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ANNUAL REPORT
NIMBUS SALMON AND STEELHEAD HATCHERY 1981-82 FISCAL YEAR

by

Chester Riley
Region 2

Anadromous Fisheries Branch
Administrative Report No. 82-34

1982

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ABSTRACT

This report describes the operation of Nimbus Salmon and Steelhead Hatchery from 1 July 1981 through 30 June 1982. 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 20,588 chinook salmon, Oncorhynchus tshawytscha, trapped, which produced 23,817,480 eggs. There were 3,190 winter-run steelhead, Salmo gairdneri, trapped, from which 1,817,910 eggs were taken.

During the year we planted or transferred a total of 8,065,484 small fingerling and 3,616,285 smolt chinook salmon and 283,184 fingerling and 431,997 yearling steelhead.

^{1/}

Anadromous Fisheries Branch Administrative Report No. 82-34
Submitted December 1982.

INTRODUCTION

This is the 27th annual report for 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. This report summarizes the activities at the hatchery during 1981-82, with particular reference to numbers of fish trapped, spawned and released, eggs taken and fish produced, and other pertinent information.

PRODUCTION SUMMARY

During 1981-82 we took an estimated 25,635,390 eggs and planted approximately 12,396,950 salmon and steelhead (Table 1).

TABLE 1. Production Summary, Nimbus Salmon and Steelhead Hatchery, 1981-82

Species	Number trapped	Eggs taken	Eggs transferred	Fingerlings planted	Yearlings planted	Total weight planted (kg)
Chinook salmon						
1980 BY				1,739,360		15,952
1981 BY	20,588	23,817,480	2,001,000 ^{a/}	9,942,409		13,367
Steelhead						
1981 BY					431,997	54,170
1982 BY	3,190 ^{c/}	1,817,910	419,955 ^{b/}	283,184		353

^{a/} Shipped to Mokelumne River Fish Installation.

^{b/} Includes 148,320 shipped to Mokelumne River Fish Installation and 271,635 to Feather River Hatchery.

^{c/} An additional 618 steelhead were released unspawned.

HATCHERY OPERATION

The Weir

The weir was installed 26 August 1981 by the U.S. Bureau of Reclamation. The pickets were lowered and capped 3 September 1981.

A visual inspection of the weir base was made by boat before the rack was installed. The base appeared to be in good condition and no repairs were necessary. The U.S. Bureau of Reclamation removed the rack from the river 17 November 1981 because expected flows would exceed the rack's safe flow of 5,500 cfs. The rack was not reinstalled because sufficient numbers of salmon were on hand to meet our egg needs and steelhead enter the ladder without the aid of a weir.

Water Temperature Control

Shutter No. 9 was raised on 9 July 1981, when water temperatures were near 65°F. at the hatchery. The temperature dropped to 61°F., but by 13 July, it was back to 64°F. Shutter No. 8 was raised on 14 July and the temperature remained near 64° through July and slowly climbed to a high of 67°F. on 1 September. The remaining shutters were pulled 15 October 1981, and the temperature dropped to 59°F. The temperature gradually dropped to the season's low of 44°F. in January 1982.

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 dispensed was 58,345 kg (128,651 lb) edible, 590 kg (1,301 lb) animal food, and 26,172 kg (57,709 lb) inedible.

Public Relations

An estimated 207,446 persons visited Nimbus Hatchery this year. This number was arrived at by an employee count of cars, bus passengers, and bicyclists. November was the peak month with 53,599 visitors.

CHINOOK SALMON MAINTENANCE PROGRAM

Chinook Salmon Counts

The fish ladder was opened 2 October 1981, and the first spawning took place 21 October 1981.

A total of 20,588 salmon entered the holding pond this season, including 10,497 males, 7,286 females, and 2,805 grilse^{2/} (Appendix Table 1). A total of 113 carcasses was removed from the weir: 41 males, 27 females, and 44 male and 1 female grilse.

Sorting and Spawning

Of the females counted, 4,586 (62.9%) were spawned, 1,946 (26.7%)^{3/} died in the pond, 754 (10.3%) were accidentally killed or immature.

The spawning season, which began 21 October 1981 and ended 23 November 1981, produced a total of 23,817,480 eggs, for an average of 5,194 eggs per female. Fertility, as determined by the difference between green eggs taken and the total eggs eyed, ranged from 10.0% to 80.5% for an average of 67.6% fertility.

^{2/} Fish 60 cm (23.6 inches) fork length or under are considered grilse.

^{3/} 1195 females died in the pond because of high temperatures (64°F.). Ladder was opened 2 weeks early (2 October). It is normally opened 15 October, after lower shutters are raised at Folsom Dam.

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 2) and heads were removed from all adipose fin clipped fish for recovery of coded wire tags.

Chinook Salmon Planting

1980 Brood Year

There were an estimated 1,169,540 chinook salmon on hand 1 July 1981. All fingerlings (1,739,360) were planted in July 1981 at the U.S. Maritime Academy. A total of 77,561 kg were planted, for an average size of 109 gm.

1981 Brood Year

We released 9,942,409 fingerlings and smolts (Table 2). No fish were marked. On 30 June 1982 there were approximately 2,950,000 chinook salmon on hand, to be released in July and August 1982.

TABLE 2. Planting Data 1981 Brood Year Chinook Salmon

Month	Release site	Fingerlings	Smolts	Size(gm)	Weight(kg)
Dec. 1981	Amer. River at Hatchery	3,100,896		0.32-0.54	5,109
Jan. 1982	Amer. River at Hatchery	2,557,676		0.32-0.38	4,346
Feb. 1982	Amer. River at Hatchery	2,077,112		0.34-0.66	3,897
Feb. 1982	Cosumnes River	100,000		0.36	174
Feb. 1982	Doty Ravine Creek	31,600		0.36	55
Feb. 1982	Bear River	135,000		0.36	235
Feb. 1982	Auburn Ravine Creek	31,600		0.36	55
Feb. 1982	Coon Creek	31,600		0.36	55
May 1982	Rio Vista		727,925	7.82-4.09	21,113
June 1982	Rio Vista		1,149,000	8.25-7.32	43,880
Totals		8,065,484	1,876,925		78,919 (35,791 lbs)

Chinook Salmon Disease Information

1981 Brood Year

No evidence of infectious hematopoietic necrosis (IHN) or "Lupus" was detected in the 1981 brood year fish. Minor outbreaks of filamentous gill bacteria and Columnaris were controlled with flush treatments of copper sulfate, salt, and Hyamine 1622. In more severe cases, Terramycin was added to their diet.

WINTER-RUN STEELHEAD MAINTENANCE PROGRAM

History of the 1982 Winter-Run

The first steelhead was inventoried from the holding pond on 29 October 1981 and the last one 18 February 1982 (Table 4). All fish were examined for marks as they were handled and the fork length and sex of all marked fish recorded (Appendix Table 3). All fish with marks indicating they had been tagged with coded wire tags (CWT) were killed and the heads sent to the Lab for tag removal and analysis.

Spawned out and surplus fish were returned to the river below the weir.

TABLE 4. Counts of Winter-run Steelhead, Nimbus Salmon and Steelhead Hatchery, 1981-82

Date	Spawned and released		Died in pond		Released unspawned		Total
	M	F	M	F	M	F	
29 October			14	19			33
22 December	17	25	339 ^{1/}	215 ^{1/}	248	185	1,029
5 January	47	118	235 ^{1/}	144 ^{1/}	131	127	802
12 January	37	61	19	20	109 ^{2/}	107 ^{2/}	353
21 January	43	50	40 ^{3/}	20 ^{3/}	282	220	655
10 February	9	24			34	41	108
18 February	10	12	26 ^{4/}	12 ^{4/}	44	106	210
Totals	163	290	673	430	848	786	3,190

^{1/} Fish killed to remove coded wire tags.

^{2/} Includes 40 males and 28 females with CWT.

^{3/} Includes 20 males and 10 females with CWT. (Killed)

^{4/} Includes 26 males and 10 females with CWT.

Spawning Data 1982 Brood Year

The 290 females spawned produced 1,817,910 eggs, for an average of 6,269 eggs per female. Survival of green to eyed eggs ranged from 84.8% to 96.8%, with an average of 88.5%.

Winter Run Steelhead Planted

1981 Brood Year

From 30 May 1981 to 22 April 1982, a total of 145,476 fingerling and 431,997 yearling Nimbus steelhead was planted. Four groups of approximately 50,000 each were marked with coded wire tags. The first group of 51,688 (Tag #6-54-43) was planted at Rio Vista on the 4th and 6th of January 1982. The next group of 50,610 (Tag #6-54-44) were planted at Rio Vista on the 17th and 18th of March 1982. The two remaining groups, which were being held in the old steelhead pond, came down with a bad case of gill bacteria and the losses were high. As a result the screens became plugged with dead fish and the two groups were mixed. The remainder of these fish were planted as one group of 50,115 (Tags #6-54-1 and 6-54-45) at Vallejo on the 15th and 19th of March 1982.

TABLE 5. Planting Data, 1981 Brood Year Winter-run Steelhead, Nimbus Salmon and Steelhead Hatchery, 1981-82

Date	Release site	Fingerlings	Yearlings	Average size (g)	Weight (kg)
5-81	American River	145,476	-	1.4	204
1-82	Rio Vista	-	170,293 ^{1/}	119.4	20,376
3-82	Rio Vista	-	77,890 ^{2/}	113.4	8,832
3-82	Vallejo	-	50,115 ^{3/}	116.3	5,828
4-82	Rio Vista	-	133,699	141.7	19,134
Totals		145,476	431,997		54,374 (119.895 lb)

^{1/} Includes 51,688 with CWT #6-54-43

^{2/} Includes 50,610 with CWT #6-54-44

^{3/} Includes 50,115 with CWT #6-54-1 and 6-54-45

1982 Brood Year

Prior to 30 June 1982 there were 283,184 fingerlings released into the American River at the base of the fish ladder (Table 6). On June 30, 1982 there were approximately 746,401 Nimbus fingerlings on hand; approximately 500,000 will be released as yearlings in January and April 1983.

TABLE 6. Planting Data, 1982 Brood Year,
Nimbus Salmon and Steelhead Hatchery, 1982

Date	Release site	Number of fingerlings	Average size (g)	Weight (kg)
5-82	American River at Nimbus	77,092	0.65	50
6-82	American River at Nimbus	206,092	1.47	303
Totals		283,184		353 (778 lb)

Steelhead Disease Information

1981 Brood Year

With the exception of a few isolated cases of bacterial gill disease, the 1981 brood year steelhead remained in excellent condition and required a minimum of treatment.

1982 Brood Year

Gill bacteria has been a constant problem. In most cases, the addition of Terramycin to the diet or chemical flushes have kept the losses to a minimum. On two occasions, the combination of low flows and gill bacteria caused heavy losses in the lower raceway and steelhead ponds.

APPENDIX TABLE 2. Fork Lengths of Marked Chinook Salmon Recovered at Nimbus Salmon and Steelhead Hatchery, 1981-82 Season

<u>FL (cm)</u>	<u>Male</u>	<u>Ad</u>	<u>Female</u>
59	1		
65	1		
85	1		
89	1		
95	1		
TOTAL	5 ^{1/}		-0-

^{1/} This represents the number of marked chinook salmon recovered at Nimbus Hatchery by the spawning crew. An additional 47 marked chinook salmon were recovered at the hatchery and from the American River by biologists.

APPENDIX TABLE 3. Fork Lengths of Marked Steelhead Recovered at
Nimbus Salmon and Steelhead Hatchery, 1981-82 Season

<u>FL(cm)</u>	<u>CWT</u>		<u>AD</u>		<u>LV</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
37	1					
40		1				
42	1	3				
43	8	5				
44	5	6				
45	7	5				
46	13	7				
47	11	13				
48	11	10				
49	9	4				
50	5	2				
51	2	2				
52	3					
53		2				
54	1					
57		1				
58	1					
59		1				
60		1				
61	1					
62				2		
63		1				
64		1				
65			1			
67		2				

<u>FL(cm)</u>	CWT		AD		LV	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
68	1					1
69	1	1				
70		3				
71	1	1				
75	1					
77	1		1			
Total	84	72	2	2		1

APPENDIX TABLE 1

Nimbus Salmon and Steelhead Hatchery Weather, Water, and
Fish Trapping Data July 1, 1981 through June 30, 1982

July 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	34.4	16.7	17.2	16.7	Clear	100.161		
2	35.6	16.7	17.2	16.7	Clear	98.462		
3	37.8	16.7	17.2	16.7	Clear	84.643		
4	38.9	18.9	17.2	16.7	Clear	68.190		
5	36.1	16.1	17.2	16.7	Partly Cloudy	66.038		
6	37.8	18.9	17.2	16.7	Clear	53.776		
7	37.8	16.7	17.2	16.7	Clear	42.704		
8	36.7	15.6	17.2	16.7	Clear	42.024		
9	36.7	15.0	7.8	17.2	Clear	42.024		
10	33.9	15.6	17.8	17.2	Clear	42.081		
11	32.8	15.0	17.2	16.7	Clear	41.996		
12	29.4	14.4	17.2	16.1	Clear	41.996		
13	36.7	20.0	17.8	17.2	Clear	42.052		
14	38.9	16.7	17.8	17.2	Clear	41.882		
15	40.0	18.9	17.2	16.7	Clear	41.911		
16	35.6	12.2	16.7	16.1	Clear	42.081		
17	35.6	12.2	17.2	16.7	Clear	41.996		
18	35.0	13.3	17.8	16.7	Clear	41.684		
19	36.7	16.7	17.2	16.7	Clear	41.939		
20	37.8	18.9	17.2	16.7	Clear	42.012		
21	38.3	16.7	17.2	16.7	Clear	42.024		
22	37.8	18.3	17.8	17.2	Clear	41.854		
23	38.3	17.8	17.2	16.7	Clear	41.797		
24	37.8	17.2	17.8	16.7	Clear	42.958		
25	37.2	16.7	17.8	16.7	Clear	42.647		
26	36.7	16.7	17.8	16.7	Clear	42.647		
27	36.7	16.7	17.8	17.2	Clear	42.704		
28	37.8	15.6	17.8	17.8	Clear	42.505		
29	37.2	16.1	17.8	17.8	Clear	42.619		
30	36.1	15.6	17.8	17.8	Clear	42.647		
31	37.2	13.9	17.8	17.2	Clear	42.619		

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

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

Appendix Table 1

August 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	36.1	13.3	17.8	17.2	Clear	42.788		
2	33.3	16.1	17.8	17.2	Clear	42.704		
3	30.0	17.8	17.8	17.2	Clear	42.590		
4	29.4	15.6	17.8	17.2	Clear	42.477		
5	37.2	15.6	17.8	17.2	Clear	42.137		
6	38.9	18.3	18.3	17.2	Clear	41.996		
7	42.2	19.4	18.3	17.8	Clear	42.590		
8	41.1	20.0	18.3	17.8	Clear	42.590		
9	32.2	20.0	17.8	17.8	Clear	42.420		
10	37.2	18.3	17.8	17.8	Clear	42.364		
11	30.6	16.7	18.3	17.8	Clear	42.392		
12	32.2	15.6	18.9	17.2	Clear	43.015		
13	31.7	14.4	18.9	17.2	Clear	43.327		
14	31.1	14.4	18.3	17.2	Clear	43.128		
15	35.6	16.7	18.3	17.8	Clear	43.411		
16	34.4	18.3	18.3	17.8	Clear	43.128		
17	34.4	15.6	18.3	17.2	Clear	43.355		
18	26.7	15.0	18.3	17.2	Clear	43.270		
19	25.6	14.4	18.3	17.8	Clear	43.298		
20	31.7	13.9	18.9	17.8	Clear	41.373		
21	34.4	14.4	18.3	17.8	Clear	28.403		
22	34.4	16.7	18.9	17.8	Clear	28.403		
23	26.7	14.4	18.3	17.2	Clear	28.131		
24	29.4	15.6	18.9	17.2	Clear	28.318		
25	33.3	15.6	18.9	17.8	Clear	28.346		
26	36.7	15.6	18.9	17.8	Clear	28.403		
27	40.0	15.6	18.9	17.8	Clear	28.318		
28	41.1	18.9	18.9	18.3	Clear	28.346		
29	41.1	17.8	18.9	13.3	Clear	28.375		
30	32.2	17.8	18.9	18.3	Clear	28.318		
31	33.3	16.7	18.9	18.3	Clear	28.318		

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

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

Appendix Table 1

September 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	35.6	18.9	19.4	18.3	Clear	28.346		
2	33.3	15.0	18.9	18.3	Clear	28.375		
3	34.4	15.6	18.9	18.3	Clear	28.516		
4	36.6	15.6	18.9	18.3	Clear	28.941		
5	35.6	15.6	18.9	18.3	Clear	29.083		
6	34.4	15.0	19.4	18.3	Clear	29.168		
7	34.4	15.0	18.3	17.8	Clear	28.884		
8	34.4	15.0	18.3	17.8	Clear	29.394		
9	35.6	15.6	18.9	18.3	Clear	28.884		
10	35.6	14.4	18.9	18.3	Clear	29.026		
11	35.6	17.8	19.4	18.3	Clear	26.789		
12	32.2	16.7	18.9	18.3	Clear	13.904		
13	32.2	16.7	18.9	18.3	Clear	13.026		
14	33.3	15.0	18.9	18.3	Clear	13.026		
15	34.4	14.4	20.0	18.9	Clear	13.026		
16	33.3	13.9	20.6	18.9	Clear	13.026		
17	33.9	16.1	20.6	18.9	Clear	13.026		
18	32.8	15.6	19.4	18.3	Clear	13.848		
19	32.2	16.7	18.9	18.3	Clear	33.698		
20	32.2	16.7	17.8	17.2	Clear	34.350		
21	32.2	16.7	17.8	17.2	Clear	34.406		
22	28.9	16.1	19.4	18.3	Clear	33.982		
23	30.0	12.2	18.3	17.8	Partly Cloudy	34.491		
24	28.3	12.8	17.8	17.2	Rain	34.491		
25	22.2	12.2	17.8	17.2	Partly Cloudy	35.369		
26	27.8	13.9	17.8	17.2	Partly Cloudy	66.717		
27	25.6	14.4	17.8	17.2	Partly Cloudy	69.096		
28	27.2	16.1	17.8	17.2	Partly Cloudy	70.908		
29	28.3	12.8	17.8	17.2	Clear	71.418		
30	31.1	12.8	17.8	17.2	Clear	71.729		

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

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

Appendix Table 1

October 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec*#)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	28.9	17.2	17.8	17.2	Clear	69.719		
2	33.9	12.2	17.8	17.2	Partly Cloudy	44.034		
3	30.0	14.4	17.2	16.7	Partly Cloudy	43.072		
4	24.4	10.0	17.2	16.7	Partly Cloudy	43.015		
5	25.6	10.0	16.7	16.1	Partly Cloudy	44.063		
6	25.6	12.2	17.2	16.7	Partly Cloudy	43.100		
7	21.1	14.4	17.2	16.7	Rain	43.100	727	
8	21.7	10.0	17.2	16.7	Partly Cloudy	43.780		
9	23.9	10.0	17.8	16.7	Partly Cloudy	43.468		
10	17.8	13.9	17.2	16.7	Rain	43.072		
11	17.8	12.8	16.7	16.1	Rain	43.128		
12	19.4	7.8	16.7	16.1	Partly Cloudy	43.072		
13	20.0	7.2	16.7	15.6	Partly Cloudy	43.043		
14	21.1	6.7	16.1	15.0	Partly Cloudy	42.987	721	309
15	23.3	6.1	16.7	15.6	Clear	42.930	653	
16	24.4	6.7	16.7	15.6	Clear	42.166		
17	25.6	6.7	16.7	15.6	Clear	41.571		
18	26.7	7.2	17.2	16.7	Clear	42.675		
19	28.3	8.9	15.6	15.6	Clear	42.704	665	
20	27.8	10.0	16.7	15.6	Clear	42.788	888	
21	27.8	10.0	15.6	15.0	Clear	42.873	1893	
22	29.4	10.6	15.0	14.4	Clear	42.704	58	
23	26.1	10.0	11.7	14.4	Clear	42.760		
24	25.6	10.6	11.7	14.4	Clear	42.760		
25	22.2	10.6	11.7	13.9	Clear	42.420		
26	21.1	10.6	13.3	13.3	Partly Cloudy	42.534	945	
27	20.6	13.3	13.9	13.3	Rain	42.505	807	
28	22.2	12.8	13.3	13.3	Rain	42.477		
29	20.6	13.3	13.3	13.3	Partly Cloudy	42.590	1379	
30	23.9	10.6	13.3	13.3	Partly Cloudy	42.534	1831	
31	24.4	6.7	14.4	13.3	Partly Cloudy	42.590		

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

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

TOTALS

10,567

309

Appendix Table 1

November 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	25.6	7.8	14.4	13.3	Clear	42.449		
2	25.6	7.8	14.4	13.3	Clear	42.477	1,375	
3	26.1	7.8	13.3	13.3	Clear	42.222	798	
4	26.1	8.9	13.3	13.3	Cloudy	42.081		
5	26.1	11.1	13.3	13.3	Rain	41.684	874	
6	23.3	8.3	14.4	13.9	Partly Cloudy	41.543	915	
7	21.7	13.9	13.9	13.3	Partly Cloudy	41.486		
8	20.6	13.9	13.9	13.3	Partly Cloudy	41.033		
9	23.3	8.3	14.4	13.9	Partly Cloudy	41.118	1,165	
10	23.3	8.3	14.4	13.9	Rain	41.146	744	
11	20.6	13.9	14.4	13.9	Partly Cloudy	40.863		
12	15.6	15.0	13.9	13.9	Rain	40.410	1,002	
13	17.8	13.3	13.9	13.3	Rain	40.325	403	
14	17.8	13.3	13.9	13.3	Rain	40.608		
15	20.0	15.6	13.9	13.3	Cloudy	40.297		
16	20.0	16.1	13.9	13.3	Rain	41.429	1,195	
17	20.0	16.7	14.4	14.4	Partly Cloudy	40.013	1,061	
18	16.1	6.1	13.3	12.8	Clear	116.812		
19	15.0	6.7	13.3	12.2	Partly Cloudy	143.884		
20	15.6	5.6	12.8	12.8	Cloudy	154.815	347	
21	14.4	12.2	12.8	12.8	Rain	145.271		
22	13.9	13.3	12.2	12.2	Cloudy	287.513		
23	20.0	13.3	12.2	12.2	Rain	423.666	142	
24	14.4	8.9	12.8	12.8	Partly Cloudy	424.260		
25	14.4	8.9	12.8	12.8	Partly Cloudy	424.572		
26	13.9	6.1	12.2	12.2	Rain	424.034		
27	13.3	5.6	12.2	11.7	Partly Cloudy	401.238		
28	15.6	4.4	12.2	11.7	Partly Cloudy	232.916		
29	10.0	3.9	11.1	11.1	Partly Cloudy	226.204		
30	10.0	3.3	11.1	10.6	Cloudy	224.873		
*Temperature measured to nearest whole degree F, and later converted to C.						TOTALS	10,421	
**Flows measured in cfs, and later converted to m ³ /sec.						CUMULATIVE	TOTALS	
							20,588	309

Appendix Table 1

December 1981	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	15.0	4.4	11.1	10.6	Clear	150.369		
2	15.6	5.0	11.1	10.6	Fog	141.958		
3	10.0	6.1	10.6	10.0	Fog	141.222		
4	10.0	6.7	9.4	10.0	Fog	142.270		309
5	10.0	8.9	10.6	10.0	Fog	143.374		
6	9.4	8.9	10.0	10.0	Fog	143.034		
7	10.6	10.0	10.0	10.0	Fog	141.250		
8	10.6	10.0	10.0	10.0	Fog	78.186		
9	8.9	7.2	10.0	10.0	Rain	67.142		
10	10.6	6.1	10.0	9.4	Fog	71.361		
11	8.9	5.6	10.0	9.4	Fog	71.531		
12	10.0	6.1	9.4	8.9	Rain	71.135		
13	13.3	7.2	10.0	9.4	Fog	70.823		
14	16.7	10.0	10.0	10.0	Cloudy	70.682		
15	15.0	12.2	10.0	10.0	Rain	149.576		
16	10.6	5.6	10.0	10.0	Fog	136.266		
17	10.6	5.6	10.0	10.0	Fog	155.806		
18	10.6	6.7	9.4	10.0	Rain	137.484		
19	14.4	10.6	10.0	10.0	Rain	258.119		
20	18.9	8.9	11.1	10.0	Rain	718.969		
21	15.6	6.7	10.6	10.0	Partly Cloudy	939.742		
22	13.3	3.3	10.6	10.0	Clear	990.960		1,029
23	8.9	5.6	10.6	10.0	Clear	979.548		
24	9.9	4.4	10.6	10.0	Clear	990.139		
25	6.7	3.9	10.6	10.0	Clear	535.635		
26	11.1	4.4	10.6	10.0	Partly Cloudy	322.089		
27	11.1	4.4	10.0	10.0	Partly Cloudy	227.648		
28	11.7	4.4	10.0	9.4	Cloudy	254.947		
29	10.0	7.8	9.4	8.9	Rain	273.750		
30	11.7	6.1	10.0	9.4	Cloudy	426.894		
31	10.0	7.8	9.4	8.9	Rain	426.271		

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

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

TOTALS

CUMULATIVE

TOTALS

1,338

1,647

Appendix Table 1

January 1982	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	9.4	5.0	9.4	8.9	Cloudy	460.366		
2	5.6	4.4	9.4	8.9	Cloudy	706.761		
3	5.6	1.7	8.9	7.8	Rain	707.865		802
4	9.4	6.1	8.9	7.8	Rain	644.348		
5	8.9	5.6	8.9	8.9	Cloudy	566.841		
6	5.0	1.1	8.9	8.3	Clear	566.388		
7	6.7	1.1	8.9	8.3	Clear	566.332		
8	7.8	.0	8.9	7.8	Clear	440.543		
9	11.1	.6	8.3	7.8	Clear	224.562		
10	14.4	2.8	8.9	7.8	Clear	220.795		
11	4.4	1.7	7.8	7.8	Partly Cloudy	219.861		
12	2.2	1.1	7.8	7.8	Clear	219.465		353
13	10.0	1.1	7.8	7.2	Clear	219.011		
14	6.7	1.1	7.8	7.2	Fog	219.549		
15	5.0	.6	7.8	7.2	Fog	217.539		
16	4.4	.6	7.8	7.2	Fog	147.707		
17	3.9	.0	7.2	6.7	Fog	135.898		
18	11.1	5.6	7.8	7.2	Rain	135.955		
19	10.0	5.6	7.2	6.7	Cloudy	140.967		
20	6.7	4.4	7.2	6.7	Rain	141.222		
21	5.6	2.8	7.8	7.2	Partly Cloudy	142.298		688
22	5.6	.6	7.8	7.2	Partly Cloudy	217.709		
23	7.2	5.6	7.8	7.2	Clear	227.563		
24	6.7	5.6	7.8	7.2	Cloudy	227.535		
25	7.8	3.3	7.8	7.2	Cloudy	229.291		
26	12.2	6.1	7.8	7.2	Cloudy	230.622		
27	11.1	.0	7.2	7.2	Cloudy	230.735		
28	6.7	5.0	7.2	6.7	Rain	231.132		
29	6.7	3.3	7.8	6.7	Clear	230.792		
30	14.4	2.2	7.8	6.7	Clear	223.656		
31	13.3	1.7	7.8	6.7	Clear	226.346		

*Temperature measured to nearest whole degree F,₃ and later converted to C.**Flows measured in cfs, and later converted to m³/sec.

TOTALS		1,843
CUMULATIVE	TOTALS	3,490

Appendix Table 1

February 1982	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	18.4	6.1	9.4	8.9	Clear	224.052		
2	16.7	3.9	7.2	7.2	Clear	154.871		
3	14.4	4.4	7.2	7.2	Clear	142.440		
4	10.0	2.8	7.2	6.7	Clear	140.825		
5	11.1	1.1	7.2	6.7	Clear	140.429		
6	11.1	.6	7.2	6.7	Clear	139.891		
7	13.3	6.7	7.2	6.7	Partly Cloudy	139.579		
8	10.6	3.3	7.2	7.2	Clear	137.937		
9	16.1	15.6	7.2	7.2	Clear	115.622		
10	11.1	2.2	7.2	6.7	Clear	98.858		108
11	14.4	1.1	7.2	6.7	Clear	98.547		
12	14.4	5.6	7.8	6.7	Clear	98.292		
13	11.1	10.0	7.2	7.2	Rain	96.168		
14	14.4	8.3	7.2	6.7	Rain	98.207		
15	15.6	4.4	7.2	7.2	Rain	319.285		
16	16.7	11.7	7.8	7.8	Partly Cloudy	2,054.188		
17	16.7	12.2	7.8	7.8	Clear	2,157.548		
18	16.7	6.1	8.9	7.8	Clear	1,314.776		210
19	17.8	10.0	8.9	8.3	Partly Cloudy	740.034		
20	20.0	8.3	8.9	8.3	Clear	396.084		
21	18.3	10.6	8.9	8.3	Partly Cloudy	397.443		
22	15.6	8.3	8.3	7.8	Clear	396.877		
23	10.6	3.3	8.9	8.3	Clear	404.721		
24	14.4	2.2	8.9	8.3	Clear	408.487		
25	16.7	4.4	8.9	8.3	Clear	380.594		
26	16.7	3.9	8.9	8.3	Rain	245.857		
27	16.7	11.7	15.0	13.9	Clear	222.721		
28	16.1	15.6	15.0	13.9	Cloudy	219.465		

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

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

Appendix Table 1

March 1982	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	16.7	15.6	14.4	8.3	Rain	224.165		
2	10.0	7.8	7.8	7.8	Rain	228.979		
3	14.4	6.7	8.3	7.8	Partly Cloudy	223.429		
4	16.1	6.7	9.4	8.3	Partly Cloudy	227.110		
5	17.2	6.1	10.0	8.9	Clear	227.648		
6	17.8	5.0	8.9	8.9	Clear	231.103		
7	12.8	5.6	8.3	8.3	Rain	232.802		
8	20.6	10.0	8.3	7.8	Partly Cloudy	229.291		
9	16.7	8.9	8.9	8.3	Cloudy	228.328		
10	17.8	12.2	8.9	8.3	Rain	227.195		
11	17.8	12.2	8.9	8.3	Rain	229.319		
12	20.0	10.0	9.4	9.4	Partly Cloudy	228.951		
13	15.6	7.8	9.4	9.4	Partly Cloudy	226.940		
14	13.3	8.9	9.4	9.4	Rain	229.064		
15	12.2	6.7	8.9	8.9	Cloudy	228.951		
16	11.1	6.1	8.3	8.3	Rain	229.291		
17	12.8	5.6	8.3	8.3	Rain	234.020		
18	12.2	6.1	8.3	8.3	Partly Cloudy	337.324		
19	15.6	8.3	8.3	8.3	Partly Cloudy	336.050		
20	15.6	1.1	9.4	7.8	Clear	332.680		
21	15.6	1.1	10.0	7.8	Clear	338.089		
22	17.8	5.6	10.0	7.8	Clear	314.698		
23	20.0	5.6	9.4	7.8	Clear	230.735		
24	21.1	8.9	8.3	8.3	Clear	227.252		
25	21.1	10.0	8.9	8.9	Clear	228.017		
26	15.6	8.9	8.9	8.3	Partly Cloudy	227.139		
27	15.6	8.9	8.9	8.3	Partly Cloudy	227.365		
28	12.2	10.0	14.4	8.9	Rain	227.677		
29	8.9	6.1	8.3	7.8	Rain	229.461		
30	9.4	5.6	8.3	8.3	Rain	228.781		
31	5.6	3.9	8.3	8.3	Rain	334.860		

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

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

Appendix Table 1

April 1982	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	4.4	2.8	8.3	8.3	Rain	696.311		
2	11.1	5.6	8.9	8.3	Rain	704.467		
3	13.3	6.1	8.9	8.3	Rain	704.637		
4	13.9	6.7	9.4	8.9	Clear	709.649		
5	8.9	6.1	12.8	8.3	Cloudy	710.867		
6	12.2	3.9	8.9	8.3	Clear	634.153		
7	20.0	5.0	8.3	8.3	Clear	429.527		
8	17.8	3.9	8.3	8.3	Clear	395.149		
9	21.1	9.4	8.3	8.3	Clear	257.722		
10	17.8	13.3	8.9	8.9	Rain	229.404		
11	17.8	14.4	8.9	8.3	Rain	550.870		
12	15.6	11.7	9.4	8.9	Partly Cloudy	1,422.838		
13	15.6	10.6	9.4	8.9	Cloudy	1,314.493		
14	19.4	10.6	10.0	8.9	Partly Cloudy	710.923		
15	16.7	5.0	9.4	8.9	Partly Cloudy	427.092		
16	21.1	4.4	10.0	8.9	Clear	430.660		
17	22.2	13.3	10.6	8.4	Clear	426.979		
18	23.9	11.7	10.0	9.4	Clear	424.628		
19	24.4	8.9	10.6	9.4	Clear	428.650		
20	27.2	7.8	10.6	9.4	Clear	435.304		
21	26.7	8.9	11.1	10.0	Clear	431.085		
22	27.8	10.0	11.1	10.0	Clear	323.675		
23	25.0	10.6	10.6	9.4	Clear	279.725		
24	23.9	10.0	10.0	9.4	Clear	279.017		
25	27.8	10.0	10.6	10.0	Partly Cloudy	281.877		
26	28.3	10.6	10.6	10.0	Clear	279.669		
27	26.1	9.4	10.0	9.4	Clear	273.948		
28	26.7	7.8	10.0	9.4	Partly Cloudy	276.242		
29	28.3	11.1	10.6	10.0	Clear	276.780		
30	26.1	11.1	10.6	10.0	Clear	278.026		

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

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

Appendix Table 1

May 1982	Temperature (C*)				Weather	American River flow at Hatchery (m ³ /sec**)	Salmon	Steelhead
	Air		Water					
	Maximum	Minimum	Maximum	Minimum				
1	26.7	10.0	10.6	10.0	Clear	277.375		
2	27.8	10.0	10.6	10.0	Clear	279.754		
3	29.4	10.6	10.6	10.0	Clear	277.885		
4	30.6	13.3	11.7	10.6	Clear	277.431		
5	31.7	11.1	11.1	10.6	Clear	279.357		
6	32.2	14.4	11.7	10.6	Clear	273.693		
7	28.9	11.7	10.6	10.0	Clear	277.998		
8	25.6	11.1	10.6	10.0	Clear	282.500		
9	21.1	10.0	10.6	10.0	Clear	281.481		
10	20.6	13.9	11.1	10.0	Partly Cloudy	284.001		
11	25.6	8.9	11.7	10.0	Clear	284.398		
12	24.4	10.0	10.6	10.0	Clear	285.389		
13	24.4	10.0	10.6	10.0	Clear	283.746		
14	27.8	10.6	10.6	10.0	Clear	281.934		
15	30.0	14.4	11.7	10.6	Clear	280.886		
16	26.1	18.3	11.7	10.6	Clear	279.131		
17	23.3	13.9	10.6	10.0	Partly Cloudy	285.899		
18	26.7	13.9	12.2	10.0	Clear	286.805		
19	27.8	14.4	11.1	10.6	Clear	284.058		
20	29.4	14.4	11.1	10.6	Clear	268.370		
21	30.0	14.4	11.1	10.6	Clear	239.910		
22	32.2	14.0	11.1	10.6	Clear	202.332		
23	35.6	15.6	12.2	10.6	Clear	199.217		
24	37.2	15.6	12.2	11.1	Clear	219.493		
25	31.1	16.1	11.1	10.6	Clear	239.202		
26	32.8	15.6	11.1	10.6	Clear	238.438		
27	22.8	12.2	11.7	10.6	Partly Cloudy	308.355		
28	28.9	11.1	11.7	11.1	Clear	311.328		
29	28.9	10.0	11.7	11.1	Clear	295.215		
30	29.4	10.0	11.7	11.1	Clear	250.586		
31	21.1	10.0	11.7	11.1	Clear	238.976		

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

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