.9 inches). Spring run cannot be separated from the fall run spawning in the Feather River; therefore, no estimate of naturally spawning spring-run salmon was made.

Fall run. An estimated 30,522 fall-run salmon spawned in the Feather River. This total includes 22,823 that spawned naturally and 7,699 that entered the hatchery.

Surveys began on 3 October and were completed on 28 November 1983. The area between Oroville Fish Barrier Dam and Evans-Reimar Road was surveyed weekly (Figure 3). The area was divided into two sections: (i) Oroville Fish Barrier Dam to Thermalito Afterbay Outlet, frequently called "low flow section," and (ii) Thermalito Afterbay Outlet to Evans-Reimar Road. Evans-Reimar Road is located about 3.2 km (2 miles) downstream from the Gridley Bridge; Gridley Bridge has been the lower boundary in past years' surveys. The upstream section or low flow section had constant flows of  $11.3 \text{ m}^3/\text{s}$  (400 cfs) throughout the survey period except for 3 days (24-26 November) when Oroville Reservoir spilled and flows exceeded  $566 \text{ m}^3/\text{s}$  (20,000 cfs). The downstream section had flows of  $68.0 \text{ m}^3/\text{s}$  (2,400 cfs) until 15 November, when they were increased to  $136 \text{ m}^3/\text{s}$  (4,800 cfs) for the remainder of the survey season.



The Schaefer Method (1951) as described by Taylor (1974b) was used to estimate the naturally spawning population. With this method, fresh dead salmon with clear eyes were tagged by attaching a small piece of colored ribbon to the jaw using a hog ring; the color indicated the week of tagging. The carcass was then placed into running water for future recovery.

An estimated 12,564 salmon spawned between Oroville Fish Barrier Dam and Thermalito Afterbay Outlet (Table 3). An estimated 10,259 salmon spawned between Thermalito Afterbay Outlet and Evans-Reimar Road (Table 4).

The sex and age composition for 1983 fall-run salmon was as follows:

	Male adults no. (%)	Female adults no. (%)	Grilse no. (%)
Feather River Hatchery	2,687 (34.9)	3,388 (44.0)	1,624 (21.1)
Feather River Spawners	6,733 (29.5)	11,708 (51.3)	4,382 (19.2)

The sex composition of fish entering Feather River Hatchery was based on observations of all fish, while the sex composition for river spawners was based on observations of a sample of 1,672. A total of 42 coded-wire tags was recovered from 1,670 fresh carcasses (Appendix Tables 6 and 7).

#### Yuba River by Lawrence G. Preston

Spring run. U. S. Corps of Engineers personnel observed salmon migrating over Daguerre Point Dam in May and June. No surveys or estimates of spring-run salmon were made.

Fall run. An estimated 13,756 fall-run chinook salmon spawned in the Yuba River during 1983. Five weekly surveys were conducted from 13 October through 11 November. Surveys were terminated after 11 November due to high flows and muddy water. The surveys normally included the area between Blue Point Mine and Marysville Dump, but the survey during the week of 24 October was shortened and only included the area between Highway 20 Bridge and Marysville Dump (Figure 3).

Flows were  $85.0 \text{ m}^3/\text{s}$  (3,000 cfs) during the first survey, then they were decreased to  $71.0 \text{ m}^3/\text{s}$  (2,500 cfs) during the remaining surveys. Water clarity was 3.0 m (10 feet) during the first three surveys then it decreased to 1.2 - 1.5 m (4 - 5 feet) during the last two surveys.

Population was estimated by tagging fresh carcasses and placing them into running water for later recovery. Normally the Schaefer Method (1951) is used to derive a population estimate and there are usually 6 - 8 weeks of survey data available. Due to the short survey season (only 3 weeks) the more simple Ricker (1975) Formula 3.5 shown below was used:

TABLE 3. Population Estimates of Chinook Salmon Based on Tag and Recovery Data for the Feather River from Feather River Fish Barrier Dam to Thermalito Afterbay River Outlet Using Schaefer's Method, 1983

Recovery period (j)	Tagging period (i)								Number tagged fish observed (Rj)	Total number carcasses observed (Cj)*	Population estimate (N)
	Oct. 3	Oct. 10	Oct. 17	Oct. 24	Oct. 31	Nov. 7	Nov. 14	Nov. 21			
Oct. 10	0								0	148	
Oct. 17	2	31							33	335	1,060
Oct. 24		5	36						41	583	1,566
Oct. 31		3	12	55					70	984	2,305
Nov. 7			2	25	67				94	1,289	2,779
Nov. 14				3	12	73			88	887	1,993
Nov. 21				1	2	36	42		81	826	2,056
Nov. 28						2	8	11	22	258	1,819
Total tagged fish recovered (Ri)	3	39	50	84	81	111	50	11			13,578 <sup>+</sup>
Total fish tagged (Mi)	6	84	138	190	170	252	135	129			

\* Includes tagged fish recovered.

+/- Totals of 3 weeks (3 to 17 Oct.) were lumped to obtain  $\frac{M_i}{R_i}$  and  $\frac{C_j}{R_j}$  values.

† Total tagged fish from third week on were subtracted:  $13,578 - 1,014 = 12,564$  (normally totals from second week are subtracted since first 2 weeks results were lumped, the total from third week was subtracted).

$$\text{Population estimate (N)} = \sum (R_{ij} \cdot \frac{M_i}{R_i} \cdot \frac{C_j}{R_j} - \sum_2^i M_i)$$

TABLE 4. Population Estimates of Chinook Salmon Based on Tag Recovery Data for Feather River from Thermalito River Outlet to Evans-Reimer Road using Schaefer's Method, 1983

Recovery period (j)	Tagging period (i)				Number tagged fish observed (Rj)	Total number carcasses observed (Cj) *	Population estimate (N)
	Oct. 18	Oct. 25	Nov. 1	Nov. 8			
Oct. 25	1				1	91	2,673
Nov. 1		5			5	305	
Nov. 8		2	14		16	605	2,996
Nov. 25			3	11	14	214	2,239
<hr/>							
Total tagged fish recovered (Ri)	1	7	17	11			7,908 <sup>†</sup>
Total fish tagged (Mi)	13	41	82	132			

\* Includes tagged fish recovered.

+ Totals of 3 weeks (18 Oct. to 1 Nov.) were lumped to obtain  $\frac{M_i}{R_i}$  and  $\frac{C_j}{R_j}$  values.

† Total tagged fish from third week on were subtracted:  $7,908 - 214 = 7,694$  (totals from third week on were subtracted due to first 3 weeks being lumped). High flows prevented surveys between 8 and 25 November and the 7,694 estimate represents only a portion of the total run. Data gathered on the upstream "low flow" section indicated the run was 60% complete by 8 November. Since high flows prevented surveys between 8 and 25 November and greatly hampered recovery efforts on the 25 November survey, the 7,694 estimate probably didn't represent over 90% of the total run. The midpoint between these estimates is 75%. Therefore, 7,694 was expanded to 10,259.

$$\text{Population estimate (N)} = \sum (R_{ij} \cdot \frac{M_i}{R_i} \cdot \frac{C_j}{R_j} - \sum \frac{i}{2} M_i)$$

$$N = \frac{MC}{R}$$

Where N = estimated population  
M = number of carcasses tagged  
C = number of carcasses examined  
R = number of tags recovered

Actual calculations were as follows:

$$N = \frac{(192)(748)}{29} = 4,952$$

This represents only 36% of the Yuba River run based on the percentage of completed spawning activity in the Feather River low flow section where surveys were conducted for the entire spawning season. The 4,952 figure was, therefore, expanded to 13,756.

The sex and age composition based on the 413 fresh carcasses was 30.8% adult males (FL  $\geq$  60.7 cm or 23.9 inches), 52.0% adult females, 9.9% male grilse (FL < 60.7 cm or 23.9 inches) and 7.3% female grilse.

No coded-wire tags were recovered in the Yuba River during 1983.

Dry Creek (Yuba County) by Lawrence G. Preston

Fall run. An estimated 500 chinook salmon spawned in Dry Creek. This stream has not been surveyed in recent years. The Beale Air Force Base game warden reported at least 200 salmon and steelhead were caught by Air Force personnel and their families in late November and early December.

On 7 December I walked from Camp Beale Lake downstream to Ryden Park. Flow was 1.4 m<sup>3</sup>/s (60 cfs) and water clarity was less than 0.3 m (1 foot). No salmon were seen. Two anglers were checked. One had caught two adult salmon during 2 1/2 h of fishing effort; the other angler had not caught a fish during 1 1/2 h of fishing effort.

I checked three anglers at the Sixth Ave. Bridge who had not caught any fish that day during 4 h of fishing effort; two of these anglers reported catching seven salmon during the previous week. While at this location I also saw five live fish and one redd.

These limited observations have been the only survey efforts during recent years. This stream probably does not have a self-sustaining population of salmon.

American River by Mike Mainz

Fall run. In 1983 an estimated 26,400 chinook salmon spawned in the American River from Nimbus Racks to Grist Mill Dam Access. The weekly carcass count surveys began 1 November 1983 and terminated 2 weeks later when river flows consistently exceeded  $142 \text{ m}^3/\text{s}$  (5,000 cfs). River conditions during the survey were good; Secchi disc readings were greater than 1.2 m (4 feet) and flows were less than  $71 \text{ m}^3/\text{s}$  (2,500 cfs).

A total of 8,900 chinook salmon entered Nimbus Hatchery. No estimate was made of salmon spawning above Nimbus racks because high flows forced the removal of the racks on 14 November. Combining the river estimate with the hatchery count, 35,300 salmon was the spawning escapement estimate for the American River.

The Schaefer Method (1951) as described by Taylor (1974b) is normally used to estimate run size, but in 1983 no usable carcass data were collected. During the two weeks carcass counts were made, very few live fish were seen and only 40 fresh carcasses were tagged and none was recovered. As a result, the 1983 escapement estimate is just a "guesstimate" based on a consensus opinion by biologists and Nimbus Hatchery personnel familiar with the American River. The consensus was that the run was about 20% below last year's or about 26,400 salmon ( $33,000 \times .80$ ).

No salmon with missing adipose fins were found during the 2 weeks the surveys were conducted.

CHINOOK SALMON POPULATIONS FOR THE SAN JOAQUIN RIVER

Salmon spawning populations in San Joaquin River tributaries were estimated by counting carcasses, redds, live fish, and hatchery returns. Stream surveys were conducted on the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers (Figure 4).

Cosumnes River to the Calaveras River

Cosumnes River by Steve Baumgarnter

Fall run. An estimated 200 chinook salmon spawned in the Cosumnes River during 1983. Efforts were limited to weekly surveys of the section between Michigan Bar Bridge and Highway 16 (Figure 4). Surveys were started on 28 October and completed on 18 December. Extreme fluctuations in flow resulted in poor recovery conditions; only two salmon were observed.

Mokelumne River by Mike Mainz

Fall run. In 1983 an estimated total of 15,861 chinook salmon spawned in the river between Mackville Road and the hatchery (Figure 4). No carcass count survey was conducted because river flows were dangerously high [ $\geq 56.6 \text{ m}^3/\text{s}$ , (2,000 cfs)]. The escapement estimate was made using a relationship between the number of salmon entering the Mokelumne River Fish Installation and the estimated number in the river. From data collected

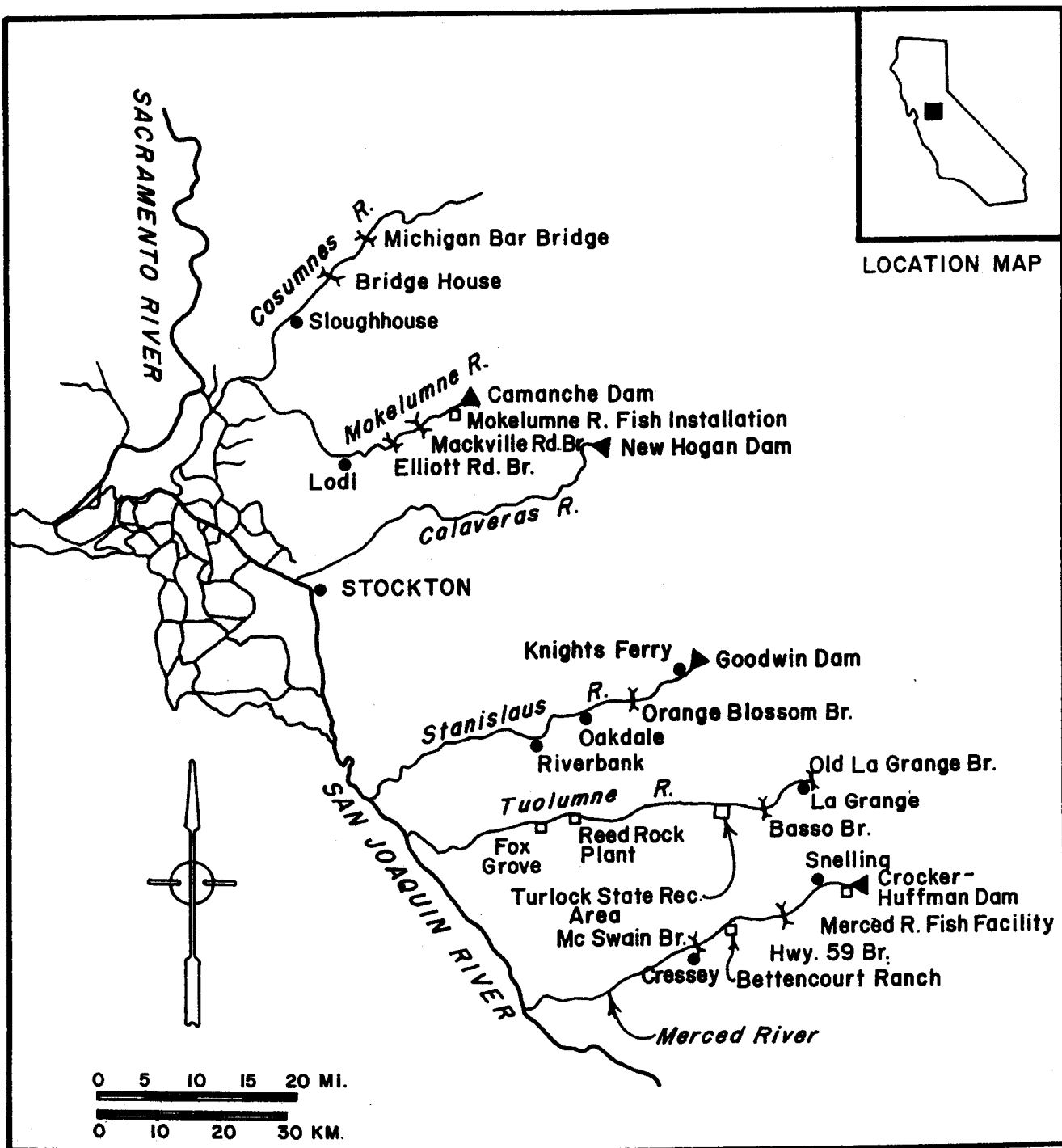


FIGURE 4. San Joaquin River tributaries.

since 1973 (Table 5) a linear relationship with a correlation coefficient of 0.9295 exists between the two parameters (Figure 5). The line describing this relationship was used to extrapolate the number of salmon in the Mokelumne River where:

$$Y = 789 + 2.19 X = \text{Estimated Mokelumne River escapement (both river and hatchery)}$$

X = Number of salmon entering hatchery

Based on this linear relationship, an estimated 10,793 salmon spawned in the main stem at the Mokelumne River below Camanche Dam.

TABLE 5. Mokelumne River Chinook Salmon Spawning Stock Data, 1973-1983

<u>Year</u>	<u>Number entering hatchery</u>	<u>Estimated number in river</u>	<u>Total escapement estimate*</u>
1973	407	2,193	2,600
1974	222	1,200	1,422
1975	399	1,501	1,900
1976	18	455	473
1977	Ladder closed	300	300
1978	Mark and recapture method not used		1,100
1979	" "	" "	1,500
1980	639	2,592	3,231
1981	1,386	3,568	4,954
1982	2,677	6,660+	9,337
1983	4,568	10,793+	15,361

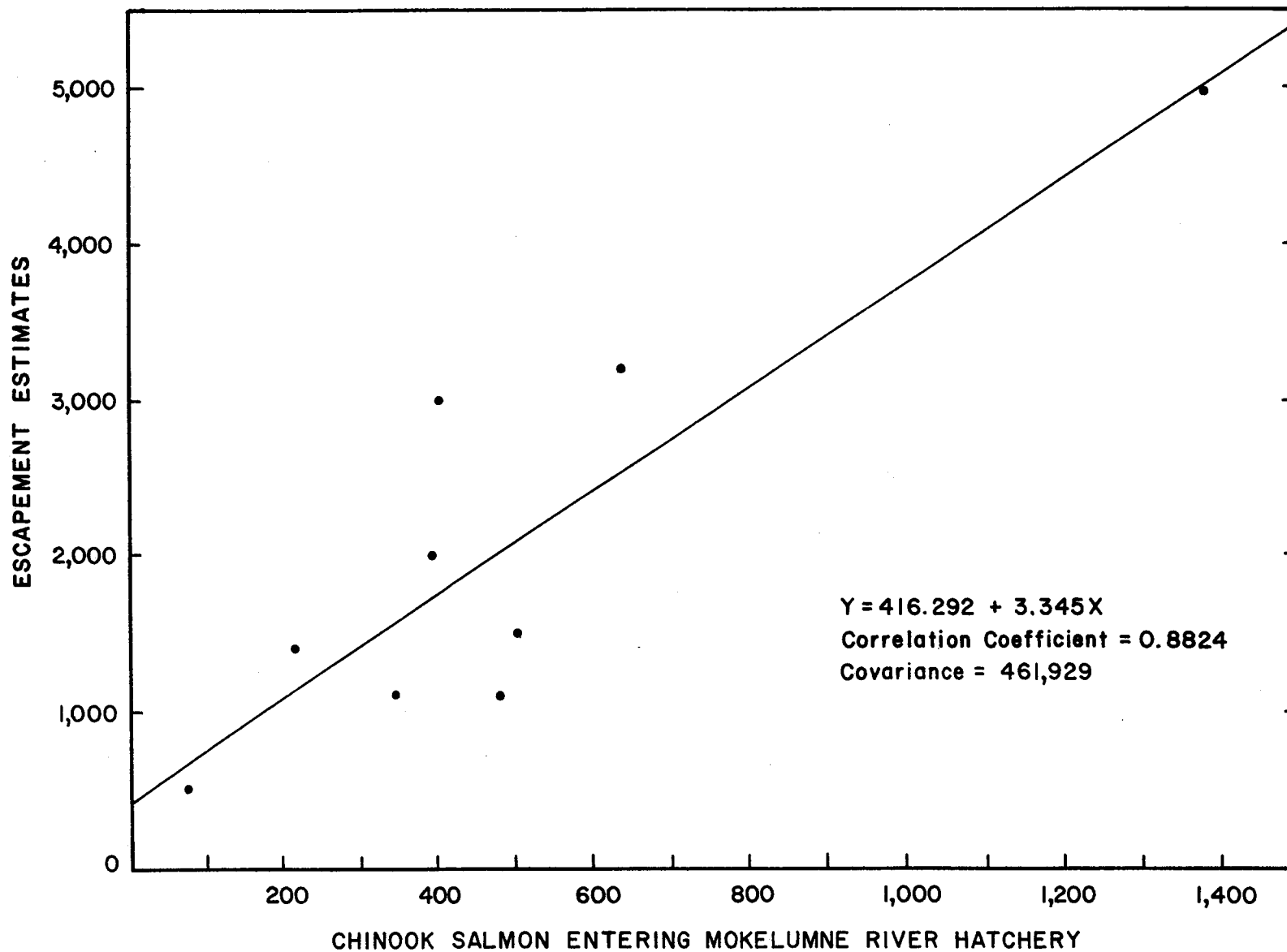
\* Combined hatchery counts and river estimates  
+ Based on linear relationship.

Only data collected during 1973, 1974, 1975, 1976, 1980, and 1981 were as used in making the 1983 escapement estimate because: (i) the same mark and recapture methods were used in estimating escapement, and (ii) the ladder at the hatchery operated continuously throughout the spawning season.

All 4,568 salmon entering Mokelumne River Fish Installation were returned to the river after clipping the upper portion of the caudal fin.

An additional estimated 500 chinook salmon spawned in Murphy Creek, a tributary to the Mokelumne River. About 300 carcasses and 30 live salmon were observed during the survey on 9 December 1983. About 70% of these were observed in a 0.2 km (1/3 mile) section above Liberty Road Bridge. Philo Jewett, hatchery manager at Mokelumne River Fish Installation since 1967, has only observed salmon in this stream during seasons of early fall rains. Warden Capt. Robert Prosser, a resident of Ione since 1977, concurs; he has only observed salmon during the last two high rainfall

FIGURE 5. Mokelumne River Escapement in Relation to the Number of Chinook Salmon Entering the Mokelumne River Fish Installation (1972-1981).





years (1982 and 1983). This stream probably does not support a self-sustaining run. Although gravel is present, it generally dries up in late winter.

Combining the 10,793 that spawned in the main stem Mokelumne River and the 500 that spawned in Murphy Creek with the 4,568 which entered the hatchery, results in a total escapement of 15,861 salmon.

#### Calaveras River by Mike Mainz

Winter run. No population estimate was made for 1983. Normally, salmon are seen in the river sometime between January and April by Army Corps of Engineer personnel working at New Hogan Reservoir or by Stockton East Water District personnel at Bellota Weir; (Figure 4) however, no fish were observed this year. It is possible that salmon were present but not visible because of high flows.

#### Stanislaus River to Merced River

by

Maurice Fjelstad

#### Stanislaus River

Fall run. An estimated 500 salmon spawned in this stream during 1983. On 26 October the section between Knights Ferry and Orange Blossom Bridge was surveyed by boat and the area around Two Mile Bar (located 3.2 km or 2 miles upstream from Knights Ferry) was surveyed on foot (Figure 4). This effort was repeated on 9 November. On 10 November the section of stream between Orange Blossom Bridge and Riverbank Bridge was surveyed. The November surveys were hampered by turbidity, wind, and rain. A total of 56 redds and 12 carcasses was observed during the surveys.

#### Tuolumne River

Fall run. An estimated 14,836 chinook salmon spawned in the Tuolumne River during 1983. This is the highest number of spawners since 1971, when the estimated run was 22,000 fish.

High October flows averaging  $115 \text{ m}^3/\text{s}$  (4,062 cfs) encouraged early upstream migration of salmon. Unfortunately, these flows were dropped suddenly to  $10.9 \text{ m}^3/\text{s}$  (385 cfs) on 1 November, stranding many salmon and eggs. During early November, I observed 210 carcasses of stranded salmon and 261 dewatered redds on several side channels created during higher October flows. This represents a small portion of the total impact of this flow reduction.

Factors causing the sudden flow reduction were as follows:

1. The 1982 water year was one of the wettest of record resulting in a large amount of water in the flood control space at New Don Pedro Reservoir after the irrigation season.
2. The irrigation districts were obligated to avoid flow reductions during the spawning season starting 1 November.
3. The district's response to their obligation to provide flood protection and fish releases was to dump large amounts of water in October and reduce flows just prior to the normal spawning season.

Flows during the 7 November through 1 December survey period ranged from  $11.1 \text{ m}^3/\text{s}$  (393 cfs) to  $16.7 \text{ m}^3/\text{s}$  (589 cfs). Flood control releases of about  $99.1 \text{ m}^3/\text{s}$  (3,500 cfs) beginning in December prevent further surveys. Few carcasses were seen during the last week's survey indicating the spawning season was completed. Water visibility was good during the 3 weeks of the survey, but decreased to less than 1.5 m (5 feet) during the last week of the survey. Wind and rain sometimes resulted in poor carcass recovery conditions even when water clarity was good.

The following stream sections were surveyed (Figure 4):

1. About 91 m (300 feet) above old La Grange Bridge to Basso Bridge (9.6 km or 6.0 miles).
2. Basso Bridge to Turlock Lake State Recreation Area (12 km or 7.6 miles).
3. Turlock Lake State Recreation Area to Reed Gravel Plant near Waterford (12.8 km or 8.1 miles).

Spawning population was estimated by tagging fresh carcasses and placing them into running water for later recovery. Normally the Schaefer Method (1951) is used to derive a population estimate. This method was not used in 1983 due to both the shortened survey season (4 weeks) and low number of tags recovered (five or fewer for two of the three recovery periods). Instead, all data were lumped and the more simple Ricker (1975) Formula 3.5 shown below was used:

$$N = \frac{MC}{R}$$

Where N = estimated spawning population  
M = total number of carcasses tagged  
C = total number of carcasses examined including carcasses with tags  
R = number of tags recovered

Actual calculations were as follows:

$$N = \frac{(270)(1305)}{25} = 14,094$$

Nearly 5% of the total escapement spawned in areas upstream from old LaGrange Bridge and downstream from Reed Gravel Plant. These areas were not surveyed in 1983. To account for spawning activity in these areas, the 14,094 figure was expanded to 14,836.

The 14,799 estimate is one of the highest in recent years, but of this total 82.2% or 12,165 were grilse and only 17.8% or 2,634 were adults. Normally grilse comprise about 20 - 30% of the total spawning population.

From the 348 fresh carcasses examined; 9.2% were female adults (FL  $\geq$  60.7 cm or 23.9 inches); 16.1% were female grilse (FL < 60.7 cm or 23.9 inches); 8.6% were male adults; and 66.1% were male grilse.

#### Merced River

Fall run. An estimated 18,248 chinook salmon spawned in the Merced River between Crocker-Huffman Dam and Cressy during 1983. This total includes 1,795 fish entering Merced River Fish Facility (MRFF). This run was the largest recorded since surveys began in 1953. The previous record was 10,415 in 1981.

Unknown numbers of salmon spawned in the Merced River during high flows in October. The progeny of these salmon were lost when the Merced Irrigation District suddenly reduced the river flow on 31 October from 56.6 m<sup>3</sup>/s (2,000 cfs) to 5.7 m<sup>3</sup>/s (200 cfs) over a 5 h period. The high flows were being released in October to evacuate flood control space in McClure Reservoir.

Spawning surveys began on 3 November and ended on 6 December when flood control releases prevented further surveys. Observations on the river and at MRFF indicated the run was essentially completed before the high flows. Water clarity and overall viewing conditions were good during the first part of the survey season, but deteriorated as the result of turbidity, wind and high flow.

Survey efforts were concentrated in the section of stream between Crocker-Huffman Dam and Highway 59 Bridge (16 km or 10 miles). One survey was made from Highway 59 Bridge downstream to Bettencourt Ranch (12 km or 7.5 miles).

To estimate run size, fresh carcasses were tagged by attaching a colored plastic ribbon to the jaw with a hog ring and then releasing the carcass into running water for later recovery. A total of 1,916 carcasses was observed (1,634 in the upper section 282 in the lower section).

Ricker (1975) Formula 3.5 was used to estimate escapement in the upper section:

$$N = \frac{MC}{R}$$

Where: N = size of run  
M = number of carcasses tagged  
C = number of carcasses examined  
R = number of tags recovered

Actual computations were as follows:

$$N = \frac{(261) (1,634)}{(36)} = 11,846$$

Based on analyses of spawning distribution during 8 years of the period between 1971 - 1981 when surveys could be carried out between Crocker-Huffman Dam and Cressy, 72% of the average annual spawning effort normally occurred above Highway 59 Bridge. Assuming this proportion, a total of 16,453 is extrapolated. Combining this total with the 1,795 salmon which entered the MRFF results in a total estimated Merced River run of 18,248.

The 18,248 estimate is one of the highest in recent years, but of this total 76.6% or 13,978 were grilse and only 23.4% or 4,270 were adults. Normally grilse comprise only 20 - 30% of the total spawning population.

From the 1,124 fresh carcasses observed during the 1983 survey, 4.8% were female adults (FL >55.9 cm or 22 inches); 24.2% were female grilse (FL <55.9 cm or 22 inches); 18.6% were male adults; and 52.4% were male grilse.

#### SUMMARY

During 1983, the California Department of Fish and Game conducted its 31st annual chinook salmon spawning stock inventory of the Sacramento-San Joaquin River system.

This report deals with four races of chinook salmon recognized in the Central Valley: late-fall-, winter-, spring-, and fall-runs.

In the San Joaquin River system and the Sacramento River system downstream from Red Bluff, spawning stock estimates were made by the Department of Fish and Game. These estimates were based on carcass counts, aerial redd counts, and live fish counts. Estimates for the Sacramento River system above Red Bluff were based primarily on U.S. Fish and Wildlife Service counts of fish passing Red Bluff Diversion Dam and on Department of Fish and Game sampling at the dam.

The estimated 1983 Central Valley chinook salmon spawning escapement was 230,164 (Table 6). This was down from the 1982 total of 261,284. Winter and fall runs in the upper Sacramento River were similiar to last year,

while the spring run was down dramatically. As in 1982, the 1983 winter run was critically low (2,000 fish). The late-fall run in the upper Sacramento River was about triple the 1982 run. Fall runs in the Feather, Yuba, and American rivers were down to only 42-80% of last year. Fall-run salmon in the San Joaquin River system totaled 49,645 considerably up from the 1982 total of 19,761; this run was mostly composed of grilse (75-85%).

TABLE 6. Sacramento-San Joaquin System Chinook Salmon  
Spawning Population

<u>Spawning area</u>	<u>Late-fall run</u>	<u>Winter run</u>	<u>Spring run</u>	<u>Fall run</u>	<u>Combined</u>
Sacramento main stem	14,984	1,827	5,647	58,244	80,702
Sacramento tributaries	105		2,311	97,401	99,817
San Joaquin tributaries				49,645	49,645
<hr/>					
	15,089	1,827	7,958	205,290	230,164

Salmon counts at Red Bluff Diversion Dam and sport catches above the dam are shown in Appendix Tables 1 and 2, respectively. Spawning populations for all Central Valley streams are summarized in Appendix Tables 3 - 5. Fin mark and coded-wire tag recoveries are presented in Appendix Tables 6 and 7.

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APPENDIX TABLE 1. Red Bluff Diversion Dam Adjusted Salmon Counts  
17 October 1982 through 31 December 1983

Week	Adjusted salmon count	Number sampled	Late-fall run		Winter run		Spring run		Fall run	
			Percent	Number	Percent	Number	Percent	Number	Percent	Number
<u>1982</u>										
Oct. 17-Jan. 1, 1983		Runs in progress		5,926*		37*				
<u>1983</u>										
Jan. 2-8	1,516	172	98.8	1,498	1.2	18				
9-15	656	151	97.8	642 <sup>a/</sup>	2.2	14				
16-22	1,451	303	98.3	1,426 <sup>a/</sup>	1.7	25				
23-29		b/		562		29				
Jan. 30-Feb. 5		b/		638		32				
Feb. 6-12		b/		653		55				
13-19		b/		638		68				
20-26		b/		744		101				
Feb. 28-Mar. 5		b/		562		141				
Mar. 6-12		b/		334		143				
13-19		b/		213		84				
20-26		b/		608		189				
Mar. 27-Apr. 2		b/		365		114				
Apr. 3-9		b/		349		104				
10-16	149	c/	17.1	26	74.0	110	8.9	13		
17-23	187	c/	2.6	5	85.0	159	12.4	23		
24-30	59	c/	0.3	1	87.1	51	12.6	7		
May 1-7	48	c/		15,190	75.4	36	24.6	12		
8-14	21	c/			76.1	16	23.9	5		
15-21	104	c/			67.4	70	32.6	34		
22-28	59				68.2	40	31.8	19		
May 29-June 4	99	c/			53.6	53	46.4	46		
June 5-11	100	c/			50.6	51	49.4	49		
12-18	165	6			0.0	0	100.0	165		
19-25	65	10			10.0	6	90.0	59		
June 26-July 2	51	10			30.0	15	70.0	36		
July 3-9	153	11			27.3	42	72.7	111		
10-16	135	18			5.6	8	94.4	127		
17-23	236	24			8.3	20	83.4	196	8.3	20
24-30	323	29					24.1	78	75.9	245
						1,831				
<u>1983</u>										
July 31-Aug. 6	381	85					24.7	94	75.3	287
Aug. 7-13	887	134					35.1	311	64.9	576
14-20	477	60					15.0	72	85.0	41

(Continued on next page)

APPENDIX TABLE 1. Red Bluff diversion Dam Adjusted Salmon Counts  
17 October 1982 through 31 December 1983 (continued)

Week	Adjusted salmon count	Number sampled	Late-fall run		Winter run		Spring run		Fall run	
			Percent	Number	Percent	Number	Percent	Number	Percent	Number
Aug. 21-27	790	149					36.2	286	63.8	504
Aug. 28-Sept. 3	799	128					40.6	324	59.4	475
Sept. 4-10	3,088	136					5.1	158	94.4	2,930
11-17	4,346	165					21.2	921	78.8	3,425
18-24	6,265	256					9.0	564	91.0	5,701
Sept. 25-Oct. 1	3,317	119					5.9	196	94.1	3,121
Oct. 2-8	4,089	166					0.6	25	99.4	4,064
9-15	4,535	109							100.0	4,535
16-22	5,391	199	2.0	108				<span style="border: 1px solid black;">3,931</span>	98.0	5,283
23-29	4,131	250	4.0	165					96.0	3,966
Oct. 30-Nov. 5	4,709	246	17.9	843					82.1	3,866
Nov. 6-12	1,644	41	7.3	120					92.7	1,524
13-19	1,028	124	38.7	398					61.3	630
20-26	576	28	64.3	370					35.7	206
Nov. 27-Dec. 3	867	70	80.0	694					20.0	173
Dec. 4-10	224	42	83.3	187					16.7	37
11-17	729	63	85.7	625 <sup>a/</sup>	6.3	46			8.0	58
18-24	371	36	94.4	350 <sup>a/</sup>	5.6	21			0.0	0
25-31	234	47	63.8	149 <sup>a/</sup>	29.8	70			6.4	15
										<span style="border: 1px solid black;">42,046</span>
Total 1983 (calendar year)	54,223	3,381		8,114		1,931		3,931		42,046

\* Portion of run passing RBDD during 1982 and expected to spawn during 1983. For a weekly breakdown of numbers, see Chinook Salmon Spawning Stocks in California Central Valley, 1981, (Reavis, 1984).

Indicates the size of the salmon run passing RBDD with the potential of spawning during calendar year 1983.

<sup>a/</sup> Includes a total of 349 fish trucked to Coleman National Fish Hatchery.

<sup>b/</sup> Estimates based on historical average (1971-82) of weekly percent of total run.

<sup>c/</sup> Expanded ladder counts from one ladder and run composition based on historical average (1971-82).

<sup>d/</sup> Includes a total of 16 fish trucked to Coleman National Fish Hatchery.



APPENDIX TABLE 2. Estimated Monthly Chinook Salmon Sport Catch in the Sacramento River Between Keswick Dam and Red Bluff Diversion Dam, Divided into Landings from the Four Runs that Spawned there in 1983, Based on their Percentages (Occurrence) in the Counts at Red Bluff Diversion Dam.

Year	Month	Catch	Late-fall run		Winter run		Spring run		Fall run	
			Percent	Catch	Percent	Catch	Percent	Catch	Percent	Catch
1982	Oct.	788	4.3	33			2.0	16	93.7	729
	Nov.	206	33.2	68					66.8	138
	Dec.									
1983	Jan.									
	Feb.									
	Mar.									
	Apr.									
	May									
	June	3			18.1	1	81.9	2		
	July	30			8.3	3	60.4	18	31.3	9
	Aug.						32.7		67.3	
	Sept.	550					10.3	57	89.7	493
	Oct.	187	1.5	3					98.5	184
	Nov.	71	27.5	20					72.5	51
	Dec.									
1983 Total				23						
(Calendar Year)						4		77		737

  = Total catch from run that spawned in 1983.

APPENDIX TABLE 3. Summary of Chinook Salmon Population Estimates for the Sacramento River System, 1983

	Late- fall run	Winter run	Spring run	Fall run	Total
<u>Keswick Dam to Red Bluff</u>					
Sacramento River Main stem <sup>a/</sup>	14,984 <sup>b/</sup>	1,827	3,854	26,226	46,891
Battle Creek (Total)				(13,983)	
Coleman Hatchery	105			8,756	8,861
Below Hatchery				5,227	5,227
Cottonwood Creek				1,000	1,000
Paynes Creek				100	100
<u>TOTAL Keswick Dam to Red Bluff</u>	15,089	1,827	3,854	41,309	62,079
<u>Red Bluff to Princeton Ferry</u>					
Sacramento River Main stem			(1,793)	(32,018)	
Red Bluff to Tehama			499	25,554	26,053
Tehama to Woodson Bridge			100	3,659	3,759
Woodson Br. to Princeton Ferry			1,194	1,538	2,732
Tehama-Colusa Spawning Channel				1,267	1,267
Salt Creek				15	15
Antelope Creek			59	60	119
Craig Creek				60	60
Dye Creek				20	20
Mill Creek	c/	c/	c/	200	200
Toomes Creek				15	15
Deer Creek			500	370	870
<u>TOTAL Red Bluff to Princeton Ferry</u>			2,352	32,758	35,110
<u>Butte Creek to American River</u>					
Butte Creek			50	1,000	1,050
Big Chico Creek			c/	500	500
Feather River				(30,522)	
Hatchery			1,702	7,699	9,401
Below Hatchery			c/	22,823	22,823
Yuba River				13,756	13,756
Dry Creek (Yuba County)				500	500
American River				(35,300)	
Hatchery				8,900	8,900
Below Hatchery				26,400	26,400
<u>TOTAL Butte Creek to American River</u>			1,752	81,578	83,330
<u>GRAND TOTAL, SACRAMENTO RIVER SYSTEM</u>	15,089	1,827	7,958	155,645	180,519

<sup>a/</sup> Includes all salmon that spawned in tributaries other than Battle, Cottonwood, and Paynes creeks.

<sup>b/</sup> Includes 204 from Keswick Dam and 343 from Red Bluff Diversion Dam that were hauled to Coleman Hatchery and spawned.

<sup>c/</sup> No estimate.

APPENDIX TABLE 4. Summary of Chinook Salmon Spawning Population  
Estimates for the San Joaquin River System, 1983

Stream	Winter Run	Fall Run
Consumnes River		200
Mokelumne River (total)		(15,861)
Hatchery		4,568
Below hatchery		11,293
Calaveras River	<u>a/</u>	
Stanislaus River		500
Tuolumne River		14,836
Merced River (total)		(18,248)
Hatchery		1,795
Below hatchery		16,453
<b>TOTAL</b>	<u>a/</u>	<b>49,645</b>

a/ No estimate

APPENDIX TABLE 5. Sacramento-San Joaquin Valley Chinook Salmon Spawning Stock Estimates, 1964-1983, in Thousands of Fish.  
Spawning Stock Estimates from 1953-1963 Can be Found in Taylor (1974a)

Year	Sacramento River system above Red Bluff, excluding Battle Creek				Battle Creek	Sacramento main stem below Red Bluff	Feather River		Yuba River	American River	Cosumnes River	Mokelumne River	Stanislaus River	Tuolumne River	Merced River	Others <sup>a/</sup> All races combined
	Late- fall	Winter	Spring	Fall	Fall	Fall	Spring	Fall	Fall	Fall	Fall	Fall	Fall	Fall	Fall	
1964	b/	b/	b/	150 <sup>c/</sup>	16	6	3.0	38 <sup>c/</sup>	35	59	2.0	2.0	4.0	2.0	0.04	7
1965	b/	b/	b/	107 <sup>c/</sup>	9	2	0.7	23 <sup>c/</sup>	10	39	0.8	1.3	2.0	3.0	0.09	2
1966	b/	b/	b/	124 <sup>c/</sup>	3	3	0.3	21 <sup>c/</sup>	8	27	0.6	0.7	3.0	5.0	0.04	1
1967	b/	b/	b/	84 <sup>c/</sup>	5	9	0.1	12 <sup>c/</sup>	24	23	0.5	3.0	12.0	7.0	0.6	1
1968	b/	b/	b/	116 <sup>c/</sup>	6	12	0.2	18 <sup>c/</sup>	7	31	1.5	1.7	6.0	9.0	0.5	2
1969	b/	b/	20	130	6	18	0.3	61 <sup>c/</sup>	5	47	4.0	3.0	12.0	32.0	0.6	5
1970	b/	b/	4	70	7	6	0.2	62 <sup>c/</sup>	13	37	0.6	5.0	9.0	18.0	5.0	5
1971	17	53	6	59	5	23	0.5	47 <sup>c/</sup>	6	52	0.5	5.0	14.0	22.0	4.0	5
1972	33	28	7	36	5	15	0.3	47 <sup>c/</sup>	9	25	1.6	1.1	4.0	5.0	3.0	3
1973	22	23	7	44	8	17	0.2	74 <sup>c/</sup>	24	95	0.9	3.0	1.2	2.0	1.1	6
1974	6	19	4	49	4	28	0.2	66	18	62	0.3	1.4	0.8	1.1	2.0	8
1975	18	23	10	55	5	36	0.7	43	6	40	0.7	1.9	1.2	1.6	2.4	15
1976	16	33	25	57	5	36	0.7	62	4	28	0.0	0.5	0.6	1.7	1.9	1
1977	9	16	13	40 <sup>d/</sup>	b/	46	0.2	46	9	48	0.0	0.3	0.0	0.4	0.4	3
1978	12	25	6	35	4	48	0.2	38	7	21	0.1	1.1	0.05	1.3	0.6	3
1979	10	2	3	48	13	67	0.25	33	12	48	0.15	1.5	0.11	1.2	2.1	2
1980	9	1	9	22	14	30	0.7	35	13	50	0.2	3.2	0.1	0.5	2.8	2
1981	7	20	21	29	17	43	1.0	53	13	64	-	5.0	1.0	14.3	10.4	10
1982	5	1	23	20	27	24	2.0	58 <sup>e/</sup>	33	44	-	9.0	-	7.0	3.0	5
1983	15	2	4	27	14	32	1.7	31	14	35	0.2	15.9	0.5	14.8	18.2	4

<sup>a/</sup> This includes streams which a few hundred chinook salmon enter most years (e.g., Mill, Deer, and Dye creeks) as well as streams which chinook salmon enter only in wet years (e.g., Dry and Singer creeks and the Calaveras River).

<sup>b/</sup> No estimate.

<sup>c/</sup> Some spring-run fish may have been included in the fall-run estimate.

<sup>d/</sup> Includes Battle Creek.

<sup>e/</sup> Includes some late-fall run

APPENDIX TABLE 6. Coded-Wire Tags from Chinook Salmon  
Carcasses Recovered in Central Valley Streams  
North of the Feather River and at Coleman  
Hatchery 1983.

CWT Code	Hatchery of Origin	Number of Recoveries by Location		Total
		Coleman NFH	Tehama- Colusa	
H5-2-2	Tehama-Colusa FF	1	4	5
H5-2-3	Coleman NFH		1	1
H5-2-5	" "	1		1
H5-3-1	" "	4		4
H5-3-2	" "	1		1
H5-3-5	" "	2		2
H5-3-6	" "	2		2
H6-1-1	" "	9	1	10
H6-1-2	" "	2	1	3
H6-1-3	" "		1	1
H6-1-5	" "	8		8
H6-2-2	" "	1		1
H6-2-6	" "	1		1
H6-3-1	" "	1		1
5-5-57	Tehama-Colusa FF		6	6
5-5-58	" "		8	8
5-5-59	" "		4	4
5-5-60	" "	1	9	10
5-5-61	" "		10	10
5-6-18	Tehama-Colusa FF	1		1
5-6-19	" "		1	1
6-48-16	Mokelumne River FI		2	2
6-48-17	"	1		1
6-58-18	Feather River H		2	2
6-58-21	" "		2	2
6-58-24	" "		1	1
6-58-25	" "	2	1	3
6-58-26	" "		1	1
6-58-30	" "		1	1
6-60-16	Coleman NFH	51		51
6-60-17	" "	39	2	41
6-60-19	" "	2		2
6-60-20	" "	2	4	6
6-60-21	" "	2	5	7
6-60-22	" "	1		1
6-60-24	" "	26	6	32
6-60-25	" "	23	2	25
6-60-26	" "	10		10
6-60-27	" "	8		8

(continued on next page)

APPENDIX TABLE 6. Coded-Wire Tags from Chinook Salmon  
Carcasses Recovered in Central Valley Streams  
North of the Feather River and at Coleman  
Hatchery 1983 (continued)

CWT Code	Hatchery of Origin	<u>Number of Recoveries by Location</u>		<u>Total</u>
		Coleman NFH	Tehama- Colusa	
6-60-28	Coleman NFH	9	2	11
6-60-29	" "	7		7
6-60-30	" "	7	2	9
6-60-31	" "	4	7	11
6-62-15	Feather River H		8	8
6-62-18	Coleman NFH	1		1
Totals		230	94	324

APPENDIX TABLE 7. Coded-wire Tags from Chinook Salmon Carcasses Recovered in Central Valley Streams and Hatcheries from the Feather River and South, 1983<sup>a/</sup>

CWT code	Hatchery of origin	Number of recoveries by location										Total
		Feather R. Hat.	Nimbus H.	Mokelumne R.F.I.	Merced R.F.F.	Feather R.	Yuba R.	American R.	Tuolumne R.	Merced R.	Other	
H6-01-2	Coleman NFH		1									1
H6-01-7	"					1						1
H6-02-3	"		1									1
6-46-12	Merced RFF				8							8
6-46-14	"				1				1(44)			2
6-46-15	"				2							2
6-46-17	"				54					2(58)	1	57
6-46-19	"				2							2
6-46-26	"				97					2(58)		99
6-46-27	"				113							113
6-46-28	"				13				2(87)	1(29)		16
6-48-14	Mokelumne RFI		2									2
6-48-15	"			1		1						2
6-48-16	"	1										1
6-48-17	"	1	2	3								6
6-58-17	Feather RH	6	5			2			1(44)			14
6-58-18	"				1		1					2
6-58-19	"	35	1			2						38
6-58-20	Yuba River-wild					1						1
6-58-21	Feather RH	80	7	1	1	15		1		1(29)	3	109
6-58-22	"	49	1	2		6	1	1				60
6-58-23	"	11		1		2					1	15
6-58-24	"	30	11	2		1		1			1	46
6-58-25	"	29	16	3		1						49
6-58-26	"	22	15	4				1				42
6-58-27	"	29				2						31
6-58-28	"	39				2		1				42
6-58-29	"	5	3	1								9
6-58-30	"	5	3									8
6-58-31	"	7		1		1						9
6-58-32	"	5	1									6

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APPENDIX TABLE 7. Coded-wire Tags from Chinook Salmon Carcasses Recovered in Central Valley Streams and Hatcheries from the Feather River and South, 1983 (continued)

CWT code	Hatchery of origin	Number of recoveries by location										Total
		Feather R. Hat.	Nimbus H.	Mokelumne R.F.I.	Merced R.F.F.	Feather R.	Yuba R.	American R.	Tuolumne R.	Merced R.	Other	
6-58-33	"	7										7
6-58-34	"	1	2									3
6-58-35	"	2										2
6-60-20	Coleman NFH	1										1
6-60-21	"	1	2									3
6-60-30	"	1										1
6-60-31	"	1										1
6-61-39	Trinity RH							1				1
6-62-7	Feather RH	8				2						10
6-62-8	"	2				1		2				5
6-62-9	"	6										6
6-62-10	"	8				1						9
6-62-11	"	3				1						4
6-62-12	"	5				2						7
6-62-13	"	1										1
6-62-14	"	3										3
6-62-15	"	95	6	3	1	13		1	2 (87)		3	124
6-62-16	"	1										1
6-62-17	"	3										3
6-62-18	Coleman NFH	4	4	1								9
6-62-19	"	2	6	2								10
6-62-20	Feather RH	25	9	3		2						39
6-62-21	"	8	2					1				11
6-62-22	"	6										6
Totals		548	100	28	293	59	2	10	6	6	9	1061

a/ Tag recoveries from Yuba and American rivers are all from angler caught fish, and recoveries from the Feather River are from angler caught fish and the carcass survey. Estimates of number of natural spawners in Tuolumne and Merced rivers are shown in parenthesis; the estimates were obtained by multiplying number of tags recovered by the ratio of estimated total run to number of fresh carcasses observed.