ANNUAL
PERFORMANCE REPORT

AGENCY: California Department of Fish and Game

PROJECT (CONTRACT) NO: 1-FG-20-09821 (FG0414)

PROJECT TITLE: Trinity River Basin Salmon and Steelhead Monitoring Project

PERIOD COVERED: July 1, 1996 through June 30, 1997

INTRODUCTION: This is the ninth in a series of annual reports detailing various monitoring activities (Tasks) conducted by the Department of Fish and Game in the Trinity River basin. This report fulfills requirements set forth under the terms of Cooperative Agreement Number 1-FG-20-09820 between the Department of Fish and Game (Department) and the United States Bureau of Reclamation (USBOR).

Specific Tasks nere designed to complement restoration activities authorized by Public Law 98-541 (Trinity River Basin Fish and Wildlife Restoration Act) enacted by Congress in 1984. This law authorized expenditures through Federal fiscal year (FY)1995. Results of Department studies through this authorization are listed in the table below and are available upon request from: California Department of Fish and Game, Inland Fisheries Division, 1416 9th Street, Sacramento, CA 95814.

Task title	Inclusive years
I. Spawner Surveys in the Upper Trinity River Basin	1988-1995
II. Capture and Coded-Wire Tagging of Naturally Produced Chinook Salmon in The Trinity River Basin	1988-1994
III. Life History, Distribution, Run Size and Angler Harvest of Steelhead in the South Fork Trinity River Basin	1988-1994
IV. Annual Run-Size, Harvest, and Spawner Escapement Estimates for Trinity River Basin Chinook and Coho Salmon and Steelhead	1989-1995
V. Survival and Contribution of the Fisheries and Spawner Escapements Made by Chinook and Coho Salmon Produced at Trinity River Hatchery.	1989-1995
VI. Survival and Contributions to the Fisheries and Spawner Escapements Made by Steelhead Produced at Trinity River Hatchery.	1990- 1994
VII. Life History, Distribution, Run Size, and Harvest of Spring Chinook Salmon in the South Fork Trinity River Basin.	1990-1994
VIII. Special Project: Technical Analysis and Report Preparation	1991-1993

In 1996, with the expiration of P.L. 98-541, Congress passed P.L. 104-143, authorizing expenditures for and additional three years, ending September 30 1998. This report is the second annual report under the new law. Copies of annual reports beginning with FY 1996 are available on request from: California Department of Fish and Game, Region 1, Trinity River Project, 5341 Ericson Way, Arcata, California 95521.

TASK REPORTS:

TASK 1: Annual Run-size, Harvest and Spawner Escapement Estimates for Trinity River Basin Chinook and Coho Salmon and Steelhead

Task Objectives:

1. To determine the size, composition, distribution and timing of adult chinook and coho salmon, and steelhead runs in the Trinity River basin.

2. To determine the angler harvest and spawner escapements of Trinity River chinook and coho salmon, and steelhead.

Procedures:

From 6/12/96 through 09/27/96, returning spring-run chinook salmon (spring chinook) were captured and tagged at a temporary weir in the Trinity River near the town of Junction City, California. A second weir, near the town of Willow Creek California, was operated from 08/14/96 through 11/15/96 to capture fall-run chinook salmon (fall chinook), coho salmon (coho) and steelhead. The trapping and tagging methods at the two weirs were the same except that only chinook were tagged at Junction City Weir (JCW), while at WCW chinook, coho and steelhead were tagged.

At both weirs, all salmon and steelhead captured were identified to species, measured to the nearest cm fork length (FL), examined for hook and gill-net scars and hatchery marks. Chinook captured at JCW and all salmon and steelhead captured at WCW, except those judged to be in poor condition, were tagged with FT-4 spaghetti tags (Project tags). To determine the number of effectively tagged fish, we subtracted from the tagged population all known tagging mortalities and fish from which anglers reported removing the tags and releasing the fish.

Project tags were inscribed with a unique number identifying the individual fish and a return address so anglers could mail the tags to us for processing. Approximately one-half of the chinook salmon and all of the coho and steelhead were tagged with $10 reward tags while the remainder received non reward tags.

We estimated the harvest rate for each species by dividing the number of reward tags returned, by the number of fish effectively reward tagged. Total harvest was then determined by multiplying the harvest rate for each species by their respective run-size estimates.

The length data collected at the weirs and Trinity River Hatchery (TRH) were smoothed with a moving average of five, l-cm increments to determine the nadir separating grilse (two-year old) and adult (three-year and older) salmon in the runs. All steelhead > 41 cm FL were consider adults, and steelhead ≤ 4 1 cm FL were consider half-pounders.

All salmon and steelhead entering TRH were counted, measured and examined for Project tags and hatchery marks. Run-size estimates, upstream of the weirs, were based on the recovery of Project-tagged and untagged fish entering TRH. In essence, the recovery of tagged and untagged fish at the hatchery gave us the trapping efficiency rate at the weir, which was then applied to the number of fish tagged at the weir. For example, if 10% of the fall chinook entering TRH were Project tagged, this would imply that 10% of the fall chinook run migrating upstream of weir was trapped and tagged at the weir. Run-sizes, upstream of the weir, were estimated with the formula: $N=((M+1)(C+1)/R+1)$ where N is the estimated run size, M is the number of effectively tagged fish, C is the number of fish examined for tags and R is the number of Project-marked fish recovered in the hatchery sample. This year, all spring chinook estimates are for fish migrating upstream of the Junction City Weir while all fall chinook, coho and steelhead estimates are for fish migrating upstream of the Willow Creek Weir.

The accuracy of the run-size estimate is dependent not so much on the total number of fish tagged but on the total percentage of the population which is tagged. Clearly, the greater the percentage of the population tagged, the more accurate the estimate. We determine the accuracy of the estimate by applying statistical procedures which bound the estimate within confidence limits. We operated the weir in an attempt to capture enough fish to obtain 95% confidence limits within ± 10% of the run-size estimates. In other words, we want be 95% sure that our estimate is within 10% of the actual run size. To achieve that level of accuracy, we attempt to capture and tag between 5% and 10% of the population.

The Trinity River supports both spring- and fall-chinook runs. Prior to the construction of Trinity and Lewiston dams these runs were separated both temporally in their run timing and spatially in their spawning location. However, now the runs overlap both in run timing and spawning location. The seasonal trend in run timing is that during the transition between runs, spring chinook numbers decrease while fall chinook increase.

In order to make independent estimates for the two runs, a means to differentiate the two runs at the weir and hatchery was needed. Coded-wire tag (CWT) analysis was used for this determination. Each year a portion of spring and fall chinook produced at TRH are

given adipose-fin clips and CWTs. These CWTs carry a binary code which identifies the origin of the fish carrying it. When the catch of fall CWTed chinook exceeds spring CWTed chinook at the weir that date is chosen as the start of the fall run. All chinook trapped after that date were considered fall chinook while those trapped prior were considered spring chinook.

Results:

Analysis of coded-wire tagged chinook captured at the weirs and returning to Trinity River Hatchery indicates that all chinook captured at JCW and chinook trapped through 09/09/96 at WCW were spring chinook. Chinook trapped after 09/09/96 at WCW were considered fall chinook. Length frequency analysis indicated that spring grilse were ≤ 47 cm FL, fall grilse were ≤ 51 cm FL and coho grilse were ≤ 45 cm FL.

Junction Citv Weir

We installed and began fishing at JCW on 06/12/96 and continued through 09/27/96, fishing a total of 68 nights. During this period we caught 2,106 chinook (all spring) and 70 steelhead.

Based on length frequency analysis, the spring chinook trapped at JCW were composed of 44 grilse and 2,062 adults and the steelhead were composed of 6 half-pounders and 64 adults. Of these, we effectively tagged 41 grilse and 1,987 adult chinook; no steelhead were tagged.

Willow Creek Weir

WCW was installed and began fishing 08/14/96 and continued through 1l/l 5/96. This weir had been scheduled to fish through November but high flows, due to a storm event, forced its removal. WCW was fished a total of 68 nights and caught 1,059 spring and 1,569 fall chinook, 491 coho and 1,562 steelhead.

Length frequency analysis indicates our catch at WCW this season was composed of 82 grilse and 977 adult spring chinook, 143 grilse and 1,426 adult fall chinook, 17 grilse and 474 adult coho and 5 half-pounder and 1,557 adult steelhead. We effectively tagged 1,486 fall chinook, 474 coho and 1,450 steelhead. At WCW, tagged spring chinook are not used to generate estimates as we capture only a small portion of that run.

Trinitv River Hatchery

Totals of 5,250 spring and 6,660 fall chinook, 9,955 coho and 4,012 adult steelhead entered Trinity River Hatchery this season. Project tags were recovered from 454 (8.6% of the total) spring chinook, 177 (2.7%) fall chinook, 128 (1.3%) coho and 557 (13.9%) steelhead.

Run-Size Estimates

This year's spring chinook run-size was estimated to be 23,4 16 fish composed of 489 grilse and 22,927 adults. Of these, anglers harvested an estimated 1,5 13 adults (no grilse were reported harvested), leaving 489 grilse and 21,414 adults available to spawn. This spawner escapement was composed of natural spawners (370 grilse and 16,283 adults) and TRH spawners (119 grilse and 513 1 adults). Previous spring chinook run-size estimates have ranged from 2,381 (in 1991) to 62,692 (in 1988) (Appendix 1).

We estimate the fall chinook run size at 55,646 fish composed of 5,072 grilse and 50,574 adults. Anglers harvested an estimated 345 grilse and 1,517 adults, leaving 4,727 grilse and 49,057 adults available to spawn. This spawner escapement was composed of natural spawners (4,478 grilse and 42,646 adults) and TRH spawners (249 grilse and 6,411 adults). Since 1977, fall chinook run-size estimates have ranged from 9,207 (in 1991) to 147,888 (in 1986) (Appendix 2).

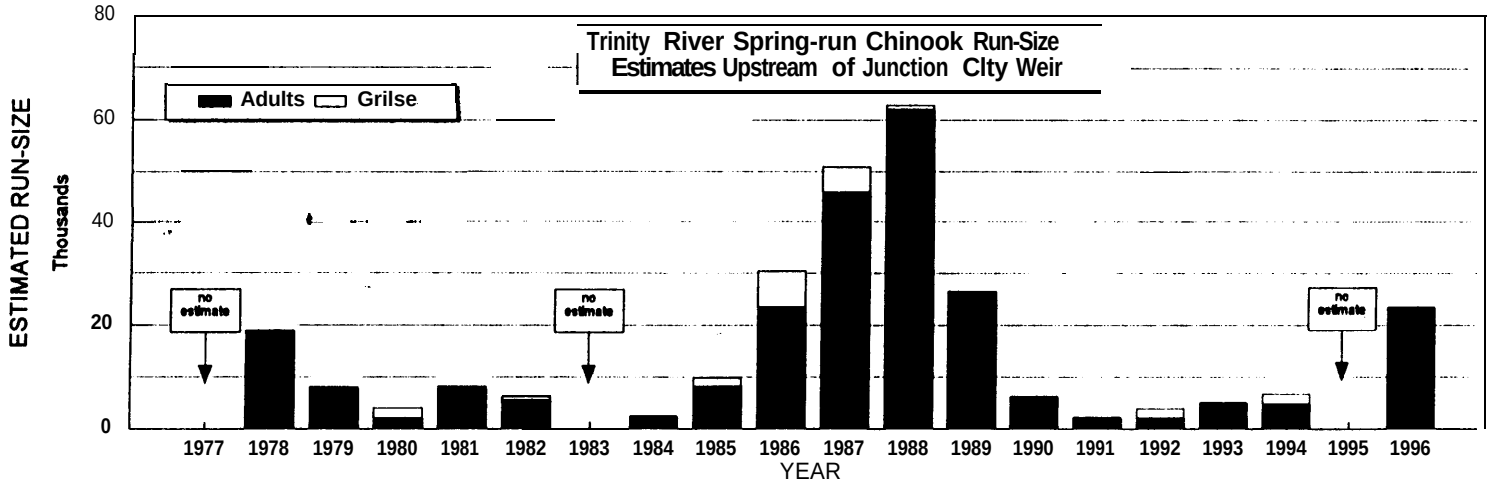
Coho run size was estimated at 36,660 fish composed of 1,269 grilse and 35,391 adults. Anglers harvested 248 (all adults) leaving 36,412 available to spawn. The spawner escapement was split between natural spawners (1,149 grilse and 26,457 adults) and TRH spawners (120 grilse and 9,835 adults). Coho run size upstream of WCW has ranged from 852 in 1994 to 59,079 in 1987 (Appendix 3).

All steelhead released from TRH since the 1989 brood year (BY) have been fin-clipped. Recovery of these fin-clipped fish as adults at the weirs and TRH allow us to make independent run-size, spawner-escapement and angler-harvest estimates for hatchery- and naturally produced steelhead in the basin. The steelhead marking program at TRH was discontinued with the 1994 BY. This year will be the last we will be able distinguish between hatchery- and naturally produced adult steelhead in the Trinity River basin.

Steelhead run size was estimated at 10,435 adults composed of 1,837 wild and 8,598 hatchery-produced fish. Anglers harvested 86 and 507 wild and hatchery-produced steelhead, respectively. Spawner escapement was estimated at 1,703 wild and 4,127 hatchery-produced fish spawning naturally and 86 wild and 3,964 hatchery-produced fish spawning in the hatchery. Steelhead run size upstream of WCW has ranged from 3,046 in 1992 to 37,276 in 1989 (Appendix 4).

APPENDIX 1. Spring-run chinook salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Junction City Weir from 1977 through 1996.

	Run-s&e estimate					Spawner escapements						Angler harvest		
						Natural			Trinity River Hatchery					
	Grilse		Adults		Total	Grilse	Adults	Total	Grilse	Adults	Total	Grilse	Adults	Total
Year	Number	Percent	Number	Percent										
1977			No estimates				No estimates		385	1,124	1,509		No estimates	
1978	190	1.0%	18,816	99.0%	19,006	29	14,364	14,413	153	3,680	3,833	8	752	760 a/
1979	113	1.4%	7,964	96.6%	8,077	0	5,008	5,008	113	1,658	1,771	0	1,298	1,296
1980	1,949	45.9%	2,301	54.1%	4,250	1,312	1,614	2,926	353	547	900	284	140	424
1981	347	4.2%	7,913	95.8%	8,260	242	3,362	3,604	95	2,405	2,500	10	2,146	2,156
1982	656	10.3%	5,731	89.7%	6,387	387	3,868	4,255	150	1,226	1,376	119	637	756
1983			No estimates				No estimates		228	930	1,158		No estimates	
1984	255	9.4%	2,465	90.6%	2,720	140	1,354	1,494	76	736	812	39	375	414
1985	1,434	14.8%	8,278	85.2%	9,712	799	4,897	5,696	508	2,645	3,153	127	736 W	863
1986	7,018	23.1%	23,403	76.9%	30,421	4,335	13,371	17,706	1,461	7,983	8.544	1,222	2,949	4,171
1967	4,858	9.5%	46,016	90.5%	50,874	2,577	29,083	31,660	1,387	8,466	9,853	894	8,467	9,361
1988	720	1.1%	61,972	98.9%	62,692	241	39,329	39,570	377	13,905	14,282	102	8,738	8,840
1989	502	1.9%	25,804	98.1%	26.306	435	18,241	18,676	17	4983	5,000	50	2,580	2,630
1990	265	4.1%	6,123	95.9%	6,388	126	2,880	3,006	104	2,433	2,537	35	810	845
1991	190	8.0%	2,191	92.0%	2,381	92	1,268	1,360	71	614	685	27	309	336
1992	1,671	41.5%	2,359	58.5%	4,030	944	942	1,886	533	1,313	1,846	194	104 W	298
1993	68	1.3%	5,164	98.7%	5,232	37	2,111	2,148	31	2,630	2,661	0	423 W	423
1994	1,793	26.4%	4,995	73.6%	6,788	550	2,897	3,447	944	1,943	2,887	299	155 w	454
1995			No estimates				No estimates		307	8,722	9,029		No estimates	
1996	489	2.1%	22,927	97.9%	23,416	370	16,283	16,653	119	5,131	5,250	0	1.513 w	1,513

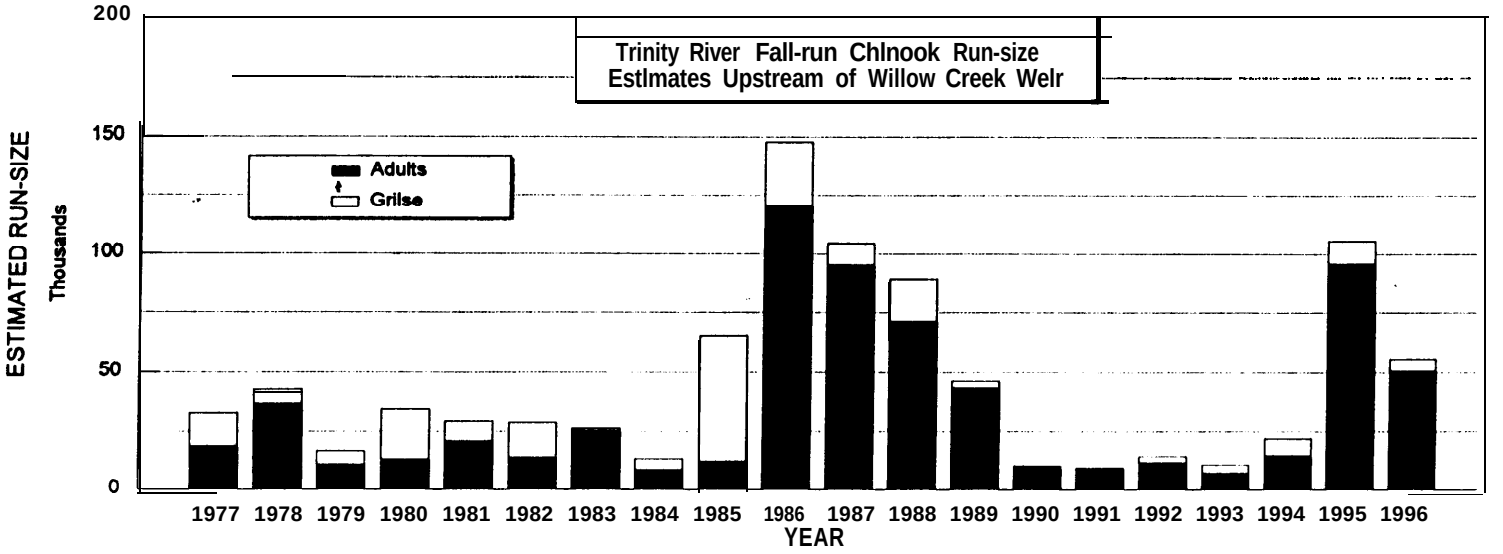


a/ The 1978 sport harvest of spring-run chinook was limited by a salmon fishing closure begining 25 August 1978.

W The sport harvest of adult spring-run chinook was limited by fishing closures to the taking chinook salmon greater than or equal to 56 cm total length during these years. The closures took effect 22 September in 1985, 5 November 1992, 9 October 1993, 3 October 1994 and 9 September 1996.

APPENDIX 2. Pall-run chinook salmon run-sire, spawner escapement and angler harvest estimates for the Trinity River upstream of Wllow Creek Weir from 1977 through 1996.

	Run-size estimate					Spawner escapements						Angler harvest		
						Natuml			Trinity River Hatchery					
	Grilse		Adults		Total	Grilse	Adults	Total	Grilse	Adults	Total	Grilse	Adults	Total
Year	Number	Percent	Number	Percent										
1977	14,318	43.5%	18,596	56.5%	32,914	9,737	13,501	23,238	2,177	2,035	4,212	2,404	3,060	5,464
1978	8,037	14.0%	37,086	86.0%	43,123	4,712	31,052	35,764	1,325	6,034	7,359	Fishing closure a/		0
1979	5,665	35.0%	10,520	65.0%	16,185	3,936	8,028	11,964	964	1,335	2,299	765	1,157	1,922
1980	21,549	62.7%	12,797	37.3%	34346	16,837	7,700	24,537	2,256	4,099	6,355	2,456	998	3,454
1981	8,366	28.6%	20,884	71.4%	29,250	5,906	15,340	21,246	1,004	2,370	3,374	1,456	3,174	4.830
1982	14,938	52.2%	13,653	47.8%	28,591	8,149	9,274	17,423	4,235	2,058	6,293	2,554	2,321	4,875
1983	1,240	4.7%	25,138	95.3%	26,378	853	17,284	18,137	271	5,494	5,765	116	2,360	2,476
1984	4,575	34.8%	8,556	65.2%	13,131	3,416	5654	9,070	766	2,166	2,932	393	736	1,129
1985	53,062	81.6%	11,954	18.4%	65,016	29,454	9,217	38,671	18,166	2,583	20.749	5,442	154 w	5,596
1986	27,506	18.6%	120,382	81.4%	147,888	20,459	92,548	113,007	3,609	15,795	19,404	3,438	12,039	15,477
1987	9,325	8.9%	95,287	91.1%	104,612	5,949	71,920	77,869	2,453	13,934	18,387	923	9,433	10,356
1988	18,113	20.3%	71,309	79.7%	89,422	10,626	44,616	55,242	4,752	17,352	22,104	2,735	9.341	12,076
1989	2,991	6.4%	43,631	93.6%	46,622	2,543	29,445	31,988	239	11.132	11,371	209	3.054	3,263
1990	634	6.3%	9,358	93.7%	9,992	241	7,682	7,923	371	1,348	1,719	22	328	350
1991	681	7.4%	8,526	92.6%	9,207	382	4,867	5,249	205	2,482	2,687	94	1.177	1,271
1992	2,932	20.7%	11,232	78.3%	14,164	2,563	7,139	9,702	211	3,779	3,990	158	314 w	472
1993	3,381	32.2%	7,104	67.8%	10,485	2,473	5,898	8,371	736	815	1,551	172	391 w	563
1994	7,494	34.2%	14,430	65.8%	21,924	2,505	10,906	13,411	4,442	3,264	7,706	547	260 w	807
1995	9,892	9.4%	95,833	90.6%	105,725	9,262	77,876	87,138	78	15,178	15.254	554	2,779 W	3,333
1996	5,072	9.1%	50,574	90.9%	55,646	4,478	42,646	47,124	249	6,411	6,660	345	1,517	1,862

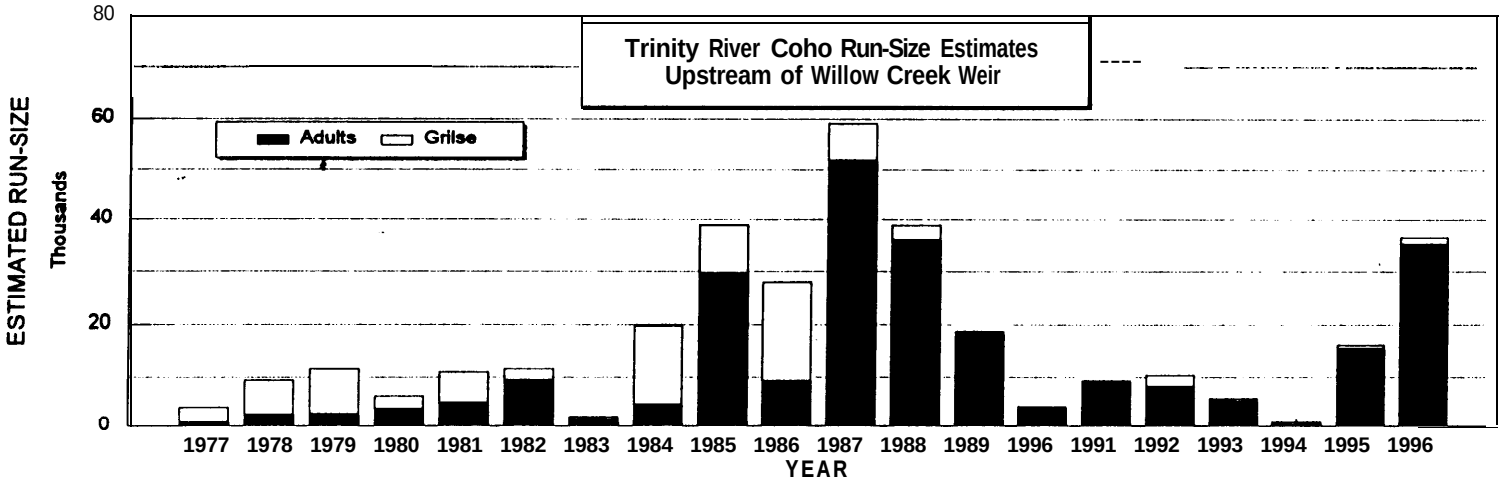


a/ The 1978 sport harvest of tall-run chinook was essentially eliminated by a salmon fishing closure beginning 25 August 1978.

W The sport harvest of adult fall-run chinook was limited by fishing closures to the taking chinook salmon greater than or equal to 56 cm total length during these years. The closures took effect 22 September 1985, 5 November 1992, 9 October 1993, 3 October 1994 and 1 October through 28 October 1995 and 1996.

APPENDIX 3. Coho salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1996.

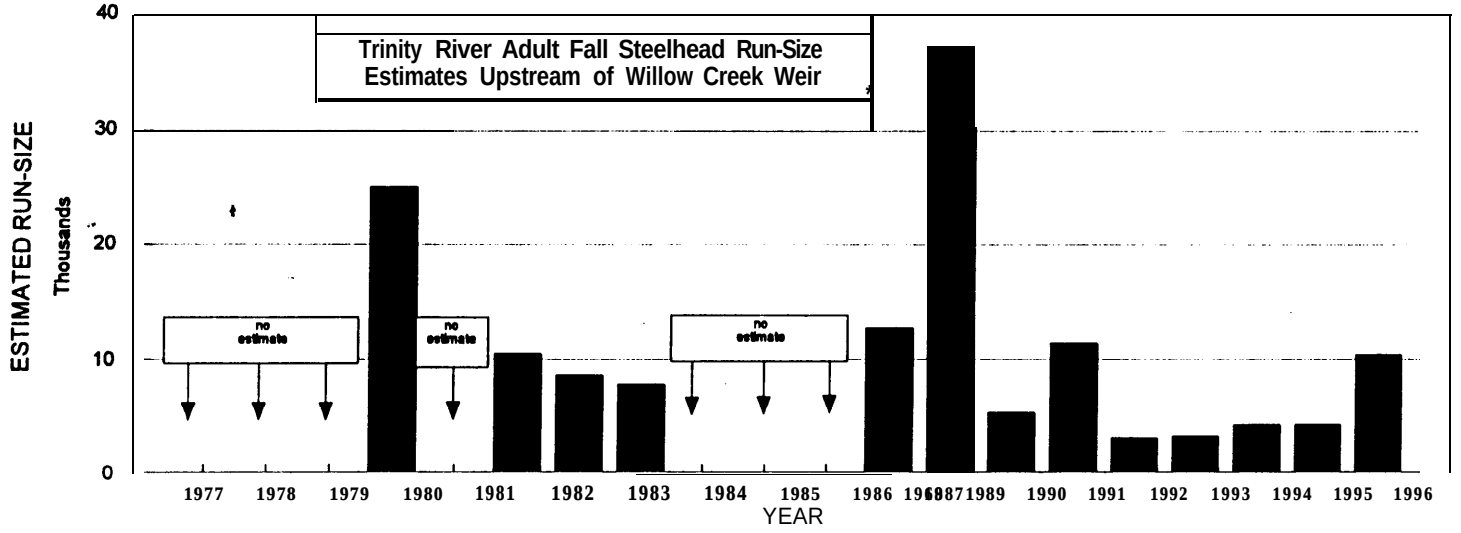
	Run-size estimate					Spawner escapements						Angler harvest		
						Natural			Trinity River Hatchery					
	Grilse		Adults		Total	Grilse	Adults	Total	Grilse	Adults	Total	Grilse	Adults	Total
Year	Number	Percent	Number	Percent										
1977	3,106	80.5%	752	19.5%	3,858	1,756	25	1,781	1,230	698	1,928	120	29	149
1978	6,685	73.2%	2,447	26.8%	9,132	4,309	1,168	5,477	2,376	1,279	3,655	Fishing	closure a/	0
1979	9,067	78.0%	2,557	22.0%	11,624	5,567	1,695	7,262	2,793	742	3,535	707	120	827
1980	2,499	41 .0%	3,595	59.0%	6,094	954	1,817	2,771	1,545	1,778	3,323			0
1981	6,144	56.0%	4,826	44.0%	10,970	3,486	1,995	5,481	1,994	2,529	4,523	664	302	966
1982	2,021	17.5%	9,508	82.5%	11,529	1,158	5,097	6,255	823	3,975	4,798	40	436	476
1983	536	27.2%	1.435	72.8%	1,971	295	788	1,083	192	514	706	49	133	182
1984	15,208	77.2%	4,486	22.8%	19,694	6,188	2,971	9,159	7,727	1,134	8,861	1,293	381	1,674
1985	9,216	23.7%	29,717	76.3%	38,933	4,798	21,586	26,384	4,237	7,549	11,786	181	582 b/	763
1986	18,909	67.6%	9,063	32.4%	27,972	13,034	6,247	19,281	5,402	2,589	7,991	473	227	706
1987	7,253	12.3%	51,826	87.7%	59,079	3,975	28,398	32,373	2,865	20,473	23,338	413	2,955	3,368
1988	2,731	7.0%	36.173	93.0%	38,904	1,850	22,277	24,127	743	12,073	12,816	138	1,823	1,961
1989	290	1.5%	18,462	98.5%	18,752	208	13,274	13,482	77	4,893	4,970	5	295	300
1990	412	10.6%	3,485	89.4%	3,897	234	1,981	2,215	173	t.462	1,635	5	42	47
1991	265	2.9%	8,859	97.1%	9,124	164	6,163	6,327	98	2,590	2688	3	106	109
1992	2,378	23.0%	7,961	77.0%	10,339	1,168	5,565	6,733	1,210	2,372	3,582	0	24	24
1993	573	10.2%	5,048	89.8%	5,621	416	3,024	3,440	93	2,024	2,117	64	0	64
1994	613	71 .9%	239	28.1%	852	453	105	558	160	134	294	0	0	0
1995	634	3.9%	15,477	96.1%	16,111	370	10,680	11,050	264	4.503	4,767	0	294	294
1996	1,269	3.5%	35,391	96.5%	36,660	1,149	25,308	26,457	120	9,835	9,955	0	248	248



a/ The 1978 sport harvest of coho was essentially eliminated by a salmon fishing closure beginning 25 August 1978.
b/ The 1985 sport harvest of adult coho was limited by a closure for the taking salmon greater than or equal to 56 cm total length beginning 22 September 1985.

APPENDIX 4. Fall-run adult steelhead run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1996. a/

	Run-size estimate					Spawner escapement						Angler harvest		
						Natural			Trinity River Hatchery					
	Hatchery b/		Wild c/											
Year	Number	Percent	Number	Percent	Total	Hatchery	Wild	Total	Hatchery	Wild	Total	Hatchery	Wild	Total
1977			No estimates				No estimates		269	16	285		No estimates	
1978			"				"		628	55	683		"	
1979			"						329	53	382			
1980	8,449	33.7%	18,645	66.3%	25,094	5,101	14,462	19,563	1,903	102	2,005	1,445	2,081	3,526
1981			No estimates				No estimates		892	112	1,004		No estimates	
1982	2,106	20.0%	8,428	80.0%	10.532	971	6,889	7,860	634	79	713	501	1,458	1,959
1983	No estimates	for hatchery/wild components			8,605			6,661			599			1,345
1984		"			7,833			6.430			142			1,261
1985		No estimates					No estimates				461		No estimates	
1986		"					"				3,760		"	
1987		"									3,007			
1988	No estimates for hatchery/wild components				12,743			11,926 d/			817			
1989		"			37,278			28,933			4,765			3,578
1990		"			5,348			3,188			930			1,230
1991					11,417			8,631			446			2,340
1992	1,315	43.2%	1,731	56.8%	3,046	759	1,540	2,299	430	25	455	126	166	292
1993	1,894	58.4%	1,349	41.8%	3,243	801	1,178	1,977	875	10	885	218	163	381
1994	1,477	34.8%	2,767	65.2%	4,244	878	2,410	3,288	403	8	411	196	349	545
1995	1,595	37.2%	2,693	62.8%	4,288	767	2,524	3,291	681	24	705	147	145	292
1996	8,598	82.4%	1,837	17.6%	10,435	4,127	1,703	5,830	3,964	48	4,012	507	86	593



a/ Steelhead greater than 41 centimeters in fork length are considered adults.
b/ Trinity River Hatchery-produced steelhead.
c/ Naturally produced steelhead.
d/ The natural spawner escapement reflects an overestimate due to the unknown number of fish harvested by anglers upstream of Willow Creek Weir.

TASK 2: Survival and Contributions to the Fisheries and Spawner Escapement Made by Chinook and Coho Salmon Produced at Trinity River Hatchery

Task Objectives:

To determine relative return rates and the contribution to spawning escapement and the fisheries made by chinook and coho salmon produced at Trinity River Hatchery, and to evaluate experimental hatchery management practices aimed at increasing adult returns.

Background:

To achieve Task 2 objective, representative samples from Trinity River Hatchery's (TRH) annual salmon production must be adipose-fin clipped (ad-clipped) and coded-wire tagged (CWT) for subsequent identification as adults. Prior to 1995, the Department was responsible for the coded-wire tagging program at TRH and the results were published as noted in the Introduction. Beginning in 1995, the Department turned over the coded-wire tagging program at TRH to the Hoopa Valley Fisheries Department. Due to the change in responsibilities, the Department will no longer report on the juvenile tagging effort at TRH. Our efforts are directed at the recovery of these coded-wire tagged fish as adults and analyzing the information derived from recovery

Procedures:

We examined all adult salmon entering TRH for fin-clips and Project tags (also part of Tasks 1 and 3). The heads from ad-clipped salmon were retained for later coded-wire tag removal and decoding.

The information needed to estimate the numbers of salmon of a specific CWT group that returned to the Trinity River basin, and contributed to the fisheries and spawner escapement are; 1) run size, 2) the proportion of the run comprised by the various CWT groups, and 3) the harvest rate. Methods to determine the run-size and angler-harvest estimates were presented in Task 1.

To estimate the numbers of the salmon above a specific weir site with a CWT, we used the equation:

$$N_{CWT} = \frac{NW_{ADclip}}{NW} \times \frac{NH_{ADCWT}}{NH_{ADclip}} \times N_{run\text{-}size\ estimate}$$

where, N_{CWT} = estimated number of the specific species of salmon above the weir with a CWT; NW_{ADclip} = number of salmon observed at the weir with an Ad clip; NW = total number of salmon observed at the respective weir; NH_{ADCWT} = number of salmon observed

at TRH with an ad clip and a CWT; $NH_{AD\text{-}clip}$ = total number of Ad-clipped salmon observed at TRH; and $N_{run\text{-}size\ estimate}$ = run-size estimate.

Using the various CWT groups recovered at TRH, we estimated the fraction of the population upstream of the weir with a specific CWT with the equation:

$$F_{CWT\ group} = \frac{NH_{CWT\ group}}{NH_{ADCWT}}$$

where, $F_{CWT group}$ = fraction of the salmon population with a specific CWT code; and $NH_{CWT\ group}$ = number of salmon observed at TRH with a specific CWT code.

We estimated the total number of chinook salmon upstream of the weir with a specific CWT code with the equation:

$$N_{CWT\ gaup} = N_{CWT} \times F_{CWT\ group}$$

where, $N_{CWT\ group}$ = estimated total number of salmon of a specific CWT group.

The estimated number of fish from each CWT group caught in the Trinity River sport fishery upstream of the weir was then estimated by the equation:

$$SF_{CWT\ group} = N_{CWT\ group} \times N_{harvest\ rate\ estimate}$$

where, $SF_{,,}$ = number of salmon of a specific CWT group caught in the Trinity River sport fishery; and $N_{harvest\ rate\ estimate}$ = harvest rate estimate.

We estimated the total number of fish of a specific CWT code group available to the spawner escapement by the equation:

$$N_{CWT\ escapement} = N_{CWT\ group} - SF_{CWT\ group}$$

where, $N_{CWT\ escapement}$ = the total number of salmon of a specific CWT group available to the spawner escapement.

The estimated number of salmon of specific CWT code group available to natural spawner escapement was:

$$N_{CWT\ natural\ escapement} = N_{CWT\ escapement} - NH_{CWT\ group}$$

where, $N_{CWT\ natural\ escapement}$ = the estimated number of a specific CWT group contributing to natural spawning escapement.

As stated above, estimating the total return of individual CWT groups depends on a basin-wide run-size estimate. In 1995, due to funding uncertainties. we were unable to estimate the spring chinook run-size in the Trinity River basin (see last year's annual report).

In evaluating the return of CWTed hatchery chinook, we normally report on the individual year's return along with a summary of each CWT group throughout their five-year life cycle. Missing the 1995 spring chinook run size has the unfortunate result of making it impossible to summarize the total return of any CWT group returning the river in 1995.

All estimates for spring and fall chinook are for the Trinity River upstream of the Junction City Weir (JCW) (river km [RKM] 137.1) and the Willow Creek Weir (WCW) (RKM 48.4) respectively.

Results

We recovered 1,637 ad-clipped chinook at TRH this season. These included TRH-produced chinook (856 spring and 768 fall) and 13 naturally produced chinook. The returning spring chinook CWTed fish were composed of eight release groups from the 1992 through 1994 Brood years (BY)s (Appendix 1). The fall chinook CWTs were from ten groups representing the 1992 through 1994 BYs (Appendix 1). The naturally produced chinook were composed of nine CWT groups from the 1992 and 1993 BYs. (Appendix 1).

Return rates for spring chinook TRH CWT groups, based on the number released and their estimated run size as adults, ranged from 0.749%, for 1992 BY yearling release, to 0.0 13% for the 1994 BY yearling release (Appendix 2).

Return rates for fall chinook TRH CWT groups ranged from 0.029% (1993 BY fingerlings) to 1.662% (1992 BY yearlings) (Appendix 3). The relatively high return rate as four-year olds for the 1992 BY is a continuation of this BY's success noted last year when 3.263% returned as three-year olds.

Both spring and fall chinook release groups from the 1992 BY had exceptionally high return rates this year. For fall chinook returning as four-year-olds, the return rates (since 1977 and excluding yearling-plus releases) have ranged from essentially zero to this year's high of 1.662%. The next highest on record was 0.733% from the 1983 BY yearlings.

Appendix 1. Release and recovery data for adipose fin-clipped chinook recovered at Trinity River Hatchery (TRH) during the 1996-97 season.

CWT a/ code	Egg source	Brood year	Release data: Date	Number	Size (No./kg)	Site	Recovery data: Males No.	Males FL b/	Females No.	Females FL b/	Total N
Spring-run chinook salmon											
0601040106	TRH	1992	06/15/93	215,038	97.9	TRH	50	77.5	123	71.2	173
065734	TRH	1992	10/1-7/93	53,675	25.1	TRH	60	70.5	70	68.3	130
065735	TRH	1992	10/1-7/93	56,281	25.1	TRH	51	71.1	62	67.7	113
0601040107	TRH	1993	06/01-10/94	222,056	116.8	TRH	162	67.2	114	64	276
065708	TRH	1993	10/3-14/94	53,738	23.6	TRH	32	61.3	11	60.7	43
065709	TRH	1993	10/3-4/94	57,787	23.6	TRH	37	60.1	18	59.1	55
065220	TRH	1994	06/6-9/95	113,236	139.0	TRH	5	40.2	0		5
065221	TRH	1994	10/2-13/95	113,124	28.0	TRH	9	39.3	0		9
100000 c/ d/							24	70.5	28	68.5	52
				Spring-run chinook salmon totals:			430		426		856
Fall-Run ***chinook salmon***											
065733	TRH	1992	06/16/93	192,032	145.9	TRH	37	75.7	50	73.1	87
065748	TRH	1992	10/1-7/93	54,586	33.7	TRH	111	76.5	150	72.9	261
065749	TRH	1992	10/1-7/93	54,308	33.7	TRH	85	76.8	166	72.2	251
065704	TRH	1993	6/10-15/94	201,032	191.8	TRH	14	61.9	3	58	17
065705	TRH	1993	10/3-14/94	55,039	27.6	TRH	38	59.2	19	61	57
065706	TRH	1993	10/3-14/94	55,297	27.6	TRH	26	58.8	8	58.9	34
0601040108	TRH	1994	06/01-09/95	107,935	353.0	TRH	6	43.7	0		6
065021	TRH	1994	06/01-09/95	54,723	271.0	TRH	3	44	0		3
065022	TRH	1994	06/01-09/95	53,905	271.0	TRH	5	44	0		5
065222	TRH	1994	10/3-13/95	113,124	39.7	TRH	11	41.8	0		11
100000 c/ e/							14	69.9	22	73.6	36
				Fall-run chinook salmon totals:			350		418		768
Naturally produced chinook salmon					Size (mm fl)						
0601080403	Wild	1992	05/11-14/93	7,781	54.1	Sheridan	1		0		1
0601080404	Wild	1992	05/14-16/93	7,495	56.6	Sheridan	1		0		1
0601080405	Wild	1992	05/16-18/93	6,568	56.6	Sheridan	0		1		1
0601080212	Wild	1993	02/1-3/8/94	9,177	53.9	Sheridan	0	-	1		1
0601080213	Wild	1993	03/10-15/94	8,648	53.9	Sheridan	2	66.5	0		2
0601080214	Wild	1993	03/16-21/94	7,125	41.6	Sheridan	1	-	0		1
0601080312	Wild	1993	04/6-7/94	10,856	37.1	Sheridan	1		0		1
0601080313	Wild	1993	04/8-9/94	11,699	40.1	Sheridan	1		3	64.7	4
0601080503	Wild	1993	04/9-12/94	10,115	53.9	Sheridan	1		0		1
				Naturally produced chinook salmon totals:			8		5		13

a CWT = Coded-wire tag.
b/ FL = Average fork length in cm.
c/ 100000 = No CWT found or it was lost during recovery.
d/ Assumed to be spring-run chinook from their entry dates into Trinity River Hatchery.
e/ Assumed to be fall-run chinook from their entry dates into Trinity River Hatchery.

Appendix 2. Run-size, percent return. in-river sport catch and spawner escapement estimates **for Trinity River Hatchery. produced.** coded-wire-tagged spring-run chinook salmon returning to the Trinity River upstream of Junction City Weir **during the period 1992** through 1996.

Release data						Estimated returns					
CWT al code	Brood year	Date b/	Number	Site	Age	Run-size	% of release	River harvest	Spawning escapement TRH c/	Natural	Total
0601040105	1991	06/05/92	198,277	TRH	2	44	0.022	0	1	1	2
					3	232	0.117	1	4	3	7
					4 d/	--	--	--	17	--	17
					5	0	0	0.		0	0
			Totals: e/			276	0.139	- -	221 4		26
			Total adults: f/			232	0.117	1	21	3	24
065658	1991	10/02/92	110.797	TRH	2	10	0.009	1	3		1 - - 4
					3	55	0.050	0	3	3	6.
					4 d/	--	–	–	16	--	16
			Totals: e/		5	0 65	0.000 0.059	1	- - - - -	-	0 26'
			Total adults: f/			55	0.050	0	22 19	4 3	22.
0601040106	1992	06/15/93	215.038	TRH	2	489	0.227	0	22	22	44
					3 d/	--	--	--	1.745	--	1,745
					4	523	0.243	35	173	315	488
065734	1992	10/01-07/93	53,675	TRH	2	37	0.069	0	5	5	10
					3 d/	--	--	--	175	--	175
					4	402	0.749	27	133	242	375
065735	1992	10/01-07/93	56.281	TRH	2	16	0.028	83	9	4	13
					3 d/	--	--	--	175	--	175
					4	341	0.606	23	113	205	318
0601040107	1993	06/01-10/94	222.066	TRH	2 d/	--	--	--	32	--	32
					3	834	0.376	55	276	503	779
065708	1993	10/03-14/94	53,738	TRH	2 d/	--	--	--	18	--	18
					3	130	0.242	9	43	78	121
065709	1993	10/03-14/94	57,787	TRH	2 d/	--	--	--	8	--	8
					3	166	0.287	11	55	100	155.
065220	1994	06/6-9/95	113.236	TRH	2	15	0.013	0	5	10	15
065221	1994	10/2-13/95	113491	TRH	2	24	0.021	0	9	18	27

al CWT = coded-wire tag.

b/ Chinook **salmon** released during May or June were smolts, those released in October were yearlings.

c/ TRH = **Trinity** River Hatchery.

d/ Run-size estimates were not produced in 1995.

e/ Totals are presented only for brood year 1991. **These** fish have reached five years of age and are considered to have completed their life cycle. Totals do not include age four returns as no estimates were made that year.

f/ The term 'adults" means chinook aged three- through five-years-olds. Totals do not include age four fish.

Appendix 3. Run-size, percent return, in-river sport catch, and spawner escapement estimates for Trinity River Hatchery-produced, coded-wire-tagged fall-run chinook salmon returning to the Trinity River upstream of Willow Creek Weir during the period 1992 through 1996.

Release data					Estimated returns						
CWT a/ code	Brood year	Date b/	Number	Site	Age	Run size	% of release	River harvest	Spawning escapement TRH c/	Natural	Total
0601040104	1991	06/22/92	206,416	TRH	2	268	0.130	14	174	81	255
					3	612	0.296	11	330	271	601
					4	58	0.028	2	14	42	56
					5	0	0.000	0	0	0	0
				Totals: d/		938	0.454	27	518	394	912
				Total adults: e/		670	0.325	13	344	313	657
065731	1991	10/02/92	58,580	TRH	2	18	0.031	1	12	5	17
					3	189	0.323	3	102	84	186
					4	21	0.036	1	5	15	20
					5	0	0.000	0	0	0	0
				Totals: d/		228	0.389	5	119	104	223
				Total adults: e/		210	0.358	4	107	99	206
065732	1991	10/02/92	56.720	TRH	2	18	0.032	1	12	5	17
					3	230	0.466	4	124	102	226
					4	41	0.072	1	10	30	40
					5	0	0.000	0	0	0	0
				Totals: d/		289	0.510	6	146	137	283
				Total adults: e/		271	0.478	5	134	132	266
065733	1992	06/16/93	192,032	TRH	2	436	0.227	32	235	169	404
					3	1760	0.917	51	427	1282	1709
					4	302	0.157	9	87	206	293
065748	1992	10/01-07/93	54,586	TRH	2	67	0.123	5	36	26	62
					3	1694	3.103	49	411	1234	1645
					4	907	1.662	27	261	619	880
065749	1992	10/01-07/93	54.308	TRH	2	43	0.079	3	23	17	40
					3	1772	3.263	51	430	1291	1721
					4	872	1.606	26	251	595	846
065704	1993	6/10-15/94	201.032	TRH	2	21	0.010	1	5	15	20
					3	59	0.029	2	17	40	57
065705	1993	10/03-14/94	55,039	TRH	2	37	0.667	2	9	26	35
					3	198	0.360	6	57	135	192
065706	1993	10/03-14/94	55,297	TRH	2	21	0.038	1	5	15	20
					3	118	0.213	4	34	80	114
0601040108	1994	06/01-09/95	107935	TRH	2	21	0.019	1	6	14	20
065021	1994	06/01-09/95	54.723	TRH	2	10	0.018	1	3	6	9
065022	1994	06/01-09/95	53.905	TRH	2	17	0.032	1	5	11	16
065222	1994	10/3-13/95	113,124	TRH	2	38	0.034	3	11	24	35

a/ CWT = coded-wire tag.

b/ Chinook salmon released during May or June were smolts, those released in October were yearlings.

c/ TRH = Trinity Riir Hatchery.

d/ Totals are presented only for brood year 1991. These fish have reached five years of age and are considered to have completed their life cycle.

e/ The term "adults" means chinook aged three- through five-years-olds.

TASK 3: Naturally and Artificially Produced Coho Evaluations in the Trinity River Basin

Task Objectives:

To determine, through mass marking of TRH-produced coho, the relative return rates and contributions to spawning escapement and the fisheries made by naturally and hatchery-produced coho salmon in the Trinity River basin.

Procedures:

Procedures for this task involves two phases: marking all TN-I-produced coho; and recovering adult coho returning to the basin. The procedures for the marking phase will be covered in this section while the adult recovery phase will be covered under Tasks 1 and 2.

Marking coho involved anaesthetizing them with MS-222, removing their right maxillary, and releasing them into a hatchery pond. To keep count of fish marked, each marking station was equipped with a manual counter to tally each fish as it was marked.

To determine overall marking accuracy, we examined a sample of the marked coho just prior to their release into the river. These fish were anaesthetized with carbon dioxide, measured to the nearest mm fork length (FL), and checked for quality of the maxillary clip. If more than 3/4 of the bone was excised it was considered a good clip; less than that was considered a poor clip. We estimated the total number of coho effectively marked by multiplying the percent of fish with good clips by the total marked.

Results:

Staff personnel marked (right maxillary clip) 618,355 juvenile coho, representing the entire 1995 brood year at Trinity River Hatchery. We began clipping September 10, 1996 and finished on January 16, 1997. According to hatchery estimates, 35,432 of the marked coho died at the hatchery due to water turbidity leaving 582,923 for final release.

On March 13, 1997, just prior to their release from the hatchery, we performed quality control evaluations (QC) on the marked coho. During QC, 2,000 coho were measured (mm-fork length) and examined for marking accuracy.

Fork lengths of the measured coho ranged from 101 to 253, averaging 145.8 mm. The table below summarizes release estimates based on our observed marking accuracy.

Stratum 1/	Percent in sample 2/	Estimated number released 3/
No clip	0.05%	291
Incomplete RM	0.10%	583
LM	0.20%	1,166
Effective Clip	99.65%	580,880
Totals:	100.00%	582,923

l No clip = both maxillary bones completely intact
Incomplete RM = 225% and ≤ 100% of the right maxillary bone intact
LM = Left maxillary bone removed, right intact
Effective clip = 100% of right maxillary bone removed

2/ Percent of the total 2,000 coho check from each stratum
Release estimates based on TRH estimates of total released; deducts hatchery mortality estimates from the total tagged.

Prepared by: Mark Zuspan, California Department of Fish and Game, September 17, 1997

TASK 4: Salmon Spawner Surveys in the Upper Trinity River Basin

Task Objectives:

To determine, through a system of spawning ground surveys, the distribution, size, sex composition, incidence of marked/tagged individuals, and pre-spawning mortality of naturally spawning chinook and coho salmon in the main stem Trinity River.

Procedures:

Our study area was the main stem Trinity River from the upstream limit of anadromous fish migration at Lewiston Dam (river km 180.1) to the confluence of North Fork Trinity River (river km 116.7). This area was surveyed once a week by personnel in rafts throughout the salmon spawning season.

The survey area was divided into seven zones based on access and historic spawner use (Table 1). These zones were the same as used by the Department during spawner surveys since 1988.

Table 1. Description and lengths of river zones used in the 1996 main stem Trinity River spawner survey.

River zone	Length (km)	Zone description
1	3.2	Lewiston Dam - Old Lewiston Bridge
2	7.9	Old Lewiston Bridge - Browns Mtn. Bridge
3	10.2	Brown Mtn. Bridge - Steel Bridge
4	10.4	Steel Bridge - Douglas City Camp_
5	11.3	Douglas City Camp - Junction City Weir
6	13.2	Junction City Weir - McCartney Pond
7	7.2	McCartney Pond - Mouth of the North Fork Trinity River

During the survey all dead fish (carcasses) encountered were examined to determine species, sex, spawning condition-of the females, presence of fin clips, presence of spaghetti tags, and condition. We measured, to the nearest cm fork length (FL), 30 chinook from each survey zone each week.

We flagged all chinook carcasses which we felt had died no more than one week prior to the survey as evidenced by at least one clear eye and a relatively firm body. Flags consisted of a piece of 1 ½ by 1 ½ inch colored plastic strip attached to a hog ring which was affixed to the fish's mandible. Recovery of flagged fish in subsequent weeks provided an estimate of the survey's efficiency which was used to estimate the total number of fish dying in each survey zone.

. We chose a date to separate spring from fall chinook based on the presence of spring and fall coded-wire tagged (CWT) chinook. The date that the number of fall CWTed chinook exceeded spring CWTed chinook in the survey was the separation date. Chinook recovered prior to that date were considered spring chinook and those recovered that date and after were considered fall chinook.

Tributaries to the main stem Trinity River were not surveyed this year. Prior years studies have shown that the tributaries are relatively unimportant in terms of chinook spawning in the Trinity River basin. The relative importance of tributaries to coho spawning has not been determined.

Results

We processed 5,439 chinook and 403 coho salmon carcasses during the survey. Chinook spawner density, in spawners per km of river, ranged from 1,070 in zone 1 to 240 in zone 4 with an overall average of 410 fish per km for the entire survey area (Table 2). We estimated a total of 26,032 adult chinook died in the survey zone this season (Table 2).

Table 2. Adult chinook salmon spawner distribution and estimated density by river zone during the 1996-97 Trinity River spawner survey.

Zone	Number carcasses flagged	Flags recovered	% recovery	Total observed	Expanded total	% distribution	Spawner density (fish/km)
1	273	132	48.4%	1,655	3,423	13.1%	1,070
2	255	104	40.8%	1,295	3.115	12.2%	402
3	238	57	23.9%	968	4,042	15.5%	396
1	109	20	18.3%	457	2,491	9.6%	240
5	138	10	7.2%	380	5,244	20.1%	464
6	78	4	5.1%	290	5,655	21.7%	428
7	51	4	7.8%	157	2,002	7.7	278
Total	1,142	331	29.0%	5,202	26,032	100%	411

We recovered a total of 130 adipose-fin clipped chinook during the main stem survey this season. Coded-wire tags were extracted from 95 of these and represented 26 different code groups from three brood years (BY) (Table 3). Based on timing of CWTed fish recovered in the survey, we assume that only spring chinook were recovered through 11/03 after which only fall chinook were recovered.

Table 3. Release and recovery data for coded-wire tagged chinook salmon recovered in the 1996-97 Trinity River spawner survey.

CWT a/	Type b/	Brood year	Location c/	Number effectively tagged d/	Number recovered
0601040106	S-f	1992	TRH	215,038	6
0601080403	Wild	1992	Sky Ranch	7,781	2
0601080404	Wild	1992	Sky Ranch	7,495	1
0601080405	Wild	1992	Sky Ranch	6,568	1
0601080407	Wild	1992	Sky Ranch	7,993	1
065733	F-f	1992	TRH	192,032	8
065734	S-Y	1992	TRH	53,575	8
065735	S-Y	1992	TRH	56,281	4
065748	F-Y	1992	TRH	54,586	6
065749	F-Y	1992	TRH	54,308	5
601040107	S-f	1993	TRH	222,056	8
0601080213	Wild	1993	Sheridan	9,177	2
0601080214	Wild	1993	Sheridan	7,125	1
0601080215	Wild	1993	Sheridan	9,998	2
0601080311	Wild	1993	Sheridan	11,443	12
0601080312	Wild	1993	Sheridan	10,856	5
0601080313	Wild	1993	Sheridan	11,699	2
0601080502	Wild	1993	Sheridan	11,837	6
0601080503	Wild	1993	Sheridan	10,115	5
065704	F-f	1993	TRH	201,032	2
065705	F-Y	1993	TRH	55,039	2
065706	F-Y	1993	TRH	55,297	2
065708	S-Y	1993	TRH	53,738	1
065709	S-Y	1993	TRH	57,787	1
065022	F-f	1994	TRH	53,905	1

CWT a/	Type b/	Brood year	Location c/	Number effectively tagged d/	Number recovered
065222	F-Y	1994	TRH	113,124	1
100000 e/					35
				Totals:	130

a/ Coded-wire tag number assigned to that group of fish.
b/ S = spring, F = fall, y = yearling, f= fingerling, Wild = Naturally produced
c/ TRH = Trinity River Hatchery; release locations for wild fish (Chapter 2 in past Annual Reports).
d/ Number effectively tagged = (Total number tagged) - (tagging mortalities + estimated shed tags + estimated poor fin-clipped fish).
e Adipose fin-clipped recovered fish. CWTs were either unreadable, shed, or lost while decoding.

Spring chinook females comprised 62.4% of the adults while fall chinook females comprised 65.3% of the total. Females accounted for 63.7% of the of the total (spring plus fall) adult recovery in the survey.

We observed a female pre-spawning mortality rate of 3.3% for spring chinook and 7.8% for fall chinook. The overall (spring and fall chinook) pre-spawning mortality rate for female adults was 5.4%. For comparison, female pre-spawning mortality rates in the Trinity River have ranged from 1.1% (1991) to 44.9% (1988) during prior surveys conducted sporadically since 1955. As noted by the Department in the past, pre-spawning mortality in the Trinity River is closely tied to escapement: as escapement increases so does pre-spawning mortality.

The survey crews observed 403 adult coho salmon this season. Based on the efficiency rates developed from chinook flag recovery, we estimated 1,115 adult coho died in the main stem survey area this season (Table 4). Spawner density was highest in zone 1 (141 fish per km) and lowest in zone 7 where no coho were observed. The overall average was 17.6 fish per km for the entire survey area (Table 4).

Table **4.** Adult coho salmon spawner distribution and estimated density by river zone during the 1996-97 Trinity River spawner survey.

Zone	Total observed	Observation efficiency (%)	Expanded total	% distribution	Spawner density (fish/km)
1	219	18.4%	452	10.6%	141.4
2	146	40.8%	358	32.1%	45.3
3	17	23.9%	71	6.4%	7.0
4	7	18.3%	38	3.4%	3.7
5	7	7.2%	97	8.7%	8.6
6	5	5.1%	98	8.8%	7.4
7	0	7.8%	0	0.0%	0.0
Total: Mean:	401		1,115	100%	17.6

Prepared by: Mark Zuspan, California Department of Fish and Game, September 17, 1997

TASK 5: Capture and Coded-wire Tagging of Naturally Produced Chinook Salmon in the Trinity River Basin

Task Objectives:

To capture, mark (adipose fin clip), tag (binary-coded wire) and release representative groups (up to 200,000 fish/group) of naturally produced chinook salmon fry/fingerlings in the main stem Trinity River for use in subsequent determination of their survival and contributions as adults to the ocean and river fisheries and spawning escapements.

Procedures:

Task 5 is composed of three distinct phases: trapping; tagging; and recovery. 'The trapping and tagging phases take place stream side in the spring following juvenile salmon emergence. The recovery phase take place from two-to-five years after emergence and involves the efforts of several agencies including the Department of Fish and Game (Department), Hoopa Valley Tribal Fisheries Department (HVTFD), Yurok Tribal Fisheries Department (YTFD), and the Pacific Fisheries Management Council. This report will deal with the tagging and trapping phases of the Task. The recovery phase of the Task will be covered in a future report.

Trapping was conducted in the main stem Trinity River using from one to eight fyke nets measuring 3.1 m wide by 1.2 m high at the mouth, by 7.6 m long, tapering to a 0.33-m by 0.33-m exit leading into dual live boxes. Fyke nets were attached, at their mouth, to a 2.5-cm diameter galvanized pipe frame of the same dimensions as the net mouth, which was connected by ropes to metal posts driven into the streambed. The nets were normally set at mid-afternoon and recovered at mid-morning the next day, when all captured fish were placed in holding cages placed in the river.

Tagging was conducted inside a 5.5-m long converted office trailer placed adjacent to the trapping site. A 3.5-KW generator was used to supply the electrical needs of the operation (tagging machines, pumps and lights).

Prior to tagging, juvenile chinook were anesthetized with tricaine methanesulfonate, their adipose fin removed (ad-clip), and a one-half length coded-wire tag (CWT) implanted in each fish's rostrum. Normally, between two-and three tagging machines were used, depending on availability of fish.

A sample of 100 fish from each CWT group for each day's tagging was held for a quality control check (QC), and the remainder were released back into the river downstream of the tagging site. Fish in the QC sample were held in live boxes in the river and, after a

minimum of 24 hours, checked for mortality, tag retention, and ad-clip quality. Tag retention was determined by passing fish though an electronic tag detector, and ad-clips were checked by direct examination. Each tagging day, we determined a mortality, tag shed and poor ad-clip rate based on our QC sample. The number of effectively tagged fish from each day's tagging effort was determined by subtracting, from the daily total, the estimated mortality, tag shedding and poor ad-clips as determined from our QC sample.

At least once a week we measured, to the nearest mm fork length (FL), a sample of 100 chinook. We kept track of the number of fish trapped each day by placing each trapping day's fish in a separate holding cage. These fish were then counted automatically during the tagging process.

Results

Our trapping efforts began on February 18 and concluded on May 13, 1997. Total effort during this period was 43 1 trap nights (one net fished for one night) and total catch was 49,234 chinook, 499 coho and 5,621 steelhead.

Results from trapping indicate an extremely poor production of naturally produced chinook in the upper Trinity River basin this year. The overall catch-per-unit effort (CPUE[1/]), during the period of historical high emigration (March 5 through May 27) was the lowest we have encountered since our operations began in 1989. Chinook CPUE during this period has ranged from 2,343 in 1990 to a mere 77 this year. The previous low in chinook CPUE was 157 in 1992.

This poor production is almost certainly the result of high flows from Lewiston Dam during the incubating/emergence phase of the 1996 brood year. Based on the results of Tasks 1 and 4, we are confident that there were enough spawners in 1996 to produce high numbers of juvenile chinook to emigrate in 1997. The low CPUE reflects the very poor survival of the progeny of these spawners. It is unknown what caused the poor survival but three likely agents are: 1) substrate movement which could have buried the redds, 2) sedimentation which could have suffocated the eggs, and/or 3) newly emerging fry may have been swept away in the high velocities.

We began coded-wire tagging operations on February 27 and finished on May 14. Project personnel coded-wire tagged 40,771 chinook, consisting of two groups this

1/ Catch-per-unit-effort is defined as the average number of fish caught per trap per night fished. For example: if we fished eight nets for one night and caught 800 fish, the CPUE would be 100 fish.

season. After subtracting for tagging mortality, tag shedding and poor fin clips, we effectively tagged a total of 38,263 naturally produced chinook (Table 1). Prior year's effective tagging totals are; 15,704 (1988-89), 112,133 (1989-90), 72,865 (1990-9 1), 56,610 (1991-92), 44,565 (1992-93), 92,486 (1993-94) and 123,610 (1995-96)

Coho CPUE ranged from zero to three with a season average of one fish per trap night. Steelhead CPUE ranged from two to twenty fish averaging thirteen fish per trap night.

Chinook trapped throughout the season ranged in fork length (FL) from 29 to 112 mm averaging 39.5 mm. The overall average FL of CWTed fish was 48.6 mm.

Table 1. Summary of coded-wire tagging of naturally produced chinook in the Trinity River basin, 1996-97 season.

Coded-wire tag number	Inclusive tagging dates	Number effectively tagged	Average fork length (mm)
0601080208	Feb27-Mar14	20,688	36.6
0601080209	Mar17-May14	17,575	43.5
Season Total		3 8,263	

Prepared by: Mark Zuspan, California Department of Fish and Game, September 17, 1997

TASK 6: Life History, Distribution, Run Size and Angler Harvest for South Fork Trinity River Basin Anadromous Salmonid Populations

Task Objectives:

1. To determine the timing, size, composition, distribution, and angler harvest of adult fall chinook and coho salmon runs in the South Fork Trinity River (SFTR) basin.

2. To determine through mark-and-recovery and direct observation methods, the timing, size, composition, and distribution of adult spring chinook and spring (summer) steelhead runs in the SFTR basin.

3. To determine juvenile Salmonid emigration timing patterns, and assess their rearing areas and resident times in the SFTR basin.

4. To describe age compositions and life-history patterns of adult and juvenile salmonids through scale pattern analysis.

Introduction

Work on Task 6 began at the end of May 1996, when approval to begin work was received.

Procedure:

Weirs: The Gates Weir was installed at river km (RK) 3 1.7 when flow permits during late spring and early summer to capture spring-run chinook salmon and summer-run steelhead immigrants for examination and tagging. The weir was operated five nights per week. All salmon and steelhead captured were examinedto determine species, sex and fork length. Fish in good condition were given an anchor tag and secondary fin clip (half left ventral fin clip for tagged fish and half right ventral fin clip for untagged fish) then released to continue migration.

The Sandy Bar Weir was installed at RK 2.1 in late summer and fall to capture immigrating salmon and steelhead for examination and tagging. This weir was operated seven nights per week. All chinook, and coho salmon and steelhead were examined to determine species, sex, condition and fork length. Fish in good condition were given a tag (spaghetti for salmon and anchor for steelhead) and a secondary fin clip (half left ventral fin clip for tagged fish and half right ventral fin clip for untagged fish), then released to continue migration.

Run-size estimates were based on an adjusted Peterson formula where the size of the population is calculated from the number of fish marked at the weirs, number of fish examined during carcass surveys and number of marked fish recovered.

Carcass Recovery and Redd Survey: The SFTR was surveyed from the air four times to determine the onset of spawning, distribution of spawning activity and which sections ground crews would cover. Ground crews walked sections to locate redds and carcasses. Redds were counted and their locations mapped. Carcasses were examined for species, sex condition and tags. Scales were taken when the condition of the fish permitted. Pectoral fins were collected as per request from Yurok Tribal Fisheries Department for DNA analysis.

Snorkel Survey: The relative abundance and distribution of spring-run adult chinook in the SFTR is based on a snorkel survey conducted in late August. Project personnel cover a total of 144.1 RK in the SFTR basin (lower 15.6 RK of Hayfork Creek, lower 6.5 RK of E.F. of the SFTR and from the mouth of SFTR to about 1.4 RK upstream of the confluence with the E.F. of SFTR).

Juvenile Out-migrant trapping: Juvenile out-migrant traps were deployed at four locations (Forest Glen, Curved Bridge near Hyampom, Sandy Bar and at the mouth of Hayfork Creek) from June 1996 through December 1996 and trapped at a twice-a-week frequency when flow conditions permit. Beginning January 1997, effort increased to thirteen locations (4 in SFTR, 6 in Hayfork Ck. basin and 3 in other tributaries) (Table 1); sampled when flow conditions permitted and was conducted weekly at all stations.

We collected scale samples from all juvenile salmon and steelhead while out-migrant trapping and from adult fish in good condition at both Gates and Sandy Bar weirs and from fish in good condition during carcass surveys.

Results:

Weirs: The Gates Weir was installed June 19, 1996 and removed July 8, 1996 and operated five days a week. A total of 32 spring-run chinook (4 grilse and 28 adults) were captured of which **21** were effectively tagged. Spring-run chinook averaged 60.1 cm FL and ranged in length from 51 to 80 cm FL. Two summer-run steelhead 46 and 58 cm FL were captured. The weir was removed when morning water temperatures exceeded 15 deg. C. Peak catch occurred during the week ending (WE) July 1, 1996.

The Sandy Bar Weir was installed September 18, 1996 and removed on November 16, 1996. **A** total of 658 fall-run (13 grilse and 645 adult) chinook salmon, 6 adult coho salmon and 95 steelhead (5 half-pounders and 90 adults) were captured for the season.

Peak catch was in WE October 28, 1996. Chinook salmon ranged in size from 40 cm to 93 cm, FL. Length frequency analysis indicates grilse were fish <49 cm FL, and made up 2% of total fish observed at the weir. Six ad-marked chinook salmon were recovered: all six were from brood year 1992; two (fall-run) from Horse Linto Creek, 1 (fall-run) from Junction City and 3 (2 fall-run and 1 spring-run) from Trinity River Hatchery.

A total of 107 scale samples collected were at Sandy Bar Weir; of these 14% were age 2, 59% were age 3 and 27% were age 4 fish.

Angler harvest rate was very low; 0.0016% for chinook salmon and 0.0016% for steelhead.

Carcass Recovery and Redd Survey: Carcass surveys began on September 24, 1996 and finished on December 4, 1997. A total of 380 (109 spring-run and 27 1 fall-run) chinook salmon, 8 coho salmon and 1 steelhead carcasses were recovered. A total of 1,261 redds were mapped.

Peak spawning for spring-run chinook occurred during WE October 14, 1996. Redds were concentrated above Hyampom valley between RK 102.7 and 57.9.

Peak spawning for fall-run chinook salmon occurred during WE November 4, 1996. These redds were generally concentrated below Hyampom valley, RK 52 to the mouth.

No adipose fin clipped fish were recovered during carcass surveys. Only one carcass was recovered at Gates weir and no tags were recovered.

Preliminary run-size estimate for fall-run adult chinook salmon in the South Fork Trinity River was 1,835 fish.

Snorkel Survey: Crews covered a total of 144.1 RK and counted 1,097 spring-run chinook salmon. The majority of fish were seen above RK 49.6, above Hyampom valley.

Juvenile Out-migrant Trapping: Juvenile chinook salmon, coho salmon, and steelhead were captured in out-migrant traps fished between July 1996 and December 1996 (Table 1). Juvenile chinook were captured at all sites except at Curved Bridge. Juvenile coho salmon were only captured at Sandy Bar. Juvenile steelhead were caught at all four locations trapped in the SFTR. Peak steelhead catches occurred during WE July 8, 1996 at Hayfork Creek, during WE July 15, 1996 at both Curved Bridge and Forest Glen, and during WE August 12, 1996 at Sandy Bar. Out-migrant trapping ceased in early December 1996 due to high flows.

Out-migrant trapping began march 1997 at thirteen stations (Table 1). Juvenile chinook

salmon were captured at four stations, three located in the SFTR (Sandy Bar, **Curved** Bridge, and Forest Glen), and at the mouth of Hayfork Creek. Juvenile steelhead were captured at all stations. Three juvenile coho salmon were captured at Sandy Bar. Peak catches of juvenile chinook salmon in SFTR (Sandy Bar, Curved Bridge and Forest Glen) occurred during WE May 20, 1997, and during WE April 1, 1997 at Hayfork Creek. Juvenile steelhead peak numbers varied from location to location.

Table 1. Total number of juvenile salmon and steelhead caught in out-migrant traps throughout the South Fork Trinity River (SFTR) basin, July 1996 through June 1997.

			Catch		
Location	RK	Time span	Chinook	Coho	Steelhead
South Fork Trinity River					
Sandy Bar	2.2	7/ 96- 12/96 3/97-6/97	6 130	1 3	100 229
Curved Bridge	49.6	7/96- 12/96 3/97-6/97	1 101	0 0	189 1,330
Forest Glen	89.5	7/96- 12/96 3/97-6/97	13 115	0 0	803 711
Above EF of SFTR	117.8	3/97-6/97	0	0	501
Hayfork Creek					
Hayfork Creek	0.1	7/96- 12/96 3/97-6/97	1 114	0 0	1,603 2,23 1
9-mile Bridge	18.6	3/97-6/97	0	0	2,702
near Big Creek	32.6	3/97-6/97	0	0	3,054
Wildwood	54.0	3/97-6/97	0	0	160
near Dubakella Creek	58.4	3/97-6/97	0	0	8
Other Tributaries'					
East Fork of SFTR	0.1	3/97-6/97	0	0	119
Pelletreau Creek	0.3	3/97-6/97	0	0	46
Eltapom Creek	0.1	3/97-6/97	0	0	363

Life history patterns: Scales collected during field activities are currently being analyzed and results will be reported in a future report.