State of California

Memorandum

REF 90389

To : Elden P. Hughes
Supvr. Salmon/Stlhd. Program

Date : May 25, 1964

From : Department of Fish and Game
Central Valleys Project

Subject: Mill Creek Counting Station

Annual upstream counts of adult salmon and steelhead have been made at Mill Creek Counting Station on Clough Dam since the fall, 1953. During the ten seasons 1953-54 through 1962-63; 12,009 fall-run king salmon, 18,572 spring-run king salmon, and 11,604 steelhead were counted (Table 1).

Each season, the counting station has been operated for approximately a nine-month period, beginning about the middle of October and usually continuing through late June or early July. In this report, seasonal counts for the ten-year period have been reviewed with the thought of reducing the amount of counting time required to operate this installation and still obtain reasonable accurate counts of steelhead, and fall- and spring-run king salmon.

FALL-RUN KING SALMON

Of the 12,009 fall-run king salmon recorded during the ten seasons, 11,977 (99.7 percent) had passed through the fishway by December 30. At Clough Dam 96.6 percent of the fish were counted during the nine-week period October 15 - December 16 (Table 2). However, as many as 998 (34 percent of the total run) salmon have been counted in a single day, concurrent with the first period of heavy run-off. In the fall, counting should start with the first high water, rather than on a particular date.

SPRING-RUN KING SALMON

The migration of adult spring-run king salmon reaches a peak in Mill Creek during late May and early June. Of the 18,572 salmon recorded during the ten-year period, 18,290 (93.5 percent) were counted between April 1 and July 14. At clough Dam 89.3 percent of the fish were counted during the nine-week period April 29 - June 30 (Table 3).

STEELHEAD

In Mill Creek, the upstream migration of adult steelhead begins with the first heavy run-off in the fall, and ends when stream

flows became low and warm the following summer. Although the steelhead migration is more or less continuous from October through June, there are two peak periods.

Most steelhead pass through the counting station in the fall with the fall-run salmon. Records for the ten-year period show that 63 percent of the run has moved upstream by December 30. At Clough Dam 60.9 percent of the run was counted during the eleven-week period October 8 - December 23 (Table 4). A smaller portion of the run moves upstream during late January and early February. At Clough Dam 15.6 percent of the run was counted during the four-week period January 23 - February 24 (Table 4).

WINTER-RUN KING SALMON

During the last few years, winter-run king salmon (May and June spawners) have been observed in increasing numbers in Mill Creek during the spring-run salmon migration. In this report, some winter-run salmon are included in the spring-run salmon counts. If winter-run kings change their migration pattern and enter Mill Creek during January - March, when the main run is migrating into the upper Sacramento River, it would be necessary to alter the recommended counting schedule to include this period.

RECOMMENDATIONS

Fall-run King Salmon: Open the counting with the first high water and continue counting through December 31. This would permit almost a complete enumeration of fall-run salmon.

Spring-run King Salmon: Spring-run salmon would be counted only during the months of May and June. An estimate of the total spring-run can be made by multiplying the accumulated counts for May and June by a factor of 1.133.

Steelhead: Counting should start with the first high water and continue through December 31, and during May and June. During these periods, 63.3 percent of the run would be recorded on the average. To increase the accuracy of the estimated total run, steelhead should also be counted during the month of February. An additional 15 percent of the run would then be enumerated. An estimate of the total run can be made by multiplying the accumulated counts for these three periods by a factor of 1.269.

If steelhead were only counted through December 31, and during May and June, the total run could be estimated by multiplying the accumulated counts for these periods by a factor of 1.566.

Counting Time Saved: If salmon and steelhead were counted according to the proceeding recommendations, only 4½ or 5½ man-months would be required to get reasonably accurate estimates of the total runs (Table 5). This would result in an annual savings of 3½ or 4½ man-months of counting time.

William Van Woert
Marine Biologist II

TABLE 1

Adult Salmon and Steelhead Counted Upstream Through the Fishway at Clough Dam, During the Ten Seasons 1953-54 through 1962-63

Season	Fall-run King Salmon	Spring-run King Salmon	Steelhead
1953-54	3,744	1,789	715
1954-55	2,901	2,967	1,492
1955-56	1,722	2,233	1,213
1956-57	131	1,203	1,443
1957-58	1,341	2,212	1,301
1958-59	1,140	1,580	790
1959-60	65	2,368	417
1960-61	66	1,245	742
1961-62	68	1,660	1,222
1962-63	811	1,315	2,269
Totals	12,009	18,572	11,604

TABLE 2

Fall-Run King Salmon Counted Upstream Through the Fishway at Clough Dam During the Ten Seasons 1953-54 Through 1962-63

Period	Number of Salmon	Percentage	Cumulative Percentage
Sept. 17-23	2	0.02	
Sept. 24-30	57	0.47	
Oct. 1- 7	95	0.79	
Oct. 8-14	112	0.93	
Oct. 15-21	348	2.90	
Oct. 22-28	813	6.77	
Oct. 29-Nov. 4	843	7.02	
Nov. 5-11	4,391	36.56	
Nov. 12-18	2,686	22.37	69.9 82.7 92.4 96.6
Nov. 19-25	1,316	10.96	
Nov. 26-Dec. 2	693	5.77	
Dec. 3- 9	351	2.92	
Dec. 10-16	158	1.32	
Dec. 17-23	78	0.65	
Dec. 24-30	34	0.28	
Dec. 31-Jan. 5	6	0.05	
Jan. 7-13	22	0.18	
Jan. 14-20	-	-	
Jan. 21-27	1	0.01	
Jan. 28-Feb. 3	2	0.02	
Feb. 4-10	1	0.01	
Totals	12,009		

TABLE 3

Spring-Run King Salmon Counted Upstream Through The Fishway at Clough Dam During the Ten-year Period 1954-63

Period	Number of Salmon	Percentage	Cumulative Percentage
Feb. 4-10	1	0.01	
Feb. 11-17	-	-	
Feb. 18-24	2	0.01	
Feb. 25-Mar. 3	-	-	
Mar. 4-10	-	-	
Mar. 11-17	-	-	
Mar. 18-24	12	0.06	
Mar. 25-31	20	0.11	
Apr. 1- 7	119	0.64	
Apr. 8-14	294	1.58	
Apr. 15-21	384	2.07	
Apr. 22-28	549	2.96	
Apr. 29-May 5	764	4.11	
May 6-12	1,414	7.61	
May 13-19	2,070	11.14	
May 20-26	2,100	11.31	
May 27-June 2	3,284	17.68	43.9
June 3- 9	2,775	14.94	66.3
June 10-16	2,088	11.24	81.8
June 17-23	1,467	7.90	89.3
June 24-30	620	3.34	93.5
July 1- 7	232	1.25	96.2
July 8-14	130	0.70	
July 15-21	70	0.38	
July 22-28	93	0.50	
July 29-Aug. 4	27	0.14	
Aug. 5-11	5	0.03	
Aug. 12-18	1	0.01	
Aug. 19-25	-	-	
Aug. 26-Sept. 1	-	-	
Sept. 2-8	-	-	
Sept. 9-15	-	-	
Sept.16-22	51	0.27	
Totals	18,572		

TABLE 4

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Adult Steelhead Counted Upstream Through the Fishway at Clough Dam During Ten Seasons 1953-54 Through 1962-63

Period	Cumulative Number of Steelhead	1962-63 Number	1962-63 Percent	Cumulative Percentage
Sept. 17-23	9	0	X	0.08
Sept. 24-30	52	0		0.45
Oct. 1- 7	102	0		0.88
Oct. 8-14	225	0		1.94
Oct. 15-21	369	0		3.18
Oct. 22-28	1,315	810	35.7	11.33
Oct. 29-Nov. 4*	822	477	21.0	7.08
Nov. 5-11	1,088	161	7.1	9.38
Nov. 12-18	609	61	2.7	5.25
Nov. 19-25	625	34	1.5	5.39
Nov. 26-Dec. 2	737	82	3.6	6.35
Dec. 3- 9	438	102	4.5	3.77
Dec. 10-16	441	81	3.6	3.80
Dec. 17-23	403	21	0.9	3.47
Dec. 24-30	80	5	0.2	0.69
Dec. 31-Jan. 6	74	6	0.3	0.64
Jan. 7-13	238	2	0.1	2.05
Jan. 14-20	103	0	-	0.89
Jan. 21-27	282	0	-	2.43
Jan. 28-Feb. 3	278	0	-	2.40
Feb. 4-10	577	258	11.4	4.97
Feb. 11-17	701	18	0.8	6.04
Feb. 18-24	254	41	1.8	2.19
Feb. 25-Mar. 3	407	12	0.5	3.51
Mar. 4-10	296	6	0.3	2.55
Mar. 11-17	322	8	0.4	2.78
Mar. 18-24	221	21	0.9	1.90
Mar. 25-31	208	5	0.2	1.79
Apr. 1- 7	119	4	0.2	1.02
Apr. 8-14	82	3	0.1	0.71
Apr. 15-21	26	0	-	0.22
Apr. 22-28	16	3	0.1	0.14
Apr. 29-May 5	13	6	0.3	0.11
May 6-12	17	5	0.2	0.15
May 13-19	32	25	1.1	0.28
May 20-26	14	12	0.5	0.12
May 27-June 2	1	1	-	0.01
June 3- 9	2	0	-	0.02
June 10-16	1	0	-	0.01
June 17-23	2	0	-	0.02
June 24-30	4	0	-	0.03
Totals	11,605	2,270		

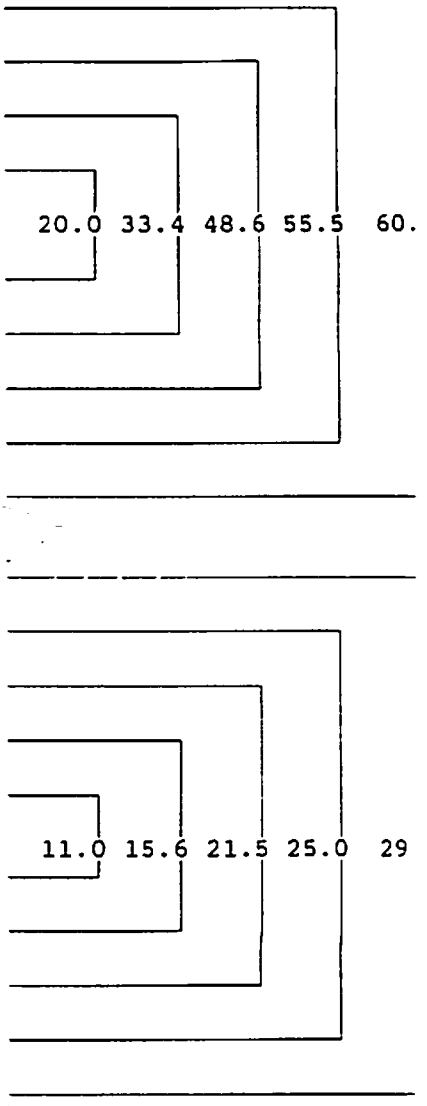

TABLE 5

Suggested Counting Schedule for Mill Creek Counting Station

Month	Fall-Run King Salmon	Spring-Run King Salmon	Steelhead	
			With February Count	Without February Count
October	X[1/]		X	X
November	X		X	X
December	X		X	X
February			X	
May		X	X	X
June		X	X	X
Total man-months	2½	2	1	none
Percent of run counted	100	88	79	64

1/ In eight of the ten years reviewed, counting started during or after the period October 15-21.