

REF 90227

ANNUAL REPORT
NIMBUS SALMON AND STEELHEAD HATCHERY
FISCAL YEAR OF 1957-58 1/

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INTRODUCTION

This is the third annual report of the Nimbus Salmon and Steelhead Hatchery. The report summarizes information for the period July 1, 1957, to June 30, 1958, on the numbers of fish trapped and spawned, production of eggs,, fry, fingerlings, and yearlings, and conditions of water quality and temperature.

KING SALMON MAINTENANCE PROGRAM

History of the 1957 Salmon Run

During the latter part of August and the early part of September, 1957, the filling and grading of the river bed at the fish weir was accomplished by the U. S. Bureau of Reclamation and Nimbus Hatchery personnel. From the amount of fill required, it was evident that the previous winter releases of water from Nimbus Dam had removed a considerable amount of gravel from the weir site.

On September 13, the weir was installed and the first salmon arrived September 17. The run was small (Figure 1). A total of 5 salmon arrived in September; 196 in October; 561 in November; 110 in December; and 18 in January. The last fish entered the hatchery on January 31, 1958.

Of the total of 890 fish which entered the holding pond, 297 were males, 341 were females, and 252 were grilse. The number of females spawned was 163, or 48 percent of the females in the run. The average number of eggs produced per female was 5,494, a decrease of 368 eggs from the average number produced per female in the previous year.

On October 16, an employee of the Bureau of Reclamation reported seeing several hundred salmon in the tailrace of the Nimbus powerhouse. These fish had passed through or under the weir pickets.

With help from Bureau of Reclamation employees and Department of Fish and Game, Region 2, personnel, the hatchery crew started seining operations on October 18. The results of the seining were meager. By October 22, only 27 males, 19 females, and 17 grilse had been taken. It proved impossible to work a seine effectively below the dam, and the project was terminated.

After a number of inspections of the weir, an opening was discovered that was probably used by the salmon to pass under the structure. This passage was blocked with rubble.

During the remainder of the salmon season, the carcasses of 277 spent males, 183 spent females, 18 unspawned females, 599 grilse, and 37 skeletons unidentifiable as to sex, were taken from the upstream face of the weir. Most of these fish would have entered the hatchery had the racks been fish tight.

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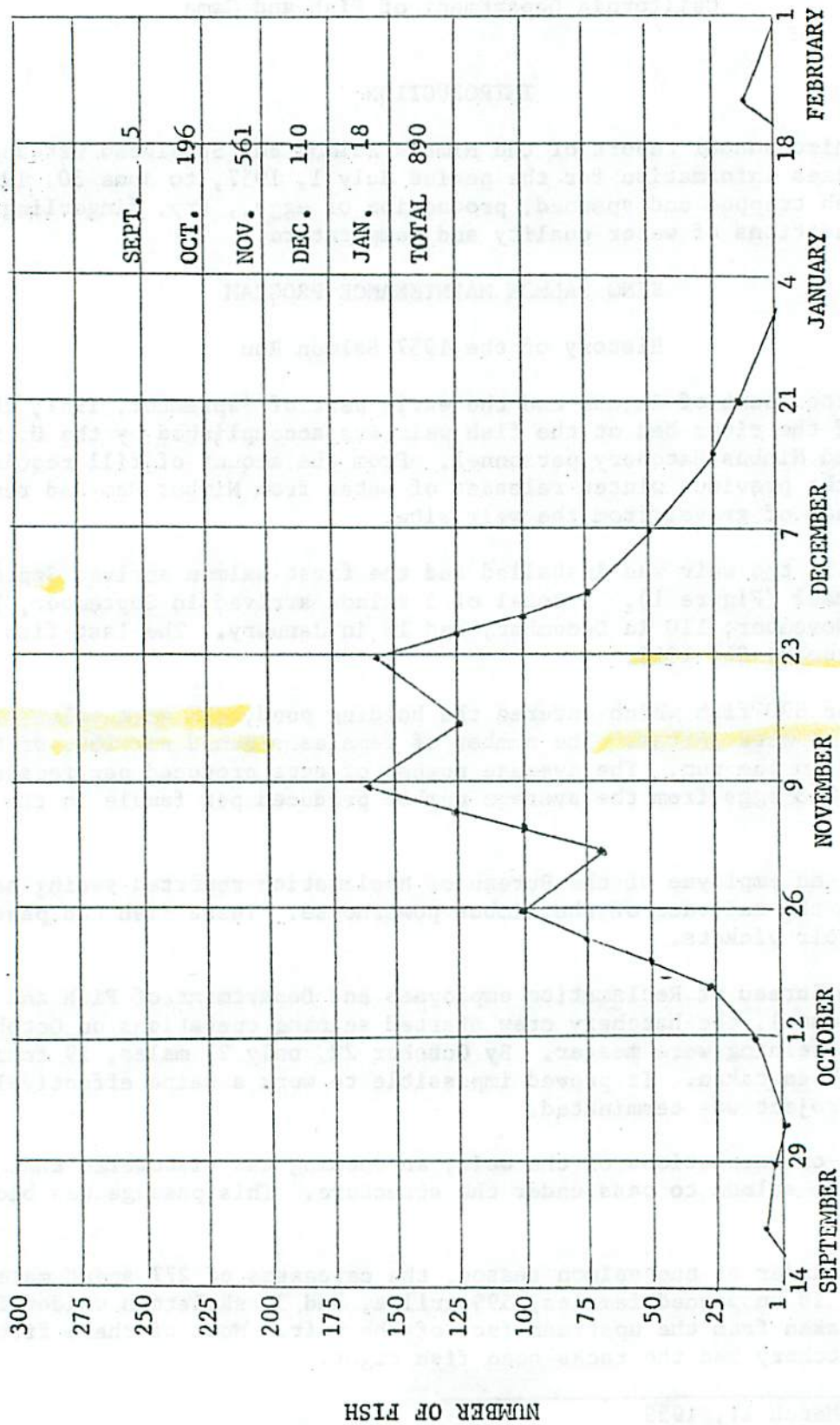


FIGURE 1. Nimbus Salmon and Steelhead Hatchery Fall King Salmon Run, 1957

Egg and Fry Production

The total king salmon egg take was 895,600. The first eggs were taken October 22, 1957, and the last on January 31, 1958. Water temperatures were above 56 degrees F. until after the first of December. After this date, the quality of the eggs taken and of the subsequent fry was greatly improved. Heavy losses from coagulated egg yolk were again experienced with fry from eggs taken during the warmwater period.

Coleman Eggs

A shipment of 1,014,366 late king salmon eggs from Sacramento River fish, taken at the U. S. Fish and Wildlife Service Coleman Fisheries Station, was received in February, 1958. If the fish hatched from these eggs retain the late-running characteristic, a start will have been made toward changing the time of the American River salmon run so as to avoid the early period of high water temperatures.

1955 Brood Year Marked King Salmon

Of the 20,579 marked salmon yearlings of the 1955 brood year, 102 returned during the 1957 run as two-year-olds. All were males and ranged from 13 to 16 inches in length. These fish were from late December eggs and, as anticipated, they returned largely in November and December.

Planting 1956 Brood Year King Salmon Fingerlings

During July and August, the remaining salmon from the 1956 brood year were planted. The 47,686 fish averaged 1.6 fish per ounce. Plans had been made to rear these salmon to yearlings and mark them before planting. However, the scales became loose and it was decided to release them rather than to risk a heavy mortality from a fin clipping operation.

Planting 1957 Brood Year King Salmon Fingerlings

The first plant of the Nimbus 1957 brood year salmon fingerlings was made on March 24, 1958, when 237,440 fish, weighing 530 pounds, were released in the American River. A total of 295,505 fish, weighing 914 pounds, was planted in April.

At the end of the fiscal year, 39,465 Nimbus salmon fingerlings were on hand.

The first of the Coleman 1957 brood year salmon fingerlings were planted in May, 1958, when 385,200 fish, weighing 610 pounds, were released in the American River. In June, 267,360 fish, weighing 740 pounds, were planted. This left 366,200 Coleman salmon fingerlings on hand at the end of the fiscal year.

EXPERIMENTAL PROGRAM

Due to the poor success experienced in holding adult king salmon at Nimbus, and the poor survival of eggs and fry, an experimental program was set up to determine the reasons for these difficulties and to discover what could be done to overcome them. However, the small number of king salmon which arrived at the hatchery limited the amount of experimental work that could be conducted.

It was proposed to trap salmon near the mouth of the American River and transport these fish to a coldwater trout planting base, where they could be ripened and spawned under favorable water temperature conditions. This operation was completely

unsuccessful, as a result either of the location of the trap or the small number of salmon in the river. An attempt to capture salmon in a gill net was also unsuccessful.

Spawning Methods

There was no significant difference in the quality of eggs taken by two spawning methods. Likewise, there was no detectable difference in the resultant fry from the two lots.

Water Temperature

Since the trapping of the salmon in the lower American River was unsuccessful, salmon taken in the holding ponds at Nimbus were transported to the catchable trout planting base on the American River near Kyburz, at an elevation of approximately 4,000 feet. A total of 123 females and 35 males was taken to this coldwater base. All of the salmon were tagged, so that an individual record could be kept of each fish.

It was found that fish held at the coldwater base in water of 40 to 50 degrees F. could be held from 4 to 6 weeks, while fish held at Nimbus in water of 59 to 67 degrees F. died within 7 to 10 days.

Four males and 16 females were spawned at Kyburz; 13 males and 61 females died before ripening; and 23 males and 46 females were returned to Nimbus on November 26, when it became apparent that the water at Kyburz was too cold to permit the fish to ripen (water temperatures, Kyburz 36 degrees F.; Nimbus 56.5 to 58 degrees F.).

A small number of the salmon eggs taken at the Kyburz base and at Nimbus were sent to Moccasin Creek Hatchery for incubation. The water temperatures at Moccasin Creek ranged from 54 to 56 degrees F.

The following are the results of taking and incubating eggs at various water temperatures:

1. When eggs were taken and incubated in water above 62 degrees F., there was a 100 percent loss. When eggs were taken and incubated in water of 60 to 62 degrees F., there was a yield of 50 percent to the eyed stage. Temperatures of 55 to 59 degrees F. yielded 80 percent to the eyed stage.
2. When eggs were taken at water temperatures of 60 to 62 degrees F. and incubated at 55 to 56 degrees F., the yield was about 70 percent to the eyed stage.
3. When eggs were taken and incubated in water of 34 to 38 degrees F., the loss was 100 percent. These temperatures were reached at the coldwater base. Below 38 degrees F., the development of the eggs in the female was almost at a standstill, and the loss of the adult salmon increased.

Water Quality

During the first year of operation at Nimbus Hatchery, there was considerable gas embolism among the salmon sac fry. To determine if this condition could be rectified, a water aerating tower was constructed to fit a set of four troughs. Water was pumped to the top of the tower and released to fall through a system of perforated plates and baffles in such a manner that air could mix with the water. Five separate lots of eggs were used in this experiment, with a control for each lot. There was no

significant difference between any of the various lots and the controls to the feeding stage of the fish, nor did any gas embolism develop.

Malachite Green

Tests to determine the effect of using malachite green to control fungus on salmon eggs were not as complete as planned, due to the small number of eggs available. Two small lots of eggs were used. The eggs were taken December 2 and 3, after the water temperatures had lowered to what was considered a tolerant temperature for egg development (55 to 56 degrees F.).

Using the medicinal injection system for application, the first lot was treated with a 1:200,000 solution and the second lot with a 1:300,000 solution for one hour every other day until hatching started. Only 0.01 percent of the fish from the eggs treated with the 1:200,000 solution developed to the feeding stage, while 92 percent of the controls for this lot developed to this stage. At the same time, 87.6 percent of the fish from the eggs treated with the 1:300,000 solution developed to the feeding stage, compared with 93 percent in the control. The fish from the treated eggs were slow in developing. Fry from the control lot began feeding 10 days before the fry from the eggs treated with the 1:300,000 solution.

KLAMATH RIVER SALMON

It was thought that the king salmon and their eggs from the Klamath River might be more tolerant to high water temperatures than those from the American River. Therefore, to determine if adult Klamath River salmon and their eggs would survive the high temperatures at Nimbus better than those of the American River, 15 male and 36 female Klamath River salmon were obtained at the Klamathon Racks and placed in the holding pond at Nimbus on September 29 (water temperature 64.5 degrees F.).

The mortality of these salmon was high. By October 22, only 5 males and 2 females remained. On this date, the only female to ripen was spawned (water temperature 65 degrees F.). Eggs from an American River salmon were also taken on October 22. The other Klamath River female died on October 23 and the last of the males on October 27.

Eggs of both lots reached the eyed stage on November 11. Sixteen percent of the American River eggs and 35 percent of the Klamath River eggs eyed, and 1.3 percent of the American River eggs and 16 percent of the Klamath River eggs hatched. By December 9, 11 American River fry remained. All had coagulated egg yolk and were disposed of. The Klamath River fry were held until February 26, 1958, at which time only 6 remained. These were in good condition.

Although the percentages of the Klamath River eggs eyed and hatched were higher than those for the American River eggs, both lots showed the effects of high water temperatures with high losses to eyed stage, large numbers of fry with coagulated yolk, 100 percent loss of the American River fry, and an almost complete loss of the Klamath River fry.

Both lots of eggs were from single females. This may have affected the results. However, it appears that eggs from Klamath River salmon are little better than the eggs from American River salmon when taken at high water temperatures.

STEELHEAD MAINTENANCE PROGRAM

History of the 1957-1958 Steelhead Run

A few steelhead arrived during the salmon season. These green fish were returned to the river, as it is not feasible to hold them for a long period. The steelhead holding pond was put into operation late in December, 1957, and the first steelhead entered it on January 2, 1958. The total number of steelhead trapped was 33 males and 18 females. Eleven females were spawned between January 21 and April 4, with a total take of 34,000 eggs.

The low steelhead take may be attributed to the removal of the fish weir during periods of high water releases from Nimbus Dam and to the erosion of the gravel stream bed at the weir site. The weir was removed February 12 and replaced March 4. It was again removed March 23. After this date, the river bed was washed to such a depth that the weir could not be replaced until the advent of low summer flows.

To maintain the steelhead of the American River, eggs were again imported from the Eel River. The Department of Fish and Game's Snow Mountain Egg Collecting Station supplied 1,113,466 eggs during February and March.

Planting 1957 Brood Year Steelhead

There were 155,000 American River steelhead and 1,155,200 Eel River steelhead of the 1957 brood year on hand at the beginning of this fiscal year. All of these fish were planted in the American River. They were released throughout the fiscal year as they grew and filled the ponds. Totals of 66,748 American River steelhead and 924,189 Eel River steelhead were planted.

During March, 1958, 100,218 Eel River steelhead were marked by the removal of the right ventral fin and planted in the American River.

Planting 1958 Brood Year Steelhead

None of the fish derived from the Eel River 1958 brood year steelhead eggs were planted this fiscal year, but 17,108 of the American River 1958 brood year steelhead were released into the American River in July.

DISEASE HISTORY

During the period of this report, disease and parasitic infections were confined almost entirely to steelhead. King salmon were affected only to a very minor degree.

Cytophaga columnaris was again the primary disease experienced at Nimbus Hatchery. Infection was present at the beginning of the fiscal year and occurred at frequent intervals through the remainder of the year. From January through March, 1957, the steelhead were relatively free of the disease. Very light infections occurred when water temperatures were below 52 degrees F. More severe infections occurred at higher temperatures.

Excellent results in control of columnaris were obtained with the use of sulfamerazine mixed in the food pellets. A level of eight grams of sulfa per 100 pounds of fish being fed was found to be a very effective control, when used for a period of 10 days.

No other bacterial infections of consequence were experienced during the year.

Parasitic infections were numerous and occurred frequently. In order of severity, these were Ichthyophthirius multifiliis, Gyrodactylus elegans, and Epistylis, with very minor infections of Trichodina and Costia. A minor infection of an unidentified myxosporidian was also experienced, with no appreciable increase in mortality.

Parasitic infections were kept under control with the use of acetic acid flushes through the ponds. No excessive losses could be attributed to any infection of parasites.

Several infections of Saprolegnia were experienced and readily controlled with the use of malachite green.

PUBLIC RELATIONS

During the fiscal year covered by this report, an estimated 48,280 persons visited Nimbus Hatchery. This is just over half the number of visitors for the previous year. The small size of the salmon run probably accounted for the small number of visitors. Included in the estimated number of visitors were 1,751 people in organized groups, such as school classes, Girl Scouts, and Boy Scouts. A hatchery employee was assigned to conduct the organized parties through the installation.

SUMMARY

1. The river bed at the weir site was repaired late in August and the weir was installed on September 13, 1957.
2. The first salmon arrived September 17, 1957, and the last January 31, 1958. The peak of the run occurred during the week of November 9. A total of 890 salmon entered the holding ponds: 297 males, 341 females, and 252 grilse, including 102 marked grilse from the 1955 brood year.
3. During February, 1,014,366 king salmon eggs were received from the U. S. Fish and Wildlife Service Coleman Fisheries Station.
4. A total of 47,686 salmon of the 1956 brood year was planted in July and August, 1957.
5. A total of 532,945 salmon from Nimbus eggs of the 1957 brood year were planted, leaving 39,465 on hand at the end of the fiscal year. An additional 652,560 salmon from Coleman eggs of the 1957 brood year were planted, leaving 366,200 on hand at the end of the fiscal year.
6. An experimental program to determine what might be done to increase the survival of adult salmon held in the ponds and to increase the quality of the eggs and fry at water temperatures above 56 degrees F. was conducted.
7. Thirty-three male and 18 female adult steelhead entered the holding pond. Thirty-four thousand eggs were taken from 11 females. The removal of the fish weir, due to high water during most of the steelhead season, was the probable cause of the small take of steelhead.

A total of 1,113,466 steelhead eggs was obtained from the Snow Mountain Egg Collecting Station, situated on the Eel River.

8. Steelhead plants in the American River totaled 66,748 American River fish and 924,189 Eel River fish of the 1957 brood year. The latter included 100,218 marked fish.
9. The 1958 brood year American River steelhead planted totaled 17,108 fish. None of the 1958 brood year Eel River steelhead was released this fiscal year.

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APPENDIX

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TABLE 1

Nimbus Salmon and Steelhead Hatchery
Temperature and Flow Data

July, 1957

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	AIR		WATER				
	Maximum	Minimum	Maximum	Minimum			
1	90	58	59	57	54	Clear	3,039
2	96	57	58.5	56.5	54	Clear	3,048
3	100	62	58.5	56.5	54	Clear	3,017
4	106	66	58.5	57	55	Clear	3,067
5	106	62	59.5	58	55	Clear	3,075
6	104	74	51.5	58	55	Clear	3,129
7	98	70	60.5	58	55	Clear	3,116
8	106	60	60	58	55	Clear	3,167
9	105	64	59.5	57.5	55	Clear	3,117
10	96	62	59	57.5	55	Clear	3,130
11	100	62	59.5	57	55	Clear	3,072
12	100	58	60	57.5	55	Clear	3,113
13	91	58	60	58	55	Clear	3,112
14	90	62	61	57	55	Clear	3,089
15	100	60	61	58	55	Clear	3,095
16	102	62	61	58	55	Clear	3,131
17	102	64	60	56.5	55	Clear	3,101
18	86	59	59.5	56.5	55	Clear	3,098
19	90	64	60	58	55	Clear	3,100
20	94	67	59	57	55	Clear	3,200
21	89	56	60	58.5	55	Clear	3,050
22	92	56	59	57	55	Clear	3,200
23	97	56	60	57	55	Clear	3,350
24	101	64	60	57.5	55	Clear	3,373
25	102	64	61	58	55	Clear	3,306
26	98	62	60.5	58	55	Clear	3,371
27	100	64	61	58	55	Clear	3,391
28	99	65	60	59	55	Clear	3,410
29	98	61	61	58.5	55	Clear	3,385
30	96	60	60	58.5	55	Clear	3,364
31	96	59	60	58	55	Clear	3,345

*Temperature taken at 307 feet elevation.

TABLE 2

Nimbus Salmon and Steelhead Hatchery
Temperature and Flow Data
August, 1957

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	Maximum	AIR Minimum	Maximum	WATER Minimum			
1	102	59	60.5	58	55	Clear	3,363
2	104	64	61	59	57	Clear	3,373
3	94	66	60	59	57	Clear	3,372
4	86	62	60	59	57	Clear	3,398
5	85	62	60	58.5	57	Partly cloudy	3,354
6	89	64	61	59	57	Clear	3,331
7	88	62	60	58	57	Clear	3,306
8	91	60	61	59	57	Clear	3,295
9	94	60	61	59	57	Clear	3,327
10	92	59	61.5	59	57	Clear	3,365
11	92	56	62	59.5	57	Clear	3,383
12	96	56	61	59.5	57	Clear	3,301
13	99	58	61	59.5	57	Clear	3,311
14	94	62	61	59	57	Clear	3,322
15	92	58	61.5	59.5	57	Clear	3,475
16	95	55	61.5	60	57	Clear	3,525
17	99	56	62	60	57	Clear	3,552
18	98	56	62	60	57	Clear	3,547
19	97	59	62	60	57	Clear	3,528
20	94	60	61	59.5	57	Clear	3,566
21	94	59	61.5	60	57	Clear	3,581
22	95	61	61.5	60	57	Clear	3,510
23	99	62	62	61.5	57	Clear	3,495
24	98	62	62	60	57	Clear	3,497
25	85	58	62	60	57	Clear	3,524
26	87	56	61	60	57	Clear	3,516
27	88	56	61.5	60	57	Partly cloudy	3,526
28	84	55	61.5	60	59	Clear	3,525
29	80	52	61	59.5	59	Clear	3,545
30	83	54	61	60	59	Clear	3,527
31	82	52	61	60	59	Clear	3,515

*Temperature taken at 307 feet elevation.

TABLE 3

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 September, 1957

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)	King salmon taken
	AIR		WATER					
	Maximum	Minimum	Maximum	Minimum				
1	94	54	62	61	59	Clear	2,758	0
2	96	56	64	62	59	Clear	2,780	0
3	98	59	64.5	61	59	Clear	2,778	0
4	95	58	63	61	59	Clear	2,754	0
5	95	58	63.5	61	59	Clear	2,780	0
6	98	56	65	61.5	59	Clear	2,773	0
7	105	52	64	62	59	Clear	2,770	0
8	105	52	64	62.5	62	Clear	2,794	0
9	94	58	64.5	62	63	Clear	2,786	0
10	85	59	64	62	63	Clear	2,749	0
11	86	60	64	62	63	Clear	2,519	0
12	86	63	64.5	62	63	Partly cloudy	2,551	0
13	88	62	65	62	63	Partly cloudy	2,518	0
14	80	58	64	63	63	Clear	2,532	0
15	81	60	65	62.5	62	Clear	2,513	0
16	80	57	64.5	63	62	Clear	2,565	0
17	79	60	64.5	63	62	Clear	2,616	1
18	80	58	64	62.5	62	Clear	2,623	0
19	82	55	65	63	62	Clear	2,571	1
20	87	54	65.5	63.5	62	Clear	2,563	1
21	90	55	66	64	62	Clear	2,705	1
22	96	56	66.5	64	62	Clear	2,695	0
23	94	60	66.5	64.5	62	Clear	2,697	1
24	88	59	66	64	62	Partly cloudy	2,696	0
25	85	58	66	64	62	Clear	2,696	0
26	85	61	65.5	54	62	Cloudy	2,715	0
27	79	60	65.5	65	62	Rain	2,695	0
28	72	66	65.5	65	62	Rain	2,643	0
29	71	59	64.5	64	63	Rain	2,682	0
30	78	62	66.5	64	63	Partly cloudy	2,698	0

*Temperature taken at 307 feet elevation.

TABLE 4

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 October, 1957

Date	<u>TEMPERATURE</u>		<u>WATER</u>		Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)	King salmon taken
	<u>AIR</u> Maximum	Minimum	Maximum	Minimum				
1	76	54	66.5	65	64	Partly cloudy	2,746	0
2	78	52	67	65	64	Partly cloudy	2,696	0
3	70	49	67	65	64	Partly cloudy	2,408	0
4	70	56	66	65	64	Partly cloudy	1,508	0
5	70	48	66	65	64	Light rain	1,517	0
6	72	46	66	64.5	64	Partly cloudy	1,515	1
7	70	53	66.5	64	64	Clear	1,510	0
8	78	57	66.5	65	64	Partly cloudy	1,508	5
9	80	55	67	65	64	Partly cloudy	1,561	0
10	62	56	65	64.5	64	Showers	1,614	1
11	70	56	65.5	64.5	64	Cloudy	1,620	0
12	68	56	65	64.5	64	Rain	1,608	0
13	64	62	64.5	64	64	Rain	1,593	0
14	72	54	65.5	64	64	Partly cloudy	1,601	0
15	74	49	66.5	64.5	64	Clear	1,604	0
16	74	48	66.5	65	64	Clear	1,614	0
17	56	52	67	64.5	64	Clear	1,601	0
18	76	53	67	65	64	Clear	1,645	31
19	70	47	66	65	64	Clear	1,440	0
20	66	47	65	64	64	Clear	1,609	0
21	66	48	65.5	64	64	Clear	1,626	0
22	70	49	65	63.5	64	Partly cloudy	1,608	30
23	62	53	63.5	63.5	64	Rain	1,838	34
24	70	54	65	63	64	Partly cloudy	2,458	26
25	71	60	66	64	64	Partly cloudy	2,457	12
26	74	56	66.5	64.5	64	Partly cloudy	2,499	0
27	78	53	65.5	64	64	Partly cloudy	2,507	0
28	76	51	66	64	64	Clear	2,498	36
29	74	52	65.5	64	64	Clear	2,515	5
30	72	51	66	64	64	Clear	2,488	12
31	70	46	65	63.5	64	Clear	2,508	3

*Temperature taken at 307 feet elevation.

TABLE 5

Nimbus Salmon and Steelhead Hatchery
Temperature and Flow Data
November, 1957

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)	King salmon taken:
	AIR		WATER					
	Maximum	Minimum	Maximum	Minimum				
1	68	50	65.5	63.5	64	Clear	2,472	16
2	62	44	63.5	63	64	Showers	2,527	0
3	58	48	62	61.5	64	Clear	2,550	0
4	60	43	63	61	64	Partly cloudy	2,531	53
5	63.5	62	62	38	64	Clear	2,545	10
6	63	38	62.5	61.5	64	Clear	2,543	28
7	64	38	62	61	64	Cloudy	2,543	12
8	64	50	63	61	63	Cloudy	2,547	8
9	68	43	62.5	61	63	Showers	2,550	58
10	63	48	61.5	60.5	63	Partly cloudy	2,521	6
11	64	42	62	60.5	63	Partly cloudy	2,515	32
12	63	48	61.5	61	63	Cloudy	2,528	20
13	62	52	61	61	63	Showers	2,518	14
14	64	55	61.5	60.5	63	Rain	3,741	26
15	66	41	61	60	63	Cloudy	3,711	28
16	56	38	61	60	63	Partly cloudy	2,677	0
17	58	36	59.5	59	61	Cloudy	2,664	84
18	58	40	59	59	61	Showers	2,648	19
19	62	50	60	59	61	Cloudy	2,661	17
20	62	42	59.5	58	59	Cloudy	2,666	15
21	70	44	59	58	59	Clear	2,683	12
22	62	35	58.5	57.5	59	Clear	2,440	19
23	58	38	59	57.5	59	Clear	1,739	0
24	61	37	58.5	57	59	Clear	1,747	0
25	62	36	57.5	57	57	Clear	1,526	27
26	62	48	58	56.5	57	Clear	1,283	15
27	60	42	57.5	56	57	Clear	1,277	17
28	64	38	58	56	57	Clear	1,306	0
29	60	36	57.5	56	57	Clear	1,265	25
30	62	36	57.5	56	57	Clear	1,018	0

*Temperature taken at 307 feet elevation.

TABLE 6

Nimbus Salmon and Steelhead Hatchery
Temperature and Flow Data
December, 1957

Date	TEMPERATURE AIR		TEMPERATURE WATER		Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)	King salmon taken
	Maximum	Minimum	Maximum	Minimum				
1	58	34	57	55.5	57	Clear	1,031	0
2	58	34	56	55	57	Clear	1,029	19
3	60	42	57.5	56	57	Clear	1,009	13
4	61	38	56.5	56	57	Cloudy	1,018	14
5	56	46	56	55	57	Light rain	1,003	6
6	58	40	56	54	57	Clear	999	2
7	50	46	54	53	57	Fog	1,014	0
8	49	45	54	53	57	Fog	1,023	0
9	44	40	54	53	57	Fog	918	11
10	44	38	53.5	53	57	Fog	811	5
11	43	38	53	52.5	57	Fog	821	4
12	43	39	52	52	57	Fog	807	0
13	43	37	52.5	52	57	Fog	793	8
14	44	40	52	52	57	Fog	806	0
15	58	38	52	52	57	Rain	801	0
16	58	38	52	52	57	Rain	880	7
17	58	49	52.5	52	57	Light rain	1,039	0
18	55	42	53	52	55	Partly cloudy	1,258	0
19	58	44	53	52	54	Cloudy	1,254	0
20	60	44	53.5	53	54	Partly cloudy	1,264	10
21	50	44	53	52.5	54	Rain	1,267	0
22	44	34	52.5	52	54	Clear	1,265	0
23	48	36	53	51.5	54	Partly cloudy	1,267	5
24	50	42	54.5	53	54	Partly cloudy	1,278	0
25	42	41	53	51	54	Cloudy	1,274	0
26	46	45	51	49.5	54	Fog	1,281	0
27	46	43	51	49.5	54	Fog	1,275	2
28	52	50	51.5	51.5	54	Rain	1,268	0
29	50	50	50.5	50.5	54	Fog	1,275	0
30	50	50	51	50.5	54	Partly cloudy	1,278	4
31	54	44	52	50.5	52	Partly cloudy	1,275	0

*Temperature taken at 307 feet elevation.

TABLE 7

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 January, 1958

Date	<u>TEMPERATURE</u>		<u>WATER</u>		Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)	King salmon taken
	<u>AIR</u> Maximum	Minimum	Maximum	Minimum				
1	54	43	51	50	52	Rain	1,257	0
2	58	44	51	50	50	Partly cloudy	1,268	3
3	58	50	51	50	48	Clear	1,266	0
4	52	38	51	50	48	Partly cloudy	1,267	0
5	54	36	50.5	49.5	48	Partly cloudy	1,267	0
6	46	36	49	48	48	Fog	1,266	0
7	56	36	48.5	47.5	48	Fog	1,273	0
8	48	42	48	46	48	Partly cloudy	1,269	0
9	50	43	47.5	46	48	Partly cloudy - rain	1,466	0
10	56	52	48	47.5	48	Rain	2,044	0
11	60	47	49	47.5	48	Cloudy	2,040	0
12	54	45	48	47.5	48	Light rain	2,012	0
13	52	36	48	47	48	Clear	2,045	0
14	54	38	48	47	48	Partly cloudy	2,053	0
15	52	34	47.5	47	48	Partly cloudy	2,050	0
16	54	36	47.5	46.5	48	Clear	2,039	0
17	46	36	47.5	47	48	Fog	2,031	0
18	60	37	48.5	47	48	Clear	2,014	0
19	54	36	47.5	47	48	Partly cloudy	2,017	0
20	54	34	48	47.5	48	Rain	2,023	5
21	54	32	48	47	48	Partly cloudy	2,030	4
22	50	32	47	46	48	Partly cloudy	2,031	0
23	50	38	46.5	46	48	Rain	1,992	1
24	52	38	47	46.5	48	Rain	2,017	2
25	60	46	48.5	47	48	Rain	2,020	0
26	58	50	48	47.5	48	Rain	2,011	0
27	58	48	48.5	47	48	Showers	2,026	0
28	56	46	48	47.5	48	Cloudy	2,192	2
29	60	52	47.5	47	48	Rain	2,736	0
30	57	45	47	46.5	48	Rain	2,793	0
31	52	42	48.5	47	48	Partly cloudy	2,773	1

*Temperature taken at 307 feet elevation.

TABLE 8

Nimbus Salmon and Steelhead Hatchery
Temperature and Flow Data
February, 1958

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	AIR		WATER				
	Maximum	Minimum	Maximum	Minimum			
1	58	40	48	47	48	Rain	2,736
2	58	42	47	46.5	48	Rain	2,720
3	60	50	48	47	48	Cloudy	3,377
4	56	52	47.5	47	48	Rain	3,520
5	58	52	47.5	46.5	48	Cloudy	3,579
6	60	54	47.5	46.5	48	Cloudy	3,598
7	64	54	48	47	48	Rain	4,778
8	58	50	48	47	48	Rain	5,886
9	52	46	47	46.5	48	Rain	7,558
10	62	52	49	46.5	46	Rain	7,627
11	64	50	48	47	46	Showers	7,725
12	58	46	47.5	47	46	Rain	8,227
13	60	40	47	46.5	46	Cloudy	7,874
14	57	45	48	47.5	46	Rain	7,476
15	66	46	48.5	47.5	46	Partly cloudy	7,497
16	72	50	49	48	46	Partly cloudy	6,343
17	68	50	50	48	46	Partly cloudy	6,684
18	58	52	50	49	46	Rain	9,387
19	60	54	50.5	49	46	Rain	15,017
20	64	50	51.5	50	46	Partly cloudy	19,022
21	66	46	52	50	46	Partly cloudy	15,276
22	64	52	51	50.5	46	Partly cloudy	6,815
23	70	50	51.5	49.5	46	Partly cloudy	5,494
24	54	50	41.5	49.5	46	Rain	7,713
25	54	44	52	50.5	46	Rain	14,082
26	54	40	52.5	51	46	Clear	17,985
27	52	38	51.5	50.5	48	Partly cloudy	18,594
28	56	38	52	50	48	Clear	12,501

*Temperature taken at 307 feet elevation.

TABLE 9

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 March, 1958

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	AIR Maximum	AIR Minimum	WATER Maximum	WATER Minimum			
1	56	34	52	50	48	Clear	12,065
2	58	33	52	49.5	48	Clear	12,027
3	61	44	53.5	50	48	Clear	8,782
4	64	42	52.5	50	48	Clear	5,497
5	64	40	50.5	49.5	48	Clear	5,249
6	58	42	50.5	49	48	Partly cloudy	5,219
7	60	32	50.5	49.5	48	Partly cloudy	4,990
8	58	39	50.5	49.5	48	Partly cloudy	5,210
9	56	38	51.5	49.5	48	Clear	5,110
10	52	42	52	50	48	Clear	4,830
11	60	34	51	50	48	Clear	5,210
12	58	41	50.5	49.5	48	Rain	5,010
13	52	41	50	50	48	Rain	5,390
14	52	43	50.5	50	48	Rain	5,210
15	62	40	51	50	48	Rain	5,210
16	62	43	51	49.5	48	Rain	5,190
17	52	42	51	49	48	Clear	5,190
18	66	40	49.5	49	48	Partly cloudy	5,204
19	68	40	50	49	48	Partly cloudy	5,210
20	62	53	49	48.5	48	Rain	5,210
21	60	52	49.5	48.5	48	Rain	6,206
22	64	46	50.5	49.5	48	Rain	6,434
23	62	50	51	49.5	48	Rain	8,163
24	64	48	51.5	49	48	Rain	17,910
25	62	46	52	50.5	48	Partly cloudy	19,220
26	64	46	52.5	50.5	48	Partly cloudy	18,338
27	60	48	52.5	50.5	50	Rain	18,008
28	62	48	52	51	50	Rain	11,679
29	59	50	51.5	51	50	Rain	6,841
30	60	46	51	50	50	Rain	9,257
31	64	42	53	51	50	Rain	13,253

*Temperature taken at 307 feet elevation.

TABLE 10

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 April, 1958

Date	<u>TEMPERATURE</u>		<u>WATER</u>		Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	<u>AIR</u> Maximum	Minimum	Maximum	Minimum			
1	66	46	52.5	52	48	Rain	20,340
2	50	46	52	51	48	Rain	20,970
3	58	44	50.5	50	48	Rain	23,024
4	58	46	51	50	48	Rain	29,109
5	62	53	51	50	48	Rain	29,967
6	60	42	52	50.5	48	Rain	32,791
7	66	45	53	51	48	Partly cloudy	34,614
8	70	42	53	50.5	48	Clear	27,872
9	72	45	53	50.5	48	Clear	29,553
10	76	46	53.5	50.5	48	Clear	29,193
11	78	46	54.5	51	48	Clear	18,184
12	80	46	54	51	48	Clear	10,204
13	80	54	54	51	48	Clear	9,832
14	80	54	55	51	48	Clear	9,842
15	82	48	56	51.5	48	Clear	9,614
16	81	50	53.5	51.5	48	Clear	9,958
17	76	54	53	51.5	48	Partly cloudy	10,034
18	76	54	55.5	52	48	Clear	9,827
19	78	52	56	52.5	48	Clear	7,058
20	84	52	54.5	53	48	Clear	7,016
21	81	51	55	53	52	Clear	7,020
22	78	48	55.5	53.5	52	Clear	7,035
23	66	40	54.5	52.5	52	Clear	7,085
24	70	38	55	52.5	52	Clear	7,025
25	72	39	55.5	53	52	Clear	7,039
26	75	46	54.5	53.5	52	Clear	6,957
27	72	44	55	53	52	Clear	6,956
28	77	48	53.5	52.5	52	Clear	7,013
29	80	48	55	53	52	Clear	7,214
30	86	48	56.5	52.5	52	Clear	7,456

*Temperature taken at 307 feet elevation.

TABLE 11

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 May, 1958

Date	TEMPERATURE				Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	AIR		WATER				
	Maximum	Minimum	Maximum	Minimum			
1	85	52	54.5	52.5	52	Clear	7,294
2	76	52	54	53	52	Clear	7,300
3	84	48	55.5	53	52	Clear	7,498
4	88	52	57	53	52	Clear	7,402
5	85	52	55	53	52	Clear	7,066
6	85	42	57	53.5	52	Clear	7,143
7	88	50	56	53	52	Clear	7,091
8	86	56	58.5	53.5	52	Clear	7,071
9	84	54	56.5	54.5	52	Clear	7,083
10	72	56	54.5	53.5	52	Showers	7,066
11	64	54	56	53	52	Cloudy	7,027
12	70	51	56.5	54	52	Partly cloudy	6,997
13	78	46	59.5	53	52	Clear	8,130
14	77	52	59.5	53	52	Clear	9,124
15	92	54	61.5	53	52	Clear	10,154
16	94	58	61	54	52	Clear	10,278
17	96	58	59.5	54.5	52	Clear	10,574
18	87	58	58	54	52	Clear	10,337
19	90	56	60	54	52	Clear	10,276
20	88	60	58.5	54	52	Partly cloudy	10,290
21	90	58	57	53.5	52	Partly cloudy	10,384
22	80	60	56	53.5	52	Showers	12,036
23	83	58	58	54	52	Showers	13,064
24	88	58	58.5	55	52	Clear	15,773
25	86	58	58	54	52	Clear	18,127
26	86	56	58	54	52	Clear	18,009
27	84	60	57	55	52	Partly cloudy	15,968
28	88	56	58	54	52	Clear	16,321
29	90	58	58	54.5	52	Partly cloudy	14,874
30	86	60	58.5	55	52	Partly cloudy	13,973
31	86	58	57.5	54.5	52	Partly cloudy	13,628

*Temperature taken at 307 feet elevation.

TABLE 12

Nimbus Salmon and Steelhead Hatchery
 Temperature and Flow Data
 June, 1958 .

Date	<u>TEMPERATURE</u>		<u>WATER</u>		Folsom Reservoir water temperature*	Weather	American River flow at hatchery (c.f.s.)
	<u>AIR</u> Maximum	Minimum	Maximum	Minimum			
1	84	60	58	55	52	Partly cloudy	13,476
2	80	60	58	55	52	Showers	13,579
3	82	56	57.5	55	52	Clear	12,001
4	89	56	57.5	55.5	52	Clear	10,020
5	83	62	55	54.5	52	Partly cloudy	7,827
6	86	58	56	54	52	Partly cloudy	7,693
7	82	57	56	54	52	Partly cloudy	7,653
8	78	62	55.5	54	52	Showers	7,552
9	86	64	56.5	54.5	52	Partly cloudy	7,465
10	86	70	56	54.5	52	Partly cloudy	7,879
11	80	62	55.5	54	52	Rain	7,586
12	78	62	55	53.5	52	Rain	7,724
13	88	70	57	54	52	Clear	7,548
14	100	62	57	54.5	52	Clear	6,881
15	101	64	58.5	55	52	Clear	6,884
16	97	76	58.5	55	52	Clear	8,006
17	90	74	57	55	52	Clear	8,346
18	83	64	57	55	52	Partly cloudy	9,513
19	88	60	59	55	52	Partly cloudy	10,174
20	96	72	58.5	56.5	52	Clear	10,062
21	95	72	59	56.5	54	Clear	8,940
22	94	64	58	56	54	Clear	8,675
23	92	58	59	56	54	Clear	7,312
24	96	61	57	55.5	54	Clear	6,895
25	102	62	58	56	54	Clear	5,896
26	96	68	57.5	55.5	54	Clear	5,157
27	97	60	60	56	54	Clear	5,104
28	96	55	58	55.5	54	Clear	3,647
29	90	58	58.5	57	54	Clear	3,649
30	94	60	60	58	54	Clear	3,711

*Temperature taken at 307 feet elevation.

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