

ANNUAL REPORT
NIMBUS SALMON AND STEELHEAD HATCHERY
1979-80 FISCAL YEAR^{1/}

by

Chester Riley
Region 2

ABSTRACT

This report describes the operation of Nimbus Salmon and Steelhead Hatchery from July 1, 1979 through June 30, 1980. 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 10,240 chinook salmon, Oncorhynchus tshawytscha, trapped, which produced 8,459,370 eggs. There were 1,310 winter-run steelhead, Salmo gairdneri, trapped, from which 1,041,800 eggs were taken.

During the year we planted or transferred a total of 6,362,663 fingerling and 267,460 yearling chinook salmon and 694,910 fingerling and 510,503 yearling steelhead.

^{1/} Anadromous Fisheries Branch Administrative Report No. 82-17.
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INTRODUCTION

This is the 25th 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 U. S. Bureau of Reclamation (USBR). This report summarizes the activities at the hatchery during 1979-80, 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 25 years of operation is summarized (Appendix Table 1).

PRODUCTION SUMMARY

During 1979-80, we took an estimated 9,501,170 eggs and planted approximately 7,835,506 salmon and steelhead (Table 1).

TABLE 1. Production Summary, Nimbus Salmon and Steelhead Hatchery, 1979-80

Species	Number trapped	Eggs taken	Eggs received or transferred	Fingerlings received or transferred	Fingerlings planted	Yearlings planted	Total kilograms planted
Chinook salmon							
1978 BY					58,680	267,460	9,842
1979 BY	10,240	8,459,370			6,303,953		33,139
Steelhead							
1979 BY					148,440	510,503 ^{a/}	42,408
1980 BY	1,310	1,041,800	700,020 ^{b/}	130,977 ^{c/}	546,470		1,080

^{a/} Includes 148,220 Washougal yearlings

^{b/} Includes 400,050 eggs received from Coleman National Fish Hatchery, 99,990 Nimbus eggs shipped to Mokelumne River Fish Installation, and 199,980 Nimbus eggs shipped to Feather River Hatchery.

^{c/} Washougal fingerlings received from Silverado Field Operations Base.

HATCHERY OPERATION

The Weir

The weir was installed September 27, 1979 by USBR. The pickets were lowered and capped October 1, 1979.

Before lowering the pickets, the base of the weir was inspected and all visible holes plugged with cobbles. As the season progressed, it became obvious that a large number of salmon were getting past the weir. Several inspections were made and each time the pickets were in place; next summer, when the flow is down, the webbing at the weir base will have to be checked for holes. Over 4,000 salmon carcasses were removed from the weir during the season, most of them having escaped through or under the weir.

On January 10, 1980, the weir was removed by USBR because of anticipated high flows. Sufficient numbers of steelhead were already ponded at this time for our egg production goal. The weir was not installed again until fall.

Water Temperature Control

By July 1, 1979, water temperatures were near 63°F and on July 11 the No. 9 shutter was raised at Folsom Dam. The water temperature continued to rise and July 16 the No. 8 was raised. By July 18 the temperature had dropped to 59°F. By October the temperature had risen to 64°F and on October 9, 1979 the remaining shutters were pulled and the temperature dropped to 59°F.

The two wells which would normally be used for temperature control were found to have a high concentration of Trichloroethylene (TCE) and cannot be used until a method of reducing the TCE to a safe level can be found.

Disposal of Salmon Carcasses

Edible carcasses were given to State and county institutions, welfare and community action groups, and groups or councils representing California Indians. Local zoos received carcasses of poor quality and all inedible carcasses went to a local rendering plant. The total dispensed for each category was 28,123 kg (62,000 lb) edible, 862 kg (1,900 lb) animal food, and 9,004 (19,850 lb) inedible.

Public Relations

An estimated 187,233 people visited Nimbus Hatchery this year. This number was arrived at by a count of cars, bus passengers, and bicyclists. November was the peak visitation month, with 87,850 visitors.

CHINOOK SALMON MAINTENANCE PROGRAM

Chinook Salmon Counts

Several salmon were observed near the weir site in mid-September, almost 2 weeks before the weir was installed. The fish ladder was opened October 15 and the first spawning took place October 24.

A total of 10,240 salmon entered the holding pond this season (Appendix Table 2). Those entering the holding pond included 4,779 large males, 2,394 large females, and 3,067 grilse^{2/}. A total of 4,195 carcasses was removed from the weir, most fish escaping upstream through a hole beneath the rack. Carcasses counted and removed from the weir included 2,148 large males, 855 large females and 1,192 grilse, including 49 small females.

Sorting and Spawning

Of the large females counted in the holding pond, 1,540 (64.3%) were spawned, 834 (34.8%) died in the pond, and 20 (0.8%) were immature.

^{2/} Fish 60 cm or 23.6 in. fork length or less were considered grilse.

During the spawning season, which began October 24, 1979 and ended December 14, 1979, a total of 8,459,370 eggs was taken, for an average of 5,493 eggs/female. Fertility, as determined by the difference between green eggs taken and total eggs eyed, ranged from 71.0 to 97.3%, with an average if 85.1%.

Marked Chinook Salmon Recoveries

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

CHINOOK SALMON PLANTING

1978 Brood Year

We had an estimated 403,550 1978 brood year chinook salmon on hand July 1, 1979. All yearlings were planted in September and October 1979 (Table 2).

TABLE 2. Planting Data 1978 Brood Year Chinook Salmon

Month	Release site	Number	Average size (g)	Weight (kg)
Sept. 1979	Rio Vista	150,960	34.0	5,133
Oct. 1979	Rio Vista	116,500	32.6	3,798
TOTALS		267,460		8,931 (19,693 lb)

1979 Brood Year

We released 6,303,953 fingerlings and smolts (Table 3). No fish were marked. On June 30, 1980 there were approximately 327,740 chinook salmon on hand to be released in the fall as yearlings.

TABLE 3. Planting Data 1979 Brood Year Chinook Salmon

Month	Release site	Fingerlings	Smolts	Size (g)	Weight (kg)
Feb. 1980	Amer. River at hatchery	2,131,767		0.36-0.74	1,067
Mar. 1980	Amer. River at hatchery	326,388		0.35-0.88	154
Apr. 1980	Amer. River at hatchery	301,003		0.60-1.18	331
June 1980	Rio Vista		3,544,795	6.98-10.19	31,593
TOTALS		2,759,158	3,544,795		33,145 (73,071 lb)

Chinook Salmon Disease Information

1980 Brood Year

Minor outbreaks of columnaris and gill bacteria during the months of March through June were easily controlled with flush treatments of copper sulfate and salt. No evidence of infectious hematopoietic necrosis (IHN) or Lupus were present at the end of the report period.

WINTER-RUN STEELHEAD MAINTENANCE PROGRAM

History of the 1980 Winter Run

The winter-run Nimbus steelhead will no longer be classified as early or late run. All steelhead entering the hatchery from the American River will be classified as Nimbus winter-run steelhead.

The first steelhead entered the holding pond October 17, 1979 and the last one was counted January 24, 1980 (Table 4). All steelhead were examined for marks as they were spawned or released and a record kept of fork length and sex of marked fish (Appendix Table 4). Spawned-out or surplus fish were either transported to Nimbus basin below Nimbus Dam or returned to the river below the weir.

TABLE 4. Counts of Winter-run Steelhead at Nimbus Salmon and Steelhead Hatchery, 1979-80

Date	Spawned and released		Died in pond		Released unspawned		Total
	M	F	M	F	M	F	
12/17/79	18	26	-	2	24	2	72
1/ 3/80	35	82	3	-	65	20	205
1/ 8/80	26	69	-	-	255	182	532
1/24/80	-	-	-	-	303	198	501
TOTALS	79	177	3	2	647	402	1,310

Spawning Data 1980 Brood Year

The 177 females spawned produced 1,041,800 eggs, for an average of 5,886/female. Survival of green-to-eyed eggs ranged from 90.6% to 95.6%, for an average of 92.9%.

Summer-run Program 1979 Brood Year

The Washougal steelhead fingerlings received from Silverado Field Operations Base on May 24, 1979 were marked with an Ad (Adipose) clip on January 29, 1980 and released in April 1980 (Table 5).

TABLE 5. Planting Data, 1979 Brood Year Summer-run Steelhead, Nimbus Salmon and Steelhead Hatchery

Date	Release site	Number of yearlings	Average size(g)	Weight (kg)
4/80	Rio Vista	148,220 ^{a/}	67.2	9,960 (21,962 lb)

^{a/} 127,159 were marked with adipose clip and 21,061 were unmarked.

Summer-run Program 1980 Brood Year

The Washougal steelhead fingerlings received from Silverado Field Operations Base on May 22, 1980 were marked and released as yearlings in March or April 1981.

WINTER-RUN STEELHEAD PLANTED

1979 Brood Year

From July 12, 1979 to April 10, 1980, 510,723 winter-run steelhead were planted (Table 6). Of these, 148,440 were late-run fingerlings and 207,968 early-run and 154,315 late-run yearlings.

TABLE 6, Planting Data, 1979 Brood Year Winter-run Steelhead, Nimbus Salmon and Steelhead Hatchery, 1979-80

Date	Release site	Fingerlings	Yearlings	Classification	Average size(g)	Weight (kg)
7/79	Amer. River	148,440	-	Late	2.2	327
1/80	Rio Vista	-	99,490	Early	79.8	7,939
1/80	Rio Vista	-	81,400	Late	71.3	5,804
2/80	Rio Vista	-	34,400	Early	105.5	3,629
2/80	Rio Vista	-	32,260	Late	81.5	2,629
3/80	Rio Vista	-	3,825	Early	100.8	386
3/80	Rio Vista	-	3,825	Late	100.8	386
4/80	Rio Vista	-	70,253	Early	108.0	7,587
4/80	Rio Vista	-	36,830	Late	102.5	3,775
TOTALS		148,440	362,283			32,459 (71,572 lb)

1980 Brood Year

Prior to June 30, 1980, there were 381,353 Nimbus and 125,082 Coleman fingerlings released into the American River at the base of the ladder (Table 7). On June 30, 1980 there were 225,300 Nimbus, 268,650 Coleman, and 117,500 Washougal steelhead fingerlings on hand, from which 200,000 Nimbus, 200,000 Coleman, and 100,000 Washougal yearlings are to be released in the spring of 1981.

TABLE 7. Planting Data, 1980 Brood Year, Nimbus Salmon and Steelhead Hatchery 1979-80

Date	Release site	Number of fingerlings	Average size(g)	Weight (kg)
1980				
April 2	American River at Nimbus	200,898	0.30	60
May 1	American River at Nimbus	100,107	1.03	103
June 6	American River at Nimbus	24,975	2.45	61
June 9	American River at Nimbus	180,455	2.76	498
TOTALS		506,435		722 (1,592 lb)

STEELHEAD DISEASE INFORMATION

1979 Brood Year

Only minor cases of columnaris and gill bacteria occurred in the Nimbus and Coleman fish and were easily controlled by feeding Terramycin in the feed or with copper sulfate and salt flushes. The Washougal steelhead were in poor condition to start and constant treatments were needed to control both columnaris and gill bacteria. Only 148,220 (68.4%) survived to yearlings.

1980 Brood Year

As in the past, columnaris was the major problem during April and May and Terramycin flushes have proved to be the best control. When the steelhead were moved from the hatchery building to the raceway ponds, the disease problem subsided.

APPENDIX TABLE 1. Summary of Anadromous Fish Trapped^{a/} at Nimbus Salmon and Steelhead Hatchery

Season	Chinook salmon					Steelhead		
	Males	Females	Total adults	Grilse	Total	Males	Females	Total
1955-56	4,427 ^{b/}	3,012	--	--	7,439 ^{b/}	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

- ^{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 Trapping Data July 1, 1979 Through June 30, 1980

1979 July	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	32.2	15.6	16.1	15.0	clear	71.61		
2	27.8	13.9	15.6	15.0	clear	71.56		
3	25.6	12.8	16.1	15.0	clear	71.58		
4	28.3	13.3	16.7	15.0	clear	71.64		
5	28.3	13.3	16.7	15.0	clear	71.56		
6	30.0	14.4	16.7	15.6	clear	71.22		
7	31.1	15.6	17.2	15.6	clear	71.10		
8	30.6	13.3	16.7	15.6	clear	71.07		
9	27.8	14.4	16.7	16.1	cloudy	71.02		
10	28.9	16.7	16.7	16.1	partly cloudy	71.05		
11	32.8	14.4	17.2	15.6	partly cloudy	71.05		
12	35.6	16.7	17.2	16.1	clear	71.27		
13	35.6	18.3	17.8	16.7	clear	71.58		
14	32.8	16.1	17.2	16.7	clear	69.49		
15	36.7	17.8	17.2	16.1	clear	69.80		
16	40.0	17.2	17.2	16.1	clear	70.31		
17	39.4	17.8	17.2	16.7	clear	71.30		
18	39.4	16.7	16.1	13.9	clear	72.40		
19	40.0	17.8	15.0	13.9	clear	71.44		
20	33.3	20.6	15.0	13.9	partly cloudy	73.48		
21	27.8	18.9	15.6	14.4	rain	86.37		
22	34.4	16.7	15.0	13.9	clear	85.63		
23	37.8	21.7	14.4	14.4	partly cloudy	83.14		
24	38.9	20.0	15.6	14.4	clear	81.81		
25	37.8	20.0	16.1	15.0	clear	70.39		
26	34.4	16.1	16.7	15.6	clear	69.18		
27	31.1	13.3	15.6	16.7	clear	69.52		
28	33.3	14.4	16.1	15.0	clear	69.66		
29	38.9	16.7	15.6	14.4	clear	69.26		
30	40.6	17.8	16.1	15.6	clear	69.52		
31	40.0	20.0	16.1	15.0	clear	68.67		

*Temperature measured to nearest whole degree F, and later converted to C.

**Flows measured in cfs, and later converted to m³/sec.

Appendix Table 2 (continued)

1979 August	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	40.6	17.8	16.1	15.6	clear	68.78		
2	38.9	18.9	16.1	15.6	clear	70.79		
3	36.7	16.7	16.1	15.6	clear	70.85		
4	32.2	14.4	16.7	15.6	clear	70.76		
5	34.4	13.9	16.7	15.6	clear	70.03		
6	35.6	15.6	16.7	16.1	clear	70.99		
7	36.1	17.8	16.1	15.6	clear	71.10		
8	35.0	16.7	16.7	15.6	clear	70.85		
9	37.2	16.7	16.7	15.6	clear	70.63		
10	37.2	18.3	16.7	16.1	partly cloudy	71.22		
11	37.2	16.7	16.7	16.1	partly cloudy	71.10		
12	36.1	17.2	16.1	15.6	partly cloudy	70.68		
13	25.6	17.2	17.2	16.1	cloudy	70.82		
14	26.1	14.4	17.2	16.1	partly cloudy	71.33		
15	31.1	15.6	16.7	15.6	clear	71.61		
16	31.1	14.4	16.7	15.6	clear	72.97		
17	33.3	15.6	16.7	15.6	partly cloudy	97.38		
18	32.2	16.1	16.1	15.6	clear	98.49		
19	30.0	16.7	16.7	15.6	clear	99.00		
20	25.6	16.7	16.1	15.6	partly cloudy	99.42		
21	28.3	15.6	16.7	15.6	partly cloudy	96.90		
22	28.9	13.9	16.7	16.1	partly cloudy	84.72		
23	30.6	16.7	16.7	16.1	clear	85.06		
24	32.2	14.4	17.2	16.1	partly cloudy	82.00		
25	32.2	16.7	17.2	16.1	clear	70.79		
26	33.9	16.7	17.2	16.1	clear	68.95		
27	34.4	17.2	17.2	16.1	partly cloudy	54.31		
28	27.8	18.3	16.7	16.1	partly cloudy	42.33		
29	26.7	15.6	17.2	16.1	partly cloudy	42.93		
30	27.8	16.1	17.2	16.7	clear	42.93		
31	31.1	14.4	17.2	16.7	clear	42.93		

Appendix Table 2 (continued)

1979 September	Temperature (C*)				Weather	Flow of American	Salmon	Steelhead
	Air		Water			River at hatchery		
	Maximum	Minimum	Maximum	Minimum		(m ³ /sec**)		
1	26.7	16.1	17.2	16.7	clear	42.87		
2	31.1	17.2	17.2	16.7	partly cloudy	42.87		
3	30.0	15.6	17.8	16.7	clear	42.87		
4	31.1	17.8	17.2	17.2	clear	43.32		
5	33.3	16.1	17.8	16.7	clear	43.66		
6	35.6	16.7	17.2	17.2	clear	44.37		
7	36.1	17.8	17.8	17.2	clear	56.63		
8	37.2	17.2	17.8	17.2	clear	71.56		
9	33.3	17.8	17.2	17.2	clear	84.50		
10	34.4	13.3	17.2	16.7	clear	98.34		
11	36.7	15.0	17.2	17.2	clear	98.00		
12	40.0	16.1	17.2	16.7	clear	98.77		
13	38.9	17.8	17.2	16.7	clear	99.34		
14	36.7	15.0	17.8	16.7	clear	98.49		
15	37.8	16.7	17.8	16.7	clear	98.37		
16	38.9	17.2	17.2	16.7	clear	98.06		
17	32.2	17.2	17.2	16.7	clear	99.11		
18	32.2	15.6	17.2	16.7	clear	100.24		
19	35.6	14.4	17.2	16.7	clear	99.84		
20	37.2	12.8	17.2	16.7	clear	99.62		
21	33.3	12.8	17.2	16.7	clear	99.31		
22	36.1	13.9	17.2	16.7	clear	98.94		
23	38.3	13.3	17.2	16.7	clear	98.17		
24	27.8	15.6	17.2	16.7	rain	98.54		
25	31.7	16.7	17.2	16.7	partly cloudy	99.70		
26	26.7	17.8	17.2	16.7	partly cloudy	99.42		
27	30.0	13.3	17.2	16.7	clear	98.51		
28	37.8	13.3	17.8	17.2	clear	98.32		
29	32.8	13.3	17.8	17.2	clear	99.11		
30	32.2	14.4	17.8	17.2	clear	94.41		

Appendix Table 2 (continued)

1979 October	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	33.3	16.7	17.8	16.7	clear	30.31		
2	30.0	15.6	17.8	17.2	clear	44.28		
3	32.8	16.1	18.3	17.2	cloudy	67.62		
4	31.1	16.7	17.8	17.2	clear	70.00		
5	30.6	14.4	17.8	17.2	partly cloudy	69.80		
6	28.3	16.7	17.8	17.2	partly cloudy	70.05		
7	24.4	16.7	17.2	16.7	partly cloudy	70.71		
8	22.2	15.6	17.2	16.7	rain	71.98		
9	26.7	13.3	17.2	16.7	clear	71.56		
10	30.0	13.3	17.2	16.1	clear	72.86		
11	27.8	13.9	16.1	15.6	partly cloudy	70.90		
12	26.7	12.2	16.1	15.6	partly cloudy	71.89		
13	27.8	15.6	15.6	15.0	rain	71.64		
14	26.1	15.0	15.6	15.0	partly cloudy	69.09		
15	26.1	16.7	15.6	15.0	clear	44.94		
16	27.8	12.8	16.1	15.6	clear	43.15		
17	26.7	11.7	16.1	15.6	clear	43.18		
18	18.9	14.4	15.6	15.0	rain	43.10		
19	18.9	13.9	15.0	15.0	rain	43.63		
20	16.7	10.0	15.0	14.4	rain	55.56		
21	21.1	7.2	14.4	13.9	clear	56.55		
22	22.2	7.8	15.0	14.4	partly cloudy	56.91		
23	24.4	12.2	15.6	15.0	partly cloudy	56.91		
24	25.0	10.0	15.0	15.0	cloudy	56.77	705	
25	20.0	15.6	15.0	15.0	rain	55.92		
26	21.1	8.3	15.6	15.0	clear	56.07		
27	23.3	7.8	15.0	15.0	clear	55.50		
28	21.1	9.4	15.6	15.0	partly cloudy	54.79		
29	21.1	7.8	15.0	14.4	clear	54.65	638	
30	19.4	5.6	15.0	14.4	clear	56.43	648	
31	20.0	10.0	15.0	14.4	clear	57.88	345	
TOTAL							2,336	
CUMULATIVE TOTAL							2,336	

APPENDIX TABLE 2 (continued)

1979 November	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	20.6	17.8	15.0	14.4	clear	57.23	483	
2	20.0	17.8	15.0	15.0	partly cloudy	57.17	359	
3	13.3	13.3	15.0	14.4	rain	57.14		
4	16.7	11.7	14.4	13.9	cloudy	56.86		
5	20.0	8.3	15.0	13.9	clear	57.17	1,019	
6	22.2	11.1	15.6	15.0	clear	68.98	514	
7	20.0	11.7	15.6	15.0	cloudy	70.34	531	
8	21.1	8.9	15.0	14.4	clear	69.86	478	
9	20.0	8.3	14.4	13.9	clear	69.40	764	
10	20.0	6.1	13.9	13.3	clear	69.91		
11	20.0	6.1	13.9	13.3	clear	70.00	624	
12	20.0	6.7	14.4	13.9	clear	69.80		
13	15.6	4.4	14.4	14.4	clear	69.52	610	
14	21.7	4.4	14.4	13.9	clear	69.57	172	
15	22.2	4.4	14.4	13.9	partly cloudy	68.95		
16	17.8	10.6	14.4	14.4	rain	70.71	679	
17	17.8	12.2	14.4	13.9	rain	71.84		
18	17.8	6.7	13.9	13.3	cloudy	70.65		
19	13.3	3.3	13.9	13.3	clear	70.99	576	
20	15.6	13.3	13.9	13.3	clear	71.16		
21	15.0	.6	13.9	12.8	clear	70.88	204	45
22	12.2	8.9	13.3	13.3	rain	70.59		
23	11.1	7.8	13.3	13.3	cloudy	69.91	115	5
24	14.4	8.9	13.3	13.3	rain	70.28		
25	13.9	10.6	13.3	12.8	rain	70.14		
26	13.3	6.7	13.3	12.8	cloudy	70.31	237	
27	14.4	1.7	13.3	12.8	clear	70.34		
28	18.9	3.3	13.3	12.8	partly cloudy	70.34	82	15
29	17.8	3.9	13.3	12.8	partly cloudy	69.77		
30	19.4	3.9	13.3	12.8	partly cloudy	69.71	120	
TOTALS							7,568	65
CUMULATIVE TOTALS							9,904	65

APPENDIX TABLE 2 (continued)

1979 December	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	16.7	3.3	12.8	12.8	clear	69.52		
2	18.3	9.4	12.8	12.2	partly cloudy	69.37		
3	21.1	10.0	12.8	12.2	partly cloudy	69.29	126	
4	20.0	7.8	12.8	12.2	partly cloudy	70.76		
5	18.9	4.4	12.8	12.2	clear	55.84		
6	19.4	5.6	12.2	12.2	clear	55.56		
7	19.4	5.6	12.2	12.2	clear	54.28	128	
8	20.0	5.6	12.8	12.2	clear	53.69		
9	14.4	5.6	11.7	11.7	clear	54.68		
10	14.4	8.3	12.2	11.7	fog	58.22		
11	14.4	4.4	11.7	11.1	clear	56.32		
12	13.3	3.3	11.1	10.6	clear	56.40		
13	13.9	2.8	11.7	10.6	clear	56.57		
14	16.7	2.2	11.7	11.1	clear	56.63	81	69
15	17.2	2.2	11.7	11.1	clear	56.49		
16	16.1	2.2	11.7	11.1	fog	56.26		
17	18.3	2.2	11.7	11.1	clear	56.01		
18	13.3	.0	11.7	11.1	cloudy	56.15		
19	11.1	4.4	11.1	11.1	rain	56.46		
20	11.7	5.6	11.1	10.6	rain	56.57		
21	14.4	10.0	11.1	11.1	clear	56.89		
22	11.7	2.2	11.7	11.1	clear	56.38		
23	10.0	4.4	10.6	10.6	rain	56.83		
24	12.8	5.0	10.0	10.0	rain	57.03		
25	12.8	8.3	10.6	10.0	partly cloudy	57.28		
26	14.4	2.2	10.6	10.0	clear	58.95		
27	12.8	1.1	11.1	10.0	clear	70.45		144
28	7.8	.6	10.6	10.0	clear	70.37		
29	12.8	3.3	10.6	10.0	fog	70.42		
30	12.8	11.1	10.0	10.0	fog	70.42		
31	14.4	10.0	10.6	10.0	rain	70.56		
TOTALS								
CUMULATIVE TOTALS							335	213
							10,240	278

APPENDIX TABLE 2 (continued)

1980 January	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	15.0	7.8	10.6	10.0	fog	71.07		
2	12.8	7.8	10.0	10.0	fog	71.56		
3	12.8	6.7	10.0	10.0	cloudy	110.10		224
4	12.2	5.6	10.0	10.0	rain	148.24		
5	12.8	7.8	10.0	9.4	partly cloudy	150.02		
6	12.2	8.9	9.4	9.4	fog	142.21		
7	10.6	7.8	9.4	9.4	fog	142.94		
8	13.9	6.7	9.4	9.4	rain	143.54		304
9	12.2	10.0	9.4	9.4	rain	143.65		
10	11.1	7.8	9.4	9.4	rain	143.03		
11	14.4	7.8	9.4	9.4	rain	143.68		
12	18.9	15.0	10.0	10.0	rain	282.75		
13	17.2	16.1	10.6	10.0	rain	1,303.33		
14	15.0	12.2	11.1	11.1	rain	1,763.56		
15	13.9	12.2	11.1	10.6	rain	2,122.15		
16	16.7	12.2	10.6	9.4	rain	1,565.36		
17	11.7	5.6	9.4	8.9	rain	1,215.97		
18	11.1	4.4	8.9	8.9	clear	1,029.47		
19	11.7	2.8	8.9	8.9	clear	580.51		
20	13.3	2.8	9.4	8.9	clear	453.08		
21	15.0	1.7	9.4	9.4	fog	306.79		
22	16.7	1.1	9.4	9.4	clear	226.54		
23	14.4	2.2	9.4	8.9	fog	226.54		
24	6.7	4.4	8.9	8.9	fog	227.08		504
25	4.4	4.4	8.9	8.9	cloudy	214.16		
26	6.7	4.4	8.9	8.3	cloudy	198.22		
27	7.2	4.4	8.3	8.3	rain	198.22		
28	12.2	4.4	8.3	8.3	clear	198.22		
29	11.1	-.6	9.4	8.3	clear	198.22		
30	13.9	-1.1	9.4	8.9	clear	197.03		
31	12.8	2.2	9.4	8.3	partly cloudy	170.36		
TOTAL								1,032
CUMULATIVE TOTAL								1,310

APPENDIX TABLE 2 (continued)

1980 February	Temperature (C*)				Weather	Flow of American River at hatchery	Salmon	Steelhead
	Air		Water			(m ³ /sec**)		
	Maximum	Minimum	Maximum	Minimum				
1	14.4	2.8	8.9	7.8	partly cloudy	152.63		
2	13.3	3.3	7.8	7.2	cloudy	126.44		
3	12.8	3.3	7.8	7.2	fog	110.66		
4	14.4	10.0	8.3	8.3	fog	97.98		
5	15.6	8.9	8.3	8.3	clear	98.00		
6	18.3	6.1	8.9	8.3	clear	92.31		
7	17.8	5.6	8.9	8.3	clear	70.99		
8	16.7	4.4	8.9	8.3	clear	70.71		
9	20.0	3.3	8.9	8.3	clear	69.01		
10	19.4	4.4	8.3	8.3	partly cloudy	67.93		
11	15.0	4.4	8.3	8.3	partly cloudy	66.80		
12	15.0	4.4	8.9	8.3	partly cloudy	70.00		
13	18.3	2.2	8.9	8.3	rain	69.71		
14	12.2	8.9	8.9	8.3	rain	72.18		
15	18.3	11.1	8.9	8.3	rain	86.11		
16	13.3	12.8	8.9	8.3	rain	163.53		
17	13.3	12.2	8.3	8.3	rain	224.19		
18	14.4	13.3	9.4	8.9	rain	420.04		
19	14.4	12.2	9.4	8.9	rain	566.36		
20	14.4	8.9	9.4	8.9	rain	743.34		
21	16.7	7.8	10.0	8.9	cloudy	967.54		
22	14.4	3.9	10.0	9.4	cloudy	991.13		
23	15.6	8.9	10.0	9.4	cloudy	991.13		
24	17.8	6.1	10.0	9.4	cloudy	934.49		
25	20.0	8.9	10.0	9.4	cloudy	717.38		
26	21.1	7.8	10.0	9.4	partly cloudy	568.56		
27	17.8	10.0	10.0	9.4	rain	418.88		
28	18.9	10.0	10.0	9.4	partly cloudy	240.70		
29	20.0	6.7	10.6	9.4	clear	212.38		

APPENDIX TABLE 2 (continued)

1980 March	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	14.4	7.8	9.4	9.4	cloudy	212.38		
2	16.7	11.7	9.4	8.9	rain	212.38		
3	16.7	10.0	9.4	9.4	cloudy	212.38		
4	17.2	7.8	9.4	9.4	rain	212.38		
5	15.6	10.0	9.4	8.9	rain	212.38		
6	13.9	7.2	10.0	8.9	partly cloudy	212.38		
7	17.2	6.7	10.0	9.4	partly cloudy	212.38		
8	18.3	5.6	10.0	9.4	partly cloudy	212.38		
9	20.0	4.4	10.0	8.9	clear	212.38		
10	22.2	5.6	10.0	8.9	partly cloudy	212.38		
11	17.8	8.9	9.4	8.9	partly cloudy	212.38		
12	15.6	3.3	10.0	8.9	clear	212.38		
13	12.2	5.6	9.4	8.9	cloudy	212.38		
14	15.6	10.0	9.4	9.4	rain	212.38		
15	14.4	5.6	10.0	9.4	partly cloudy	212.38		
16	16.7	3.9	10.0	8.9	clear	212.38		
17	17.2	3.9	9.4	9.4	rain	212.38		
18	16.7	5.0	10.0	9.4	partly cloudy	212.38		
19	17.8	4.4	10.0	9.4	clear	212.38		
20	18.3	6.7	9.4	9.4	partly cloudy	212.38		
21	17.8	5.6	10.0	9.4	partly cloudy	212.38		
22	21.7	7.8	10.0	9.4	clear	212.38		
23	21.1	8.9	10.6	9.4	partly cloudy	212.38		
24	19.4	7.3	10.0	9.4	clear	212.38		
25	17.8	7.3	9.4	9.4	rain	212.38		
26	18.3	6.1	9.4	9.4	clear	212.38		
27	18.9	5.6	10.0	9.6	clear	212.38		
28	22.2	5.6	11.1	9.4	clear	212.38		
29	21.1	6.7	10.6	9.4	clear	212.38		
30	21.1	6.7	11.1	9.4	partly cloudy	212.38		
31	21.1	5.6	10.0	9.4	clear	212.38		

APPENDIX TABLE 2 (continued)

1980 April	Temperature (C*)				Weather	Flow of American	Salmon	Steelhead
	Air		Water			River at hatchery		
	Maximum	Minimum	Maximum	Minimum		(m ³ /sec**)		
1	20.6	6.7	10.6	9.4	Partly cloudy	211.19		
2	22.2	8.9	10.0	10.0	" "	158.83		
3	21.7	10.6	10.0	10.0	Cloudy	140.08		
4	20.6	11.1	10.0	10.0	"	142.44		
5	20.6	8.9	10.0	9.4	Partly cloudy	142.97		
6	20.0	9.4	9.4	9.4	" "	142.29		
7	20.6	8.9	10.6	9.4	" "	141.76		
8	21.1	4.4	10.6	10.0	Clear	141.13		
9	21.7	7.8	10.6	10.0	"	140.54		
10	22.2	6.7	11.1	10.0	"	140.25		
11	25.6	8.3	11.7	10.0	"	142.46		
12	30.6	8.9	11.1	10.6	"	139.74		
13	29.4	13.3	11.1	10.6	"	138.73		
14	22.2	13.3	10.6	10.6	Partly cloudy	158.11		
15	26.7	11.1	10.6	10.6	Clear	142.94		
16	30.0	11.1	10.6	10.6	Partly cloudy	147.11		
17	28.3	14.4	10.6	10.6	" "	179.84		
18	27.8	8.9	11.1	10.6	" "	185.31		
19	27.8	11.1	10.6	10.6	Clear	187.80		
20	22.2	15.0	10.6	10.6	Rain	188.76		
21	15.6	5.6	10.0	10.0	Cloudy	188.85		
22	11.7	8.9	10.0	10.0	Rain	186.75		
23	15.6	8.3	10.0	10.0	Cloudy	184.77		
24	22.8	10.0	11.1	10.6	Partly cloudy	184.60		
25	24.4	8.3	11.1	10.6	Clear	182.84		
26	26.1	7.8	11.1	10.6	Clear	183.55		
27	29.4	10.6	11.1	11.7	Partly cloudy	183.21		
28	22.2	11.1	10.6	11.1	" "	181.57		
29	22.8	11.1	10.6	10.6	" "	187.09		
30	28.3	10.0	11.1	10.6	" "	188.14		

APPENDIX TABLE 2 (continued)

1980 May	Temperature (C*)				Weather	Flow of American River at hatchery (m ³ /sec***)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	28.3	11.7	11.7	11.1	Clear	187.72		
2	26.7	13.3	11.1	11.1	Clear	186.36		
3	29.4	11.1	11.7	11.1	Clear	150.51		
4	31.1	13.3	11.7	11.1	Clear	140.08		
5	26.7	13.1	11.1	11.1	Partly Cloudy	144.67		
6	25.0	10.0	11.7	11.1	Clear	141.53		
7	28.9	11.1	12.2	11.7	Clear	140.74		
8	22.2	11.7	11.7	11.7	Cloudy	140.48		
9	12.2	10.0	11.1	11.1	Rain	140.74		
10	17.8	6.7	11.1	10.6	Partly Cloudy	141.16		
11	18.9	4.4	11.1	11.1	Partly Cloudy	140.54		
12	22.2	5.6	11.1	11.1	Partly Cloudy	140.59		
13	17.2	7.8	11.1	11.1	Partly Cloudy	140.82		
14	26.1	8.9	11.7	11.1	Partly Cloudy	139.74		
15	26.7	12.8	11.7	11.7	Clear	139.60		
16	27.8	13.3	12.2	11.7	Clear	139.77		
17	30.0	12.2	12.2	11.7	Clear	138.10		
18	28.9	13.3	12.2	11.7	Partly Cloudy	137.54		
19	35.0	13.3	12.2	11.7	Clear	140.17		
20	37.8	15.6	12.2	11.7	Partly Cloudy	137.17		
21	27.2	14.4	12.2	12.2	Partly Cloudy	141.25		
22	24.4	10.6	12.2	11.7	Partly Cloudy	138.64		
23	20.6	7.8	12.8	12.2	Partly Cloudy	88.57		
24	20.6	6.7	12.8	12.2	Partly Cloudy	87.41		
25	22.2	5.6	13.3	12.8	Partly Cloudy	86.65		
26	25.0	8.3	12.8	12.8	Partly Cloudy	88.80		
27	24.4	10.0	12.8	12.2	Partly Cloudy	86.88		
28	23.3	11.1	12.8	12.8	Partly Cloudy	86.99		
29	26.7	10.0	13.3	12.8	Clear	86.93		
30	26.1	11.7	13.3	12.8	Clear	86.73		

APPENDIX TABLE 2 (continued)

1980 June	Temperature (°C)				Weather	(m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	26.7	12.8	13.3	12.8	Partly Cloudy	87.16		
2	25.6	7.8	13.9	13.4	Partly Cloudy	86.82		
3	23.3	8.3	13.3	12.8	Partly Cloudy	86.51		
4	18.3	12.2	12.8	13.3	Partly Cloudy	86.73		
5	23.9	8.9	13.3	12.8	Partly Cloudy	87.21		
6	26.7	10.0	12.8	12.8	Partly Cloudy	87.21		
7	28.9	10.6	14.4	13.3	Clear	86.65		
8	30.6	12.2	13.9	13.3	Clear	87.27		
9	31.7	15.6	14.4	13.9	Clear	87.24		
10	28.9	13.3	14.4	13.9	Clear	86.99		
11	24.4	10.6	15.0	14.4	Clear	86.65		
12	24.4	12.2	14.4	14.4	Clear	86.96		
13	24.4	11.1	13.9	13.3	Partly Cloudy	87.13		
14	25.0	13.3	13.9	13.3	Partly Cloudy	87.10		
15	25.0	12.2	13.9	12.8	Clear	86.79		
16	28.9	14.4	14.4	13.9	Clear	86.37		
17	37.2	15.6	14.4	13.3	Clear	85.57		
18	32.2	13.9	14.4	13.9	Clear	86.11		
19	29.4	12.8	14.4	13.9	Clear	86.37		
20	31.7	12.2	14.4	13.9	Clear	89.76		
21	30.6	13.3	14.4	13.9	Clear	113.10		
22	28.3	12.8	14.4	13.9	Partly Cloudy	112.08		
23	28.9	13.3	14.4	13.9	Partly Cloudy	116.75		
24	26.7	13.3	13.9	13.9	Partly Cloudy	144.39		
25	26.7	14.4	14.4	13.9	Clear	145.72		
26	27.8	12.2	13.9	13.9	Clear	140.40		
27	28.9	13.3	14.4	14.4	Clear	140.17		
28	39.4	17.8	15.0	14.4	Clear	139.21		
29	33.3	20.0	14.4	14.4	Clear	138.33		
30	35.6	17.8	14.4	14.4	Clear	138.92		

APPENDIX TABLE 3. Fork Lengths of Adipose Marked Chinook Salmon Recovered at
Nimbus Salmon and Steelhead Hatchery, 1979-80 Season

FL(cm)	Ad	
	Male	Female
39	1	
48	2	
50	2	
53	1	
55	1	1
56	1	
60	1	
61	1	
62	1	
63	1	1
68	1	
73	1	
74		1
77		1
78		1
79		1
82		1
84	2	1
86		1
88	1	
89		2
90		1
92		1
94	1	
96	1	
98	1	
114	1	
<hr/>		
TOTAL	21	13
<hr/>		
GRAND TOTAL	34	

APPENDIX TABLE 4. Fork Lengths of Marked Steelhead Recovered at
Nimbus Salmon and Steelhead Hatchery,
1979-80 Season

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