

THE STATUS OF SALMON POPULATIONS IN CALIFORNIA COASTAL RIVERS

By

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INTRODUCTION

This report presents a discussion of salmon populations in California coastal rivers. The primary source of information for this discussion is the "California Fish and Wildlife Plan", (the "Plan") published in 1965 by the California Department of Fish and Game.

King salmon (Oncorhynchus tshawytscha) and silver salmon (O. kisutch) are the only salmons which enter California rivers in significant numbers. The coastal rivers in 1965 supported estimated spawning populations of 256,200 king salmon and 99,400 silver salmon.

HISTORY OF SALMON SPAWNING ESCAPEMENTS

Klamath River System

General

The Klamath River is the largest coastal California river, the discharge near the mouth (near Klamath, California) averaging 12.9 million acre-feet/year. Approximately 10% of the runoff results from the part of the drainage in Oregon. The Klamath system supports approximately 66% of the king salmon, and 15% of the silver salmon spawning in California coastal rivers (Table 1). Most of the Klamath River drainage is in National Forest holdings.

Four major tributaries contribute to the system: the Shasta, Trinity, Scott, and Salmon Rivers. Considerations or problems unique to each of these major tributaries or to the upper main stem of the upper Klamath are discussed under the respective separate headings.

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TABLE 1. AVERAGE ANNUAL SALMON AND STEELHEAD SPAWNING
POPULATIONS IN CALIFORNIA COASTAL STREAMS, IN THE EARLY
1960's*

<u>River System</u>	<u>King Salmon</u>	<u>Silver Salmon</u>	<u>Steelhead</u>
Smith River	15,000	5,000	30,000
Klamath River System	168,000	15,400	221,000
(Shasta River)	(20,000)	(800)	(6,000)
(SCott River)	(8,000)	(800)	(5,000)
(Salmon River)	(10,000)	(800)	(10,000)
(Trinity River)	(80,000)	(5,000)	(50,000)
(Klamath Main Stem Plus Minor Tributaries)	(50,000)	(8,000)	(150,000)
Redwood Creek	5,000	2,000	10,000
Mad River	5,000	2,000	6,000
Eel River System	55,500	14,000	82,000
(Van Duzen River)	(2,500)	(500)	(10,000)
(South Fork Eel River)	(27,000)	(13,000)	(34,000)
(Middle Fork Eel River)	(13,000)	0	(23,000)
(Eel Main Stem Plus Minor Tributaries)	(13,000)	(500)	(15,000)
Mattole River	5,000	2,000	12,000
Ten Mile River	0	6,000	9,000
Noyo River	<50	6,000	8,000
Big River	0	6,000	12,000
Navarro River	0	7,000	16,000
Garcia River	0	2,000	4,000
Gualala River	0	4,000	16,000
Russian River	500	5,000	50,000
San Lorenzo River	0	1,600	19,000
Other Coastal Streams	2,200	21,400	75,000
TOTALS	256,200	99,400	873,000

Annual counts of adult salmon at fishways or at fish hatcheries date back to 1925 for the upper main Klamath River, to 1930 in the Shasta River, and to 1958 in the upper Trinity River. Estimates of total runs in the Klamath system are based on counts at these locations and on occasional spawning stock surveys in some of the most important spawning areas of the system.

Estimated annual spawning populations in the Klamath River system in 1965 were 168,000 king salmon and 15,400 silver salmon (California Fish and Game 1965). Tag and recovery estimates of king salmon were made in 1976 and 1977. Estimates were 260,000 and 203,000 salmon in 1976 and 1977, respectively, entering the mouth and prior to operation of river fisheries.

Shasta River

The Shasta River drainage contains approximately 800 square miles, and contains about 34 miles of salmon habitat. The Shasta River supports approximately 12% of the Klamath River system salmon spawners, essentially all king salmon (Table 1).

Counts of adult king salmon have been made since 1930 at a fishway located either near the mouth of the Shasta River or 7 miles upstream (it was moved twice before 1958). Annual counts have ranged from a high of 81,844 in 1931 to a low of 37 in 1948.

Numerous small diversion dams in the Shasta River prevented fish passage and were the primary cause for a steady decline in salmon runs from 81,844 in 1931 to 37 in 1948. Many of these fish passage problems were corrected in the 1940's, and Shasta River runs increased thereafter until the mid-1960's. In 1964 34,363 salmon were counted over the racks. Runs have generally

declined since the early 1960's. In 1976 6,073 salmon were counted through the fishway.

Historically, the Shasta River supported a large spring-run king salmon population as well as a fall-run population. The existing run is almost exclusively fall run.

Trinity River

The Trinity River has a drainage area of approximately 3,000 square miles; most of which lies in Trinity County, California. Useful records of Trinity River salmon spawning populations date back to the mid-1950's. At that time from 80 to 90% of the total Trinity River salmon populations apparently spawned in the upper main stem.

Annual counts of adult salmon at Trinity Hatchery began in 1958 (Table 2) Salmon spawning stock estimates are available for the main stem Trinity River for 11 of the 22 years since 1955.

Annual counts of adult king salmon at the hatchery have ranged from 2,586 to 11,381. The numbers of fall-run fish entering the hatchery have diminished over the last two decades, and the spring runs have increased. The total numbers of king salmon annually entering the hatchery have remained relatively stable.

Three surveys prior to 1968 indicated that the main stem Trinity annually supported from 41,000 to 76,000 king salmon spawners. The "average" for the entire Trinity River system was estimated at 80,000 (Calif. Dep. Fish and Game 1965).

Estimates during eight seasons since 1968 indicate a steady and serious decline in king salmon spawning stocks since 1968. In 1976 an estimated 4,000 king salmon spawned in the main stem of the Trinity below the hatchery-- less than 10% of the historic runs.

Table 2. The Resources Agency of California
 Department of Fish and Game
 California Coastal Streams Salmon and Steelhead Counts

Year	Klamath River (Klamathon)			Shasta River			Trinity River (Lewiston)			Mad River (Sweasey Dam)			Eel River (Van Arsdale)		South Fork of Eel River		
	Chinook salmon	Chinook salmon	Chinook salmon	Chinook salmon	Coho salmon	Steel head	Chinook salmon	Coho salmon	Steel head	Chinook salmon	Coho salmon	Steel head	Chinook salmon	Steel head	Chinook salmon	Coho salmon	Steel head
1925 1/	10,420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1926	9,387	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1927	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1928	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1929	4031	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1930	2392	19338	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1931	12611	81844	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1932	13740	34689	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1933	--	11570	--	--	--	--	--	--	--	--	--	3247	--	--	--	--	--
1934	10340	48668	--	--	--	--	--	--	--	--	--	2255	--	--	--	--	--
1935	14051	74537	--	--	--	--	--	--	--	--	--	6310	--	--	--	--	--
1936	10389	46115	--	--	--	--	--	--	--	--	--	6861	--	--	--	--	--
1937	33144	33255	--	--	--	--	--	--	--	--	--	3413	--	--	--	--	--
1938	16340	9090 A/	--	--	--	--	1273	498	3110	--	4786	6051	7370	12995	--	--	--
1939	--	28167	--	--	--	--	1257	725	3118	--	3889	3424	8629	14476	--	--	--
1940	14965	55155	--	--	--	--	1293	73	5706	--	2225	14691	11073	18308	--	--	--
1941	11204	13252	--	--	--	--	3139	308	4583	--	--	21011	13694	17356	--	--	--
1942	13038	11425	195 B/	--	--	--	1676	378	6650	--	--	10612	15037	25032	--	--	--
1943	--	10022	--	--	--	--	1236	259	4921	--	--	7264	13030	23445	--	--	--
1944	--	11498	9925 B/	--	--	--	--	--	--	--	9528	13966	18309	20172	--	--	--
1945	--	18191	7510 B/	--	--	--	--	--	--	--	5054	12488	16731	13626	--	--	--
1946	--	7590	274 B/	--	--	--	1181	415	5106	917	4409	16024	14109	19005	--	--	--
1947	--	341	--	--	--	--	717 C/	510	3582	994	178	13160	25289	18225	--	--	--
1948	5821	37	--	--	--	--	672	515	4074	--	2433	16312	12872	13963	--	--	--
1949	11504	193	--	--	--	--	484	512	4430	--	--	3803	7495	13715	--	--	--
1950	21584	248	--	--	--	--	1505	147	5543	55	1091	14357	12050	15138	--	--	--
1951	17857	2024	--	--	--	--	1519	414	5613	--	5444	12476	11441	13774	--	--	--
1952	6591	1666	--	--	--	--	401	72	2943	--	2197	7256	3711	19488	--	--	--
1953	6267	1605	--	--	--	--	847	91	2390	--	2590	7948	3052	15405	--	--	--
1954	2042	2625	--	--	--	--	409	59	148	--	6131	5367	5952	13609	--	--	--
1955	14946	1817	--	--	--	--	390	2	2717	5	3719	3974	5977	10065	--	--	--
1956	6770	--	--	--	--	--	129	21	1957	--	4109	1530	5717	12333	--	--	--
1957	2436	2234 D/	--	--	--	--	494	11	1780	2	5151	3050	5433	7910	--	--	--
1958	1950	6089	3524	616	2835	478	3	1376	--	3335	1472	3344	11984	--	--	--	--
1959	2457	9875	7277	119	2095	19	541	1343	--	2206	473	2119	8367	--	--	--	--
1960	6363	10698	7466	208	3547	55	244	1985	--	1130	2665	3184	6370	--	--	--	--
1961	2930 E/	8764	5397	355	3243	40	710	1708	--	1693	2046	8479	14374	--	--	--	--
1962	1339 E/	14398 G/	9451	16	1687	238	3580	2904 H/	9	2030	3688	10031	8303	--	--	--	--
1963	2171	31837	6740	83	879	232	1419	--	3	846 H/	2918	14316	14255 H/	--	--	--	--
1964 2/	2598	34363	6303	50	6941	492	332	--	63	921 I/	8315	4468	2358	--	--	--	--
1965	678	7911	3075	12	943	Ladder non-functioning				94	423	2455	3804	9283	--	--	--
1966	3064	6062	4840	1025	135	Ladder non-functioning				148	534	8649 J/	1480 J/	3296 H/	--	--	--
1967	2667	12314	4616	865	232	NO COUNTS				--	531	3006	2461	3292	--	--	--
1968	2764	14042	4771	38	554	DAM REMOVED				--	340	2278	1289	2443	--	--	--
1969	2879	13625	2586	1996	241	DAM REMOVED				15	719	3200 H/	3170 H/	2788 H/	--	--	--
1970	10492	13405	4444	3147	67	DAM REMOVED				34	1863	9367 H/	2070	3328 H/	--	--	--
1971	10769	6619	9221	47	242	DAM REMOVED				--	696	5026	1509	2082 H/	--	--	--
1972	3568	3641	11381	2670	271	1036	466	52 K/	--	586	2640	750	3320 H/	--	--	--	--
1973	8724	9418	5212	8081	162	495	327	2836 K/	--	947	5006	3993	6941 H/	--	--	--	--
1974	9831	10105	8064	95	372	231	160	2138	--	996	3865	1224	2613	--	--	--	--
1975	11180	16030	7223	2237	149	170	2269	184	--	712	4101	509	1847	--	--	--	--
1976	13738	6073	7624	2808	9	661	1193	421	--	2	--	--	--	--	--	--	--
1977	4833	7447	5721	1827	281	250	646	1249	--	585	--	--	--	--	--	--	--
1978																	

1/ 1925 refers to counting years 1925-26, etc.

2/ All 1964 data are preliminary. Benbow Dam and Sweasey Dam counts incomplete because of floods.

A/ Counting station moved 7 miles upstream from original location.

B/ Incomplete Fish & Wildlife Service weir counts.

C/ Does not include an estimated 250 fish that passed te dam before counting started.

D/ Counting station moved back to original location near mouth.

E/ Racks not fish-tight. Approximately 6,000 additional fish estimated to have passed upstream.

F/ Counting station moved upstream from Klamathon racks to Iron Gate Dam.

G/ Racks not fish-tight for one week.

H/ This figure is an estimate--station was closed before the end of the run.

I/ Ladder out of operation Dec. 25 to Feb. 1.

J/ Includes 369 chinooks, 210 coho salmon and 133 steelhead counted with electric counter.

K/ Incomplete counts, Mad River Hatchery.

The average annual Trinity River silver salmon run during the early 1960's was an estimated 5,000 spawners (Calif. Dep. Fish and Game 1965). Annual counts of adult silver salmon at Trinity Hatchery indicate that the hatchery program may be maintaining the upper Trinity River silver salmon run approximately at the level of the early 1960's.

Upper Klamath River Main Stem^{2/}

Annual counts of adult salmon began in the upper Klamath River at Klamathon racks (River Mile 180) in 1925, and have been made in 42 of the 52 years since 1925, either at the racks or at Iron Gate Hatchery (River Mile 192) (Figure 1). Counts over the 52-year period have ranged from 33,144 in 1937 to 678 in 1965. Counts at the hatchery have steadily increased since 1970. In 1976 13,738 adult king salmon entered the hatchery.

Average annual main stem populations were estimated at 50,000 king salmon in the early 1960's (Calif. Dep. Fish and Game 1965). The counts at the hatchery show encouraging recent increases, but represent a small proportion of the total main stem populations. Limited recent survey work indicates that spawning populations below the hatchery have probably declined since the early 1960's (Millard Coots, pers. comm.), and that the overall trend in the main stem spawning populations is downward. Current total spawning populations are probably less than 50,000.

Scott and Salmon Rivers

The Scott and Salmon Rivers each drain approximately 800 square miles. In the early 1960's the Scott River supported an estimated 8,000 king salmon, and 800 silver salmon spawners; the Salmon River, 10,000 king salmon and 800 silver salmon (Calif. Dep. Fish and Game 1965). Spawning populations

^{2 /} Includes all Klamath River tributaries except the Trinity, Scott, Salmon, and Shasta Rivers.

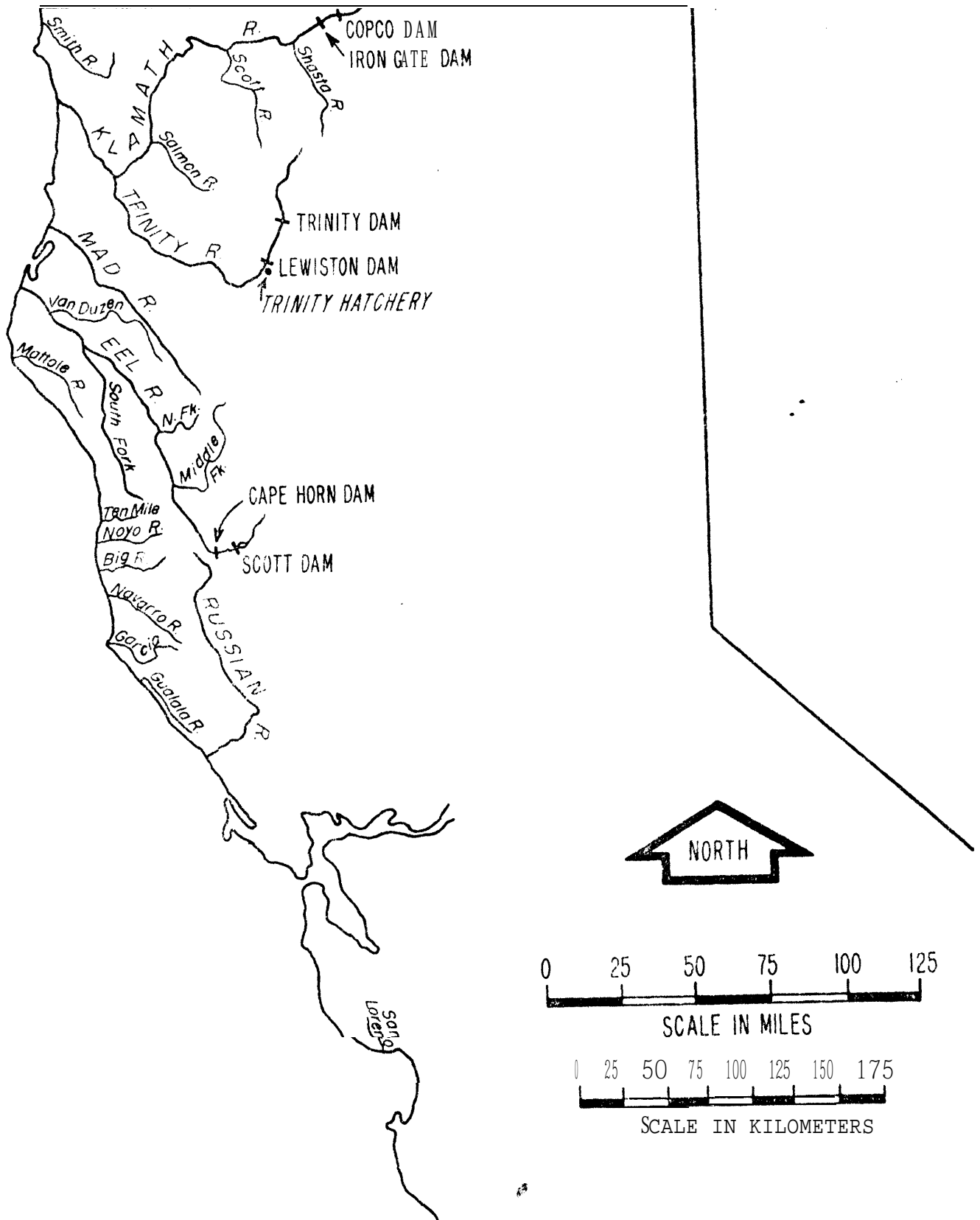


Figure 1. Major coastal California salmon-producing rivers.

have probably declined in the Scott and Salmon Rivers since the early 1960's . (Millard Coots, pers. comm.).

Eel River System

The Eel River system has an average annual runoff of more than 5 million acre feet/year, second among California's coastal streams only to the Klamath River system.

Nearly all of the precipitation in the 3,600 square mile Eel River basin occurs as rain; consequently Eel River flows fluctuate rapidly and widely. Late-summer flows at the mouth are low--often less than 100 cfs,

The Main Eel River has three important tributaries: the South and Middle Forks of the Eel, and the Van Duzen River (Figure 1).

Surveys of salmon spawning stocks have been conducted in the Eel River system, but they have usually covered relatively small portions of the drainage. The limited survey data available in the early 1960's indicated that the Eel River system supported average annual runs of 56,000 king salmon and 14,000 silver salmon,

Counts of salmon at the Benbow Dam Fishway, on the South Fork of the Eel River, date back to 1938 (Table 2). Though counts at Benbow Dam represent a small proportion of the total populations spawning in the Eel River system (about 5% of the king salmon and 25% of the silver salmon) they constitute the best long-term information available on Eel River runs.

The numbers of salmon passing Benbow Dam have declined dramatically since counting was begun. Average counts during the first 10 years of operation (1938-1947) were 11,869 king salmon and 14,327 silver salmon. During the last 10 years (1966-1975) average annual counts were 4,714 king salmon and 1,846 silver salmon. The most recent of these counts indicate that king

salmon runs are relatively stable but silver salmon runs are continuing to decline. In 1975 only 509 silver salmon were counted past the dam.

Mad River

Mad River drains an area of about 500 square miles in Trinity and Humboldt Counties and contains about 65 miles of king salmon and 85 miles of silver salmon habitat.

The best historical data on salmon populations are annual fish counts from 1938 through 1964 at the Sweasey Dam Fish Ladder, which was located 19 miles above the mouth of the Mad River. The counts (up to 3,139 king salmon and 3,580 silver salmon per year) indicated that after 1951 both king and silver salmon populations above Sweasey Dam declined dramatically (Table 2). King salmon counts remained low throughout the period of record and silver salmon counts increased in the early 1960's.

Survey work elsewhere in the Mad River drainage indicated that in the early 1960's average annual Mad spawning populations were about 5,000 king salmon and 2,000 silver salmon.

Salmon have been counted at Mad River Hatchery since hatchery operation began in 1972, and some stream survey work has been done in recent years, but the available data are insufficient for demonstrating changes in Mad River salmon populations since the early 1960's.

Smith and Mattole Rivers and Redwood Creek

These three drainages together drain approximately 1,300 square miles. All support both king salmon and silver salmon runs, but in each, king salmon are the most abundant species. Spawning stock estimates in these rivers are

based on limited survey work and scattered observations. In the early 1960's these streams collectively supported average annual spawning populations of about 25,000 king salmon and 9,000, silver salmon (Table 1). There has been insufficient monitoring on these streams to demonstrate changes in populations since the early 1960's.

Other California Coastal Streams

None of the dozens of remaining California coastal streams support large king salmon populations; their combined annual king salmon populations probably averaging less than 3,500 fish. Many, however, support significant runs of silver salmon. Average annual runs of silver salmon during the early 1960's in these smaller streams totaled 58,400, more than half of California's silver salmon populations. Spawning population estimates for the most important of these appear in Table 1.

The Noyo River is the only one of these streams in which salmon populations have been regularly monitored in recent years. Adult salmon are counted at the Noyo Egg Taking Station on the South Fork Noyo River, about 15 miles from the mouth. Annual counts date back to 1962.

Counts have ranged from about 5,000 to 1,150 with the 15-year average being 2,570 salmon. Populations appear to have declined in recent years: in 1976 the run was the smallest since operation of the counting facility began. However low conditions in some scattered years prevented fish from migrating up to the station as in 1976.

Observations elsewhere in these smaller coastal streams indicate that present populations are smaller than those of the early 1960's, but do not provide a sound basis for estimating the present populations.

ESCAPEMENT GOALS UNDER PRESENT CONDITIONS

The estimated annual average of spawning escapements in California coastal streams for the early 1960's were 256,000 king salmon and 99,400 silver salmon (Calif. Dep. Fish and Game 1965).

In areas where recent monitoring has been accomplished to assess current status and trends, populations have declined since the early 1960's. In most areas, insufficient information is available to assess current trends.

Immediate goals are to maintain and where necessary, to increase salmon populations to the levels of the early 1960's.

Table 3 lists the goals and recent escapements for the three north coast hatcheries.

TABLE 3

CALIFORNIA HATCHERY ESCAPEMENT GOALS
AND RECENT ADULT RETURNS

Hatchery	Goals ^{1/}	ADULT RETURNS								
		1969	1970	1971	1972	1973	1974	1975	1976	1977
Mad River										
King Salmon	4,200		0 ^{2/}	323	1,050	619	231	278	661	163
Silver Salmon	500		0	337	466	327	160	2,103	1,193	451
Steelhead	500		0	0	42	52	2,872	2,138	438	315
Iron Gate										
King Salmon	5,500	1,012	10,325	10,461	3,120	8,774	9,414	7,727	12,608	4,313
Silver Salmon	150	202	1,387	125	56	841	456	82	1,376	251
Steelhead	400	370	1,194	2,365	3,757	1,286	1,865	3,227	1,523	1,941
Trinity										
King Salmon	9,200	1,256	1,498	8,293	11,042	3,635	7,387	6,363	4,746	3,160
Silver Salmon	875	285	2,806	39	58	7,595	55	177	2,585	645
Steelhead	800	554	241	67	242	271	162	372	175	13
Tehama-Colusa Channel										
King Salmon	5,000 ^{3/}			5,935 ^{2/}	2,360	3,536	3,522	4,367	3,312	4,811
Coleman										
King Salmon	9,000	6,838 ^{4/}	7,743	4,298	3,225	4,540	3,673	3,304	4,727	2,446
Steelhead	2,000		3,967	3,680	1,486	2,578	1,834	1,097	2,162	1,270
Feather										
King Salmon	5,000	4,611	3,581	2,852	3,871	8,682	5,626	5,743	5,800	8,546
Steelhead	275	361	224	78	288	1,000	715	758	573	156
Nimbus										
King Salmon	2,500	2,549	7,854	7,877	5,447	10,859	7,508	6,567	4,342	6,505
Steelhead	400	3,066	1,734	3,033	2,256	2,506	3,157	2,164	2,992	582
Mokelumne River Channel										
King Salmon	4,000	615	925	366	352	389	222	399	18	0 ^{5/}
Merced River Channel										
King Salmon	10,000		100 ^{2/}	235	128	375	1,000	700	650	45

^{1/} Goals based on juvenile hatchery capacity or adult channel capacity.

^{2/} First year of operation.

^{3/} Present goal maximum capacity is 40,000 - most spawners trucked from Sacramento River.

^{4/} Hatchery plus Keswick Trap.

^{5/} River dry because of drought.

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