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The Resources Agency
DEPARTMENT OF FISH AND GAME

ANNUAL REPORT
NIMBUS SALMON AND STEELHEAD HATCHERY
1980-81 FISCAL YEAR

by

Chester Riley
Region 2

Anadromous Fisheries Branch

Administrative Report No. 82-18

1982

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ABSTRACT

This report describes the operation of Nimbus Salmon and Steelhead Hatchery from July 1, 1980 through June 30, 1981. Tables present numbers of adult fish trapped, eggs taken, fish reared and released, daily river flow, weather conditions, and water and air temperatures.

There were 15,743 chinook salmon, Oncorhynchus tshawytscha, trapped, which produced 32,273,066 eggs. There were 836 winter-run steelhead, Salmo gairdneri, trapped, from which 1,316,140 eggs were taken.

During the year we planted or transferred a total of 16,542,676 fingerling and 270,281 yearling chinook salmon and 185,511 fingerling and 454,330 yearling steelhead.

1/ Anadromous Fisheries Branch Administrative Report No. 82-18. Submitted May 1982.

INTRODUCTION

This is the 26th annual report of the Nimbus Salmon and Steelhead Hatchery. The hatchery is operated by the California Department of Fish and Game under contract with the United States Bureau of Reclamation (USBR). This report summarizes the activities at the hatchery during 1980-81, with particular reference to numbers of fish trapped, spawned, and released, eggs taken and fish produced, and other pertinent information. The number of salmon and steelhead trapped during the 26 years of operation is summarized (Appendix Table 1).

PRODUCTION SUMMARY

During 1980-81 we took an estimated 33,589,206 eggs and planted approximately 17,452,798 salmon and steelhead (Table 1).

TABLE 1. Production Summary, Nimbus Salmon and Steelhead Hatchery, 1980-81

Species	Number trapped	Eggs taken	Eggs received or transferred	Fingerlings planted	Yearlings planted	Total weight planted (kg)
Chinook salmon						
1979 BY					270,281	8,660
1980 BY	15,743	32,273,066	9,400,196[a/]	16,542,676		22,814
Steelhead						
1980 BY				40,035[b/]	454,330[c/]	49,789
1981 BY	836	1,316,140	300,168[d/]	145,476		204

a/ Includes 7,198,876 shipped to Feather River Hatchery and 2,201,320 shipped to Mokelumne River Fish Installation.
b/ Coleman fingerlings.
c/ Includes 197,845 Coleman-strain and 56,440 Washougal-strain yearlings.
d/ Includes 199,980 shipped to Feather River Hatchery and 100,188 shipped to Mokelumne River Fish Installation.

HATCHERY OPERATION

The Weir

The weir was installed September 3, 1980, by the USBR. The pickets were lowered and capped September 16, 1980.

Prior to installing the weir, the USBR lowered the flow to approximately 250 cfs to allow Department of Fish and Game and U.S. Bureau of Reclamation personnel to make a visual inspection of the weir base. Numerous holes were discovered where the wire matting had rusted through. These holes are obviously where the

large numbers of adult salmon found their way through the weir last season. With the hlep of the USBR employees, the Nimbus crew filled the holes and lined the upstream and downstream sides of the base with several tons of cobbles before installing the weir. The weir was removed from the river by the USBR on December 19, 1980.

Water Temperature Control

Shutter No. 9 was raised on July 25, 1980 when water temperatures reached 64°F at the hatchery. The temperature dropped about 4°F, but by July 28 it was back up to 63°F. Shutter No. 8 was raised on August 1 and the temperature became stable at 60°F. By October the temperature was back up to 62°F, and on October 16, 1980 the remaining shutters were pulled and the temperature dropped to 58°F. The temperature gradually dropped to the season's low of 48°F in February 1981.

Disposal of Salmon Carcasses

Edible carcasses were given to State and County institutions, community action groups, and groups or councils representing the local Indians; local zoos received carcasses of questionable quality and all inedible carcasses went to a local rendering plant. The total carcasses disposed of was 52,640 kg (116,050 lb) edible, 816 kg (1,800 lb) animal food, and 4,082 kg (9,000 lb) inedible.

Public Relations

An estimated 219,998 persons visited Nimbus Hatchery this year. This number was determined by an employee count of cars, bus passengers, and bicyclists. November was the peak month, with 50,000 visitors.

CHINOOK SALMON MAINTENANCE PROGRAM

Chinook Salmon Counts

The fish ladder was opened October 15. The first spawning took place October 28, and the last on December 4, 1980.

A total of 15,743 salmon entered the holding pond this season (Appendix Table 2) including 6,122 large males, 7,553 large females and 2,068 grilse[2/]. A total of 240 carcasses was removed from the weir, including 54 large males, 26 large females and 159 male and 1 female grilse.

Sorting and Spawning

Of the large females counted, 6,161 (81.6%) were spawned, 185 (2.4%) died in the pond, 124 (1.6%) were accidentally killed or immature, and 1,083 (14.3%) were returned to the river unspawned.

The females spawned produced a total of 32,273,066 eggs, for an average of 5,238 eggs/female. Fertility, as determined by the difference between green eggs taken and the total eggs eyed, ranged from 70.0% to 98.8%, and averaged 86.2%.

2/ Fish 60 cm (23.6 in.) fork length or under are considered grilse.

Marked Chinook Salmon Recoveries

All fish were examined for marks as they were processed or removed dead from the pond or weir. Fork length and sex of marked fish were recorded (Appendix Table 3) and heads were removed from all fish with adipose fin clips for recovery of coded wire tags.

Chinook Salmon Planting

1979 Brood Year

There were an estimated 327,740 1979 brood year chinook salmon on hand July 1, 1980. All yearlings were planted in September 1979 (Table 2).

TABLE 2. Planting Data 1979 Brood Year Chinook Salmon

Month/year	Release site	Number	Average size (gm)	Weight (kg)
Sept. 1980	U. S. Maritime Academy	270,281	31.3 (14.2/lb)	8,661 (19,095 lb)

1980 Brood Year

We released 16,542,676 fingerlings and smolts (Table 3). No fish were marked. On June 30, 1981 there were approximately 1,740,000 chinook salmon on hand to be released in July 1981.

TABLE 3. Planting Data 1980 Brood Year Chinook Salmon

Month/year	Release site	Fingerlings	Smolts	Size(gm)	Weight(kg)
Dec. 1980	Amer. River at hatchery	1,510,292		0.37-0.36	551
Jan. 1981	Amer. River at hatchery.	4,360,140		0.35-0.33	1,482
Feb. 1981	Amer. River at hatchery	6,485,377		0.34-0.32	2,140
Mar. 1981	Bear River	100,050		0.68	68
Apr. 1981	Pittsburg	1,536,048		1.41-0.98	1,936
Apr. 1981	U.S. Maritime Academy	335,699		2.35-1.26	730
May 1981	Benicia		877,820	8.37	7,347
June 1981	Benicia		1,276,700	8.89-4.77	7,998
June 1981	U.S. Maritime Academy		60,550	9.65-9.07	566
TOTALS		14,327,606	2,215,070		22,818 (50,304 lb)

Chinook Salmon Disease Information

1980 Brood Year

Minor outbreaks of bacterial infections encountered prior to the 15th of May were easily controlled with the usual flush treatments of copper sulfate and salt. Problems with filamentous gill bacteria and furunculosis appeared at water temperatures went from 55°F in May to 61°F by the end of June. Repeated treatments of Terramycin, Furox, and Sulmet added to the diet were needed to bring about a complete cure. No evidence of "Lupus" of infectious hematopoietic necrosis (IHN) was detected in fish from this brood year.

WINTER-RUN STEELHEAD MAINTENANCE PROGRAM

History of the 1981 Winter Run

The first steelhead entered the holding pond October 16, 1980 and the last one counted was Junuary 22, 1981 (Table 4). All steelhead were examined for marks as they were spawned or released and a record kept of fork length and sex of all marked fish (Appendix Table 4). All fish (13 males, 2 females) having coded wire tags were killed. The heads were removed, data recorded, and both sent to the Anadromous Fisheries Branch for tag recovery and processing. Spawned out or surplus fish were returned to the river below the weir.

TABLE 4. Counts of Winter-run Steelhead, Nimbus Salmon and Steelhead Hatchery, 1980-81

	Spawned and released		Died in pond		Released unspawned		
Date	M	F	M	F	M	F	Total
1/ 8/81	16	41			66	15	138
1/ 9/81	19	39			153	24	235
1/16/81	30	64			38	6	138
1/22/81	22	51	6	11	131	89	310
TOTALS	87	195	6	11	388	134	821

Spawning Data 1981 Brood Year

The 195 females spawned produced 1,316,140 eggs, for an average of 6,749 eggs/female. Survival of green-to-eyed eggs ranged from 81.3% to 90.8% for an average of 85.7%.

Summer-Run Program 1980 Brood Year

The Washougal steelhead fingerlings received from Silverado Field Operations Base on May 22, 1980 were marked with Adipose clip on September 30, 1980 and released on March 31, 1981 at Rio Vista. A total of 56,440 yearlings was released at an average size of 66.7 gm.

Summer Run Program 1981 Brood Year

A total of 215,694 Washougal steelhead was delivered from Silverado Field Operations Base on April 23, 1981 and May 1, 1981. These fish were to be marked and then released in April 1982, but, because of possible contact with virus-infected fish in Washington, they were destroyed June 10, 1981.

Winter-run Steelhead Planted

1980 Brood Year

From July 30, 1980 to March 31, 1981 a total of 200,045 Nimbus and 237,880 Coleman steelhead was planted. Three groups of approximately 50,000 each of the Coleman fish were marked with coded wire tags. The first group of 51,461 (Tag #6-54-41) were planted at Rio Vista in January 1981; the second group of 50,981 (Tag #6-54-42) was planted at Rio Vista in March, 1981 and the third group of 51,628 (Tag #6-54-40) were released in the Carquinez Strait in March 1981.

TABLE 5. Planting Data, 1980 Brood Year Winter-run Steelhead, Nimbus Salmon and Steelhead Hatchery, 1980-81

Date	Release site	Fingerlings	Yearlings	Average size(g)	Weight (kg)
Jul. 80	American River	40,035	-	8.9	356
Jan. 81	Rio Vista	-	136,036	108.3	14,733
Feb. 81	Rio Vista	-	74,000	92.0	6,808
Mar. 81	Rio Vista	-	136,226	120.3	16,388
Mar. 81	Carquines Strait	-	51,628	150.7	7,780
TOTALS		40,035	397,890		46,065 (101,573 lb)

1981 Brood Year

Prior to June 30, 1981 there were 145,476 Nimbus fingerlings ($\overline{w}$ = 1.40 gm) released into the American River at the base of the fish ladder. On June 30, 1981 there were 491,950 Nimbus fingerlings on hand. They will be released as yearlings in January and March 1982.

Steelhead Disease Information

1980 Brood Year

Minor outbreaks of columnaris and gill bacteria were easily controlled in the Nimbus steelhead with copper sulfate and salt flushes. The Washougal steelhead required constant treatments of Terramycin feed or flushes of Hyamine 1622 or copper sulfate and salt to control either columnaris or gill bacteria. Only 56,440 (43.1%) survived to yearlings.

1981 Brood Year

Light losses from columnaris occurred through May and June but were kept under control with Terramycin baths. Usually this problem declines when the steelhead are moved from the hatchery building to the raceway ponds. The Washougal steelhead were in excellent condition for the first time in several years but, as noted earlier, had to be destroyed.

APPENDIX TABLE 1. Summary of Anadromous Fish Trapped[a] at Nimbus Salmon and Steelhead Hatchery

Season	Salmon					Steelhead		
	Males[b]	Females	Adults	Grilse	Total[b]	Males	Females	Total
1955-56	4,427	3,012	--	--	7,439	36	74	110
1956-57	267	502	769	774	1,543	?	?	115
1957-58	297	341	638	252	890	33	18	51
1958-59	4,471	3,689	8,160	2,050	10,210	65	37	102
1959-60	3,003	7,366	10,369	2,866	13,235	354	424	778
1960-61	13,455	6,487	19,942	9,331	29,273	150	166	316
1961-62	3,446	9,257	12,703	1,638	14,341	85	51	137
1962-63	5,088	4,138	9,226	3,442	12,668	1,225	915	2,141
1963-64	1,218	1,215	2,428	813	3,241	472	744	1,216
1964-65	7,209	8,799	16,008	4,534	20,542	502	276	778
1965-66	5,295	7,595	12,890	786	13,676	374	500	874
1966-67	2,434	5,098	7,532	573	8,105	370	272	642
1967-68	2,022	2,392	4,414	733	5,147	?	?	1,183
1968-69	1,318	2,740	4,059	1,175	5,233	1,617	1,449	3,066
1969-70	1,061	1,488	2,549	521	3,070	1,088	646	1,734
1970-71	3,027	4,827	7,854	770	8,624	1,547	1,486	3,033
1971-72	3,384	4,493	7,877	1,269	9,146	1,148	1,108	2,256
1972-73	2,195	3,252	5,447	1,659	7,106	1,220	1,286	2,506[c]
1973-74	5,155	5,704	10,859	1,676	12,535	1,895	1,262	3,157[d]
1974-75	5,783	4,746	7,529	671	8,200	1,114	1,050	2,164[e]
1975-76	2,734	3,833	6,567	846	7,413	1,538	1,643	3,181
1976-77	2,002	2,340	4,342	894	5,236	592	715	1,307
1977-78	3,496	2,874	6,370	498	6,868	377	242	619
1978-79	2,348	3,767	6,115	2,047	8,162	333	347	680
1979-80	4,779	2,394	7,173	3,067	10,240	729	581	1,310
1980-81	6,122	7,553	13,675	2,068	15,743	494	342	836

a/ Fish which entered the holding ponds.
b/ Includes grilse.
c/ Plus 43 unsexed summer steelhead.
d/ Plus 40 male and 40 female summer steelhead.
e/ Plus 62 male and 69 female summer steelhead.

APPENDIX TABLE 2. Nimbus Salmon and Steelhead Hatchery Weather, Water and Fish Spawning Data July 1, 1980 through June 30, 1981

July 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	32.2	15.6	15.0	14.4	Partly Cloudy	140.2		
2	22.2	16.7	14.4	14.4	Rain	141.6		
3	31.1	14.4	14.4	13.9	Partly Cloudy	127.5		
4	30.6	13.3	15.6	15.0	Clear	129.4		
5	31.1	13.3	15.6	15.0	Clear	130.2		
6	30.6	15.0	15.0	15.0	Partly Cloudy	128.5		
7	28.3	14.4	15.6	14.4	Clear	128.2		
8	26.7	13.3	15.0	14.4	Clear	128.3		
9	30.0	12.8	15.6	15.0	Clear	128.7		
10	32.2	13.3	15.6	15.0	Clear	127.5		
11	32.2	15.6	15.6	15.6	Clear	127.7		
12	34.4	14.4	15.6	15.6	Clear	126.6		
13	31.1	15.0	15.6	15.6	Clear	127.6		
14	32.2	13.9	15.6	15.6	Clear	127.9		
15	36.7	14.4	16.1	15.6	Clear	127.9		
16	38.9	17.8	16.7	15.6	Clear	126.2		
17	37.8	16.7	16.7	16.1	Clear	128.7		
18	38.9	17.8	16.7	16.1	Clear	129.0		
19	37.8	14.4	16.7	16.1	Clear	128.8		
20	37.8	15.6	16.7	16.1	Clear	128.9		
21	38.3	17.8	16.1	15.6	Clear	129.1		
22	38.3	18.3	16.7	16.1	Clear	129.1		
23	41.7	20.0	16.7	16.1	Clear	129.8		
24	41.1	18.9	16.7	16.7	Clear	129.0		
25	43.3	19.4	17.2	16.1	Clear	134.3		
26	43.3	20.0	17.2	16.7	Clear	131.8		
27	42.8	22.2	16.7	16.7	Clear	130.8		
28	36.7	24.4	17.2	16.7	Clear	132.5		
29	42.8	21.1	17.2	16.7	Clear	128.7		
30	41.1	22.8	17.2	16.7	Partly Cloudy	130.5		
31	40.6	23.3	17.2	16.7	Clear	94.9		

*Temperature measured to nearest whole degree F, and later converted to C.
**Flows measured in cfs, and later converted to m^3/sec.

APPENDIX TABLE 2 (continued)

August 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	40.0	22.2	17.2	16.7	Clear	87.7		
2	38.9	18.9	12.2	16.7	Clear	87.1		
3	36.7	16.7	16.7	16.1	Clear	88.9		
4	36.7	15.6	16.1	15.6	Clear	88.9		
5	31.1	14.4	16.7	15.6	Clear	70.5		
6	37.8	13.3	16.7	15.6	Clear	71.8		
7	36.7	16.7	16.7	15.6	Clear	72.0		
8	36.7	16.7	16.7	16.1	Clear	70.7		
9	37.2	14.4	16.7	16.1	Clear	71.4		
10	38.9	15.6	16.7	16.1	Clear	71.5		
11	38.3	16.7	16.7	16.1	Clear	69.2		
12	37.8	16.7	16.7	16.1	Clear	43.6		
13	31.1	14.4	16.7	16.1	Clear	43.7		
14	27.8	12.2	16.7	15.6	Clear	24.2		
15	32.2	13.3	17.2	16.1	Clear	42.5		
16	34.4	14.4	17.2	16.7	Clear	42.2		
17	33.3	16.1	16.7	16.1	Clear	42.3		
18	27.2	14.4	16.7	16.1	Clear	15.3		
19	31.1	13.3	16.7	15.6	Clear	18.5		
20	32.2	13.3	16.7	16.7	Clear	57.2		
21	34.4	15.0	17.8	16.7	Clear	59.3		
22	28.9	13.3	17.2	16.7	Partly Cloudy	59.4		
23	28.9	12.2	17.2	16.7	Cloudy	59.3		
24	34.4	12.2	17.2	16.7	Clear	59.2		
25	34.4	15.0	17.2	16.7	Clear	59.1		
26	33.9	15.6	17.2	16.7	Clear	58.4		
27	32.2	13.9	17.2	16.7	Clear	18.6		
28	31.1	12.8	16.7	16.1	Partly Cloudy	13.9		
29	31.7	12.2	17.8	16.1	Clear	25.3		
30	31.1	14.4	17.8	17.2	Clear	57.7		
31	33.3	14.4	17.2	16.7	Clear	57.4		

APPENDIX TABLE 2 (continued)

Sept. 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	34.4	15.6	17.2	16.7	Clear	59.7		
2	34.4	15.6	17.2	16.7	Clear	57.4		
3	34.4	15.6	17.2	16.7	Clear	57.3		
4	31.1	15.6	17.8	16.7	Clear	57.2		
5	34.4	15.6	17.8	17.2	Clear	56.7		
6	30.0	13.3	17.2	16.7	Clear	56.5		
7	30.6	13.9	17.2	16.7	Clear	56.4		
8	33.3	12.2	20.0	16.7	Clear	56.2		
9	32.2	11.7	17.8	16.7	Clear	56.2		
10	30.0	11.1	18.3	16.7	Clear	56.2		
11	30.0	11.1	17.2	16.1	Clear	56.2		
12	31.1	13.9	17.8	17.2	Clear	56.0		
13	24.4	14.4	17.2	16.7	Clear	56.1		
14	26.7	12.2	17.2	16.7	Partly Cloudy	56.2		
15	27.8	12.8	17.2	16.7	Clear	56.3		
16	28.9	12.2	17.2	16.7	Partly Cloudy	56.2		
17	31.1	15.6	17.8	16.7	Clear	56.1		
18	32.2	17.8	17.2	16.7	Partly Cloudy	56.2		
19	30.0	14.4	17.2	16.7	Partly Cloudy	56.3		
20	29.4	13.3	17.2	16.7	Clear	56.3		
21	30.6	12.2	17.2	16.7	Clear	56.3		
22	32.8	13.3	18.3	16.7	Clear	57.5		
23	32.2	13.3	17.2	16.7	Clear	71.8		
24	32.2	14.4	18.3	17.2	Clear	72.0		
25	32.8	13.9	17.8	17.2	Clear	71.9		
26	32.8	15.6	17.8	16.7	Clear	74.7		
27	26.7	14.4	17.8	16.7	Clear	141.2		
28	32.2	15.0	17.8	16.1	Clear	138.9		
29	32.2	14.4	16.7	16.7	Clear	81.1		
30	34.4	14.4	17.2	17.2	Clear	68.4		

APPENDIX TABLE 2 (continued)

Oct 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	32.2	15.6	17.2	16.7	Clear	67.9		
2	35.6	15.6	17.2	16.7	Clear	70.7		
3	17.2	16.7	16.1	17.2	Clear	66.9		
4	39.4	15.6	17.8	17.2	Clear	65.5		
5	36.7	15.6	17.8	17.2	Clear	67.4		
6	36.7	16.7	16.7	15.6	Clear	57.2		
7	36.1	15.6	17.2	16.7	Clear	71.1		
8	36.1	15.6	18.3	17.2	Clear	57.6		
9	32.2	15.6	17.2	17.2	Clear	56.7		
10	32.2	12.8	18.3	16.7	Clear	56.0		
11	25.0	13.9	17.2	16.7	Cloudy	56.2		
12	23.9	12.8	16.7	16.1	Partly Cloudy	55.8		
13	22.8	12.2	17.8	16.1	Rain	56.9		
14	21.1	5.6	16.1	15.6	Partly Cloudy	55.3		
15	21.7	6.1	16.1	14.4	Partly Cloudy	41.9		
16	16.1	5.6	15.6	14.4	Clear	41.3		
17	16.7	7.8	16.1	11.1	Clear	41.5		
18	16.7	7.2	15.6	15.6	Clear	41.5		
19	26.7	8.9	15.6	15.0	Clear	41.8		
20	28.9	8.9	16.7	14.4	Clear	41.1		
21	27.2	10.0	15.0	15.0	Clear	41.0		
22	26.7	10.0	15.0	15.0	Clear	40.9		
23	31.1	10.0	15.6	15.0	Clear	41.2		
24	28.9	10.6	15.6	15.0	Partly Cloudy	42.2		
25	17.2	11.1	15.0	14.4	Rain	43.0		
26	22.8	8.3	15.0	14.4	Clear	42.8		
27	25.6	8.8	15.0	14.4	Clear	42.7		
28	26.1	7.3	14.4	14.4	Clear	42.4	697	
29	26.7	5.6	14.4	14.4	Clear	42.3	350	
30	27.8	6.7	14.4	14.4	Clear	43.2		
31	27.8	7.8	14.4	14.4	Clear	43.0	890	
TOTAL							1,937	

APPENDIX TABLE 2 (continued)

Nov 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	23.3	8.9	15.0	14.4	Clear	41.3		
2	27.8	8.3	15.0	14.4	Clear	41.0		
3	26.7	10.0	15.0	14.4	Clear	41.0	622	
4	25.6	11.1	15.0	14.4	Clear	42.2	358	
5	25.0	10.0	15.0	14.4	Clear	42.6	632	
6	24.4	8.9	14.4	13.3	Clear	42.6		
7	25.6	12.2	15.0	15.0	Clear	41.9	432	
8	22.8	9.4	15.6	14.4	Clear	41.8		
9	22.8	8.4	15.6	13.3	Partly Cloudy	41.3		
10	21.7	7.2	14.4	14.4	Clear	42.4	621	
11	21.7	7.2	15.0	14.4	Clear	42.4		
12	21.7	7.2	15.0	14.4	Clear	42.4	427	
13	19.4	6.1	13.9	11.7	Partly Cloudy	42.5	170	
14	19.4	6.7	13.9	13.9	Clear	41.8	622	
15	20.0	5.6	13.3	12.8	Clear	42.1		
16	20.6	5.6	13.3	12.8	Clear	41.8		
17	20.6	5.0	13.3	12.8	Clear	42.0	849	
18	20.0	6.1	13.3	12.8	Clear	41.9	356	
19	19.4	5.0	13.3	12.8	Clear	42.2	627	
20	19.4	5.0	13.3	12.8	Clear	41.0	287	
21	18.9	5.6	13.3	13.3	Partly Cloudy	40.9	518	
22	18.9	5.6	13.3	13.3	Partly Cloudy	40.7	603	
23	19.4	4.4	13.3	13.3	Rain	40.9		
24	19.4	3.9	13.3	12.8	Clear	40.7	1,051	
25	18.9	3.3	13.3	12.8	Clear	40.7	631	
26	17.2	2.2	13.3	12.8	Clear	40.7	711	
27	20.0	3.3	13.3	12.8	Clear	40.8		
28	19.4	4.4	13.3	12.8	Clear	40.7	824	
29	17.2	4.4	13.3	12.8	Cloudy	40.7		
30	17.2	5.6	13.3	12.8	Rain	40.7		
TOTAL							10,341	
CUMULATIVE TOTAL							12,278	

APPENDIX TABLE 2 (continued)

Dec 1980	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	13.3	4.4	12.2	12.2	Cloudy	40.9	638	
2	12.8	3.9	12.2	12.2	Rain	40.8	379	
3	8.3	2.2	12.2	12.2	Rain	43.5		
4	8.3	2.2	12.2	12.2	Partly Cloudy	67.4	427	
5	8.9	2.2	12.2	12.2	Clear	68.8	49	
6	9.4	.6	12.2	12.2	Clear	69.4		
7	11.7	1.7	12.2	12.2	Clear	67.5		
8	13.3	1.1	12.2	12.2	Clear	70.4		
9	13.3	.6	11.7	11.7	Clear	67.2		
10	12.8	1.1	11.7	11.1	Clear	70.7		
11	13.3	.0	11.7	11.1	Clear	71.9		
12	16.1	.6	11.7	11.1	Clear	70.4		
13	16.1	.6	11.7	11.1	Clear	69.5		
14	16.7	3.3	11.7	11.1	Clear	70.5		
15	17.8	2.2	11.7	11.1	Fog	70.6		
16	17.8	5.0	11.7	11.1	Clear	70.8		
17	17.8	3.3	11.1	10.6	Partly Cloudy	71.2		
18	17.8	8.9	11.1	10.6	Partly Cloudy	70.6		
19	17.8	5.6	11.1	10.6	Partly Cloudy	70.1		
20	15.6	4.4	11.1	10.6	Partly Cloudy-Fog	70.6		
21	11.1	5.6	11.1	10.6	Fog-Rain	70.3		
22	12.2	10.0	11.1	10.6	Cloudy-Fog	68.9		
23	16.7	10.6	10.6	10.6	Cloudy-Fog	70.6		
24	10.0	5.6	10.6	10.6	Cloudy-Fog	69.7		
25	11.1	5.6	10.6	10.6	Cloudy-Fog	69.9		
26	12.8	8.9	10.6	10.6	Cloudy-Fog	70.3		
27	12.8	7.2	11.1	10.6	Cloudy-Fog	70.2		
28	13.9	7.2	10.6	10.6	Cloudy-Fog	70.3		
29	8.9	7.8	10.0	10.0	Cloudy-Fog	69.9		
30	7.8	6.1	10.6	10.6	Cloudy-Fog	69.8		
31	7.2	5.6	10.6	10.6	Cloudy-Fog	69.3		
TOTAL							1,493	
CUMULATIVE TOTAL							13,771***	

*** Plus an additional 2,110 released unspawned.

APPENDIX TABLE 2 (continued)

Jan 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	6.7	6.1	10.6	10.0	Cloudy - Fog	60.2		
2	4.4	3.3	10.0	10.0	Cloudy - Fog	58.5		
3	10.0	4.4	10.6	10.0	Rain	58.6		
4	16.7	6.7	10.6	10.0	Cloudy - Fog	58.5		
5	14.4	4.4	10.6	10.0	Cloudy - Fog	58.2		
6	15.6	4.4	10.6	10.0	Cloudy - Fog	58.3		
7	15.6	6.7	10.6	10.0	Cloudy - Fog	57.4		
8	10.0	4.4	10.6	10.0	Cloudy - Fog	57.5		138
9	5.6	3.9	10.0	10.0	Cloudy - Fog	57.0		235
10	6.1	3.9	10.0	10.0	Cloudy - Fog	48.5		
11	6.1	3.3	10.0	10.0	Cloudy - Fog	42.0		
12	6.1	3.9	10.0	9.4	Cloudy - Fog	41.9		
13	17.8	3.3	10.0	10.0	Fog AM - Clear	42.0		
14	16.1	2.2	10.0	10.0	Cloudy	41.6		
15	19.4	3.3	10.0	10.0	Partly Cloudy	41.6		
16	18.3	4.4	10.6	10.6	Partly Cloudy	41.6		138
17	18.9	3.3	10.6	10.6	Partly Cloudy	41.3		
18	21.1	4.4	11.1	10.6	Partly Cloudy	41.2		
19	16.1	11.7	10.6	10.6	Rain	41.1		
20	16.7	6.7	10.6	10.6	Partly Cloudy	41.0		
21	17.8	11.7	10.6	10.0	Partly Cloudy	40.3		
22	17.8	12.2	10.6	10.0	Rain	41.0		325
23	17.2	9.4	10.6	10.0	Rain	41.4		
24	16.1	6.7	10.6	10.0	Partly Cloudy	41.4		
25	15.0	3.9	10.6	10.0	Clear	41.2		
26	11.1	6.7	10.0	10.0	Rain	41.5		
27	12.8	8.3	10.0	10.0	Rain	41.7		
28	15.0	9.4	10.0	10.0	Rain	41.5		
29	15.0	10.6	10.0	10.0	Rain	41.4		
30	14.4	1.1	10.0	10.0	Partly Cloudy	41.5		
31	13.9	1.1	10.6	10.0	Clear	41.4		
TOTAL								836

APPENDIX TABLE 2 (continued)

February 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	15.0	.0	10.6	10.0	Partly Cloudy	41.5		
2	16.1	6.7	10.0	9.4	Partly Cloudy	41.4		
3	16.7	1.1	11.1	10.6	Clear	41.6		
4	12.8	2.2	11.1	10.6	Clear	41.6		
5	13.3	7.2	11.1	10.6	Partly Cloudy	42.3		
6	15.6	4.4	10.6	10.6	Partly Cloudy	42.7		
7	16.1	4.4	9.4	9.4	Partly Cloudy	42.5		
8	17.2	5.6	9.4	8.9	Rain	42.5		
9	16.7	5.6	9.4	8.9	Clear	42.4		
10	17.2	8.3	10.0	9.4	Cloudy	42.5		
11	20.6	10.0	10.6	10.0	Partly Cloudy	42.7		
12	19.4	7.2	10.0	10.0	Clear	43.9		
13	18.9	5.6	11.1	10.6	Rain	42.9		
14	22.2	5.6	11.1	10.6	Partly Cloudy	42.5		
15	22.2	5.6	11.1	10.6	Partly Cloudy	42.4		
16	22.8	8.9	10.6	10.0	Rain	42.3		
17	21.1	12.8	11.1	10.6	Clear	41.5		
18	23.9	10.0	11.1	10.6	Clear	42.8		
19	20.0	13.3	11.1	10.6	Partly Cloudy	43.6		
20	21.1	10.0	11.1	10.6	Clear	42.9		
21	21.7	4.4	11.1	10.6	Clear	42.4		
22	24.4	11.1	11.7	10.6	Clear	43.1		
23	18.3	8.9	11.1	10.6	Partly Cloudy	43.4		
24	14.4	8.3	10.6	10.6	Partly Cloudy	43.4		
25	12.2	5.6	10.6	10.6	Partly Cloudy	43.5		
26	15.6	8.9	10.6	10.6	Partly Cloudy	45.2		
27	16.7	7.2	11.1	10.6	Clear	45.3		
28	15.6	4.4	10.6	10.6	Rain	45.1		

APPENDIX TABLE 2 (continued)

March 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	18.9	8.9	10.6	10.0	Cloudy	44.9		
2	16.1	4.4	11.1	10.6	Partly Cloudy	45.3		
3	16.1	5.0	10.6	10.6	Partly Cloudy	43.2		
4	17.2	12.2	11.1	10.6	Rain	43.3		
5	17.8	6.1	11.1	10.6	Clear	43.2		
6	16.7	4.4	11.1	10.6	Clear	43.4		
7	18.3	10.0	11.1	10.6	Partly Cloudy	43.3		
8	21.7	10.6	11.7	10.0	Clear	43.1		
9	24.4	6.7	11.7	11.1	Clear	43.3		
10	16.7	11.7	11.1	11.1	Clear	43.3		
11	22.2	8.9	11.1	10.6	Clear	43.2		
12	16.1	7.2	11.1	10.6	Partly Cloudy	43.3		
13	15.6	6.7	11.1	10.6	Partly Cloudy	43.3		
14	15.6	6.1	11.1	10.6	Partly Cloudy	43.2		
15	10.0	6.1	11.1	10.6	Rain	43.2		
16	16.7	5.6	11.1	10.6	Clear	43.1		
17	16.7	3.9	12.2	11.1	Clear	43.2		
18	15.6	9.4	11.7	11.7	Rain	43.2		
19	17.2	9.4	11.7	11.1	Rain	43.3		
20	14.4	6.7	11.1	11.1	Rain	42.8		
21	11.1	6.7	11.1	11.1	Rain	42.0		
22	14.4	7.2	11.1	11.1	Cloudy	42.7		
23	21.5	6.7	11.1	11.1	Partly Cloudy	42.7		
24	21.1	8.9	11.7	11.1	Partly Cloudy	42.7		
25	17.8	6.7	11.7	11.1	Rain	42.7		
26	16.7	6.7	12.2	11.7	Partly Cloudy	42.6		
27	21.1	4.4	12.8	11.7	Partly Cloudy	42.7		
28	21.1	7.8	11.7	11.7	Clear	42.5		
29	16.7	7.8	11.7	11.1	Partly Cloudy	42.6		
30	21.1	4.4	12.8	12.2	Clear	42.7		
31	19.4	5.6	11.1	11.7	Partly Cloudy	42.7		

APPENDIX TABLE 2 (continued)

April 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	17.2	5.6	11.7	11.1	Partly Cloudy	42.6		
2	21.1	2.2	11.7	11.1	Clear	42.7		
3	21.1	6.7	12.2	11.7	Clear	42.5		
4	24.4	8.9	12.2	11.7	Clear	42.8		
5	27.8	13.3	12.2	11.7	Clear	42.5		
6	21.1	4.4	12.8	12.2	Clear	42.6		
7	21.7	4.4	12.8	12.2	Clear	43.1		
8	21.1	4.4	12.8	12.2	Clear	43.7		
9	22.2	7.8	12.8	12.2	Clear	43.8		
10	21.1	8.3	12.8	12.2	Clear	43.8		
11	22.8	6.7	12.8	12.2	Clear	43.9		
12	21.1	5.6	12.8	12.2	Clear	43.9		
13	26.1	5.0	12.8	12.2	Clear	44.1		
14	28.9	6.7	13.3	11.7	Clear	44.1		
15	23.3	6.1	12.8	12.2	Clear	44.2		
16	23.9	9.4	12.8	12.2	Clear	42.4		
17	24.4	12.2	13.3	12.8	Partly Cloudy	44.2		
18	16.7	11.1	12.2	12.2	Rain	44.2		
19	16.7	11.1	12.2	12.2	Rain	44.0		
20	20.0	8.9	12.8	12.2	Partly Cloudy	44.4		
21	24.4	7.8	12.8	12.2	Clear	43.5		
22	27.8	7.8	12.8	12.8	Clear	43.4		
23	29.4	12.2	13.3	12.2	Clear	43.5		
24	27.8	12.2	12.8	12.2	Clear	43.7		
25	18.3	11.1	13.3	12.8	Rain	43.6		
26	20.6	9.4	13.3	13.3	Clear	43.5		
27	27.8	10.0	13.3	13.3	Clear	43.5		
28	34.4	12.2	13.9	12.8	Clear	43.4		
29	35.6	17.8	13.3	13.3	Clear	43.5		
30	33.9	17.8	13.9	13.3	Partly Cloudy	43.3		

APPENDIX TABLE 2 (continued)

May 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	35.6	15.6	13.3	12.8	Clear	43.3		
2	26.1	10.6	13.9	12.8	Clear	43.3		
3	27.8	10.0	13.9	13.3	Clear	43.2		
4	26.1	10.0	13.3	12.8	Clear	42.6		
5	26.7	10.0	13.9	12.8	Clear	42.5		
6	26.7	10.0	13.3	12.8	Clear	114.6		
7	31.7	10.6	13.3	12.8	Clear	126.7		
8	31.7	10.6	13.3	12.8	Clear	125.7		
9	31.7	10.6	13.3	12.8	Clear	125.2		
10	32.2	14.4	13.3	12.8	Clear	124.5		
11	31.7	15.0	13.9	12.8	Clear	124.7		
12	30.6	7.2	13.3	12.8	Clear	124.7		
13	30.0	4.4	13.3	12.8	Clear	124.7		
14	23.9	12.8	13.3	12.8	Clear	124.7		
15	23.9	12.2	13.3	13.3	Partly Cloudy	124.9		
16	25.0	8.9	13.3	12.8	Clear	124.9		
17	27.2	8.9	13.9	12.8	Cloudy	124.2		
18	27.2	11.1	13.3	13.3	Rain	122.3		
19	21.1	11.1	13.3	12.8	Partly Cloudy	88.5		
20	21.1	11.1	13.3	12.8	Partly Cloudy	83.0		
21	26.7	9.4	13.9	13.9	Clear	52.7		
22	27.8	13.3	13.9	13.9	Clear	43.2		
23	31.7	15.6	13.9	13.9	Clear	42.2		
24	32.2	15.6	14.4	13.9	Partly Cloudy	42.1		
25	22.8	15.6	14.4	13.9	Cloudy-Rain	42.3		
26	28.3	15.6	14.4	14.4	Clear	42.4		
27	30.6	15.6	15.0	14.4	Clear	42.3		
28	33.3	16.7	15.0	14.4	Clear	42.5		
29	29.4	13.3	15.0	14.4	Clear	42.2		
30	31.7	15.6	15.0	15.0	Clear	42.3		
31	32.2	16.7	16.1	15.0	Clear	42.1		

APPENDIX TABLE 2 (continued)

June 1981	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Flow of American River at hatchery (m^3/sec**)	Salmon	Steelhead
1	27.8	15.6	15.0	13.9	Clear	42.1		
2	28.3	15.0	16.1	13.9	Clear	43.1		
3	32.8	15.0	16.1	13.9	Clear	56.3		
4	36.7	15.0	15.6	13.9	Clear	56.6		
5	37.8	16.7	15.6	15.0	Clear	56.8		
6	35.6	21.1	15.6	15.0	Clear	58.7		
7	28.9	15.6	16.1	15.0	Clear	86.9		
8	30.0	16.7	16.1	15.0	Clear	142.2		
9	28.9	15.6	16.1	15.0	Clear	144.6		
10	28.3	13.9	16.1	15.0	Clear	103.5		
11	28.9	15.6	15.0	14.4	Clear	100.4		
12	34.4	13.3	15.6	15.0	Clear	83.9		
13	38.9	20.6	15.6	15.0	Clear	82.4		
14	38.3	15.6	15.6	15.0	Clear	83.9		
15	37.8	16.1	16.1	16.1	Clear	85.4		
16	39.4	21.1	16.1	15.0	Clear	85.1		
17	38.3	15.6	16.1	15.0	Clear	85.2		
18	37.8	16.1	16.1	15.0	Clear	85.4		
19	39.4	21.1	16.1	15.0	Clear	86.6		
20	40.0	22.2	16.1	15.6	Clear	98.4		
21	38.9	20.0	16.1	15.6	Clear	97.7		
22	40.0	21.2	16.1	15.0	Clear	105.3		
23	36.7	18.9	15.6	15.0	Clear	113.5		
24	37.8	17.8	16.1	15.0	Clear	113.5		
25	39.4	17.8	16.1	15.0	Clear	113.3		
26	40.0	18.9	16.7	15.0	Clear	112.7		
27	38.9	18.9	16.7	16.1	Clear	112.6		
28	37.8	21.1	16.7	16.1	Clear	111.4		
29	38.9	20.0	16.1	15.0	Clear	99.9		
30	38.9	16.7	16.7	16.1	Clear	100.4		

APPENDIX TABLE 3. Fork Lengths of Marked Chinook Salmon Recovered at Nimbus Salmon and Steelhead Hatchery, 1980-81 Season

FL(cm)	Ad	
	Male	Female
41	1	
52	1	
53	1	
55	1	
56		1
60	2	2
61	2	1
63	1	1
64	1	3
65	1	2
66		2
67	1	
68		3
69	1	1
70	1	1
71	1	3
72	2	5
73	3	4
74	3	1
75		4
76	3	4
77	1	6
78	4	3
79		1
80	2	2
81	1	
82	1	
83	1	2
84		2
85	1	
86		1
89	2	
90	1	
TOTALS	40	55
GRAND TOTAL	95	

APPENDIX TABLE 4. Fork Lengths of Marked Salmon Recovered at Nimbus Salmon and Steelhead Hatchery, 1980-81 Season

	LP		RP		LP-RP		RP-Ad		Ad	
FL(cm)	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
34										1
44			2							
45	3									
47	1									
49			1				1			
62						1				
TOTALS	4		3			1	1			1