

## ANNUAL PERFORMANCE REPORT

AGENCY: California Department of Fish and Game

PROJECT (CONTRACT) NO: 1-FG-20-09820 (FG 0414)

PROJECT TITLE: Trinity River Basin Salmon and Steelhead Monitoring Project

PERIOD COVERED: July 1, 1995 through June 30, 1996

INTRODUCTION: This is the eighth 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 were designed to complement restoration activities authorized by Public Law 98-541 (Trinity River Basin Fish and Wildlife Restoration Act) enacted by Congress in 1984. Task titles and prior study years are listed in the table below. Reports detailing results of these activities are available upon request from: California Department of Fish and Game, Inland Fisheries Division, 1416 9<sup>th</sup> 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.	1999-1995
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

## TASK REPORTS:

Due to minor changes in Task objectives beginning with this reporting year, Task numbers have been revised to better reflect Department prioritization.

### **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 8/25/95 through 12/01/95, returning fall chinook, coho and steelhead were captured and tagged at a temporary weir in the Trinity River near the town of Willow Creek, California. A second weir, near the town of Junction City, normally operated to capture spring chinook, was not installed this season due to funding uncertainties.

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. All fish, but 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, fish from which anglers reported removing the tags and releasing the fish and fish which were harvested downstream of the weir.

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-third of the salmon and all of the 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 weir and Trinity River Hatchery (TRH) were smooth with a moving average of five, 1-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  $\leq 41$  cm FL were consider half-pounders.

All salmon and steelhead entering TRH were counted, measured and examined for Project tags. Run-size estimates, upstream of the weir, 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 the weir was trapped and tagged at the weir. Run-sizes, upstream of the weir, were estimated with the formula:  $N = ((M+I)(C+I))/(R+I)$  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 run-size, angler-harvest and spawner-escapement estimates are for Trinity River basin 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  $\pm 10\%$  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:

Willow Creek Weir (WCW) was installed and began fishing 08/20/95 and continued through 12/02/95. During this time we fished 71 nights and caught 6,418 chinook, 356 coho and 542 steelhead. We effectively tagged 4,788 fall chinook, 320 coho and 497 steelhead.

CWT analysis indicated spring chinook were trapped through 09/09/95 after which fall chinook were trapped. Length frequency analysis indicated that spring grilse were  $\leq 51$  cm FL, fall grilse were  $\leq 53$  cm FL and coho grilse were  $\leq 52$  cm FL.

Based on the above analysis, our catch at WCW this season was composed of 217 grilse and 921 adult spring chinook, 494 grilse and 4,786 adult fall chinook, 14 grilse and 342 adult coho and 20 half-pounder and 522 adult steelhead.

Totals of 15,254 fall chinook, 4,767 coho and 705 adult steelhead entered Trinity River Hatchery this season. Project tags were recovered from 690 (4.5% of the total) fall chinook, 94 (2.0%) coho and 81 (11.5%) steelhead.

We were unable to estimate spring chinook run size this year. Previous spring chinook run-size estimates have ranged from 2,381 in 1991 to 62,692 in 1988 (Appendix 1).

This year's fall chinook run-size was estimated to be 105,725 fish composed of 9,892 grilse and 95,833 adults. Of these, anglers harvested an estimated 554 grilse and 2,779 adults leaving 9,338 grilse and 93,054 adults available to spawn. This spawner escapement was composed of natural spawners (9,262 grilse and 77,876 adults) and TRH spawners (76 grilse and 15,178 adults). Since 1977, fall chinook run-size estimates have ranged from 9,207 (in 1991) to 147,888 (in 1986) (Appendix 2).

We estimated the coho run size at 16,111 fish composed of 634 grilse and 15,477 adults. Anglers harvested 294 (all adults) leaving 15,817 available to spawn. The spawner escapement was split between natural spawners (370 grilse and 10,680 adults) and TRH spawners (264 grilse and 4,503 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. Next year will be the last we will be able to distinguish between hatchery- and naturally produced adult steelhead in the Trinity River basin.

Steelhead run size was estimated at 4,288 adults composed of 2,693 wild and 1,595 hatchery-produced fish. Anglers harvested 145 wild and 147 hatchery-produced steelhead, respectively. Spawner escapement was estimated at 2,524 wild and 767

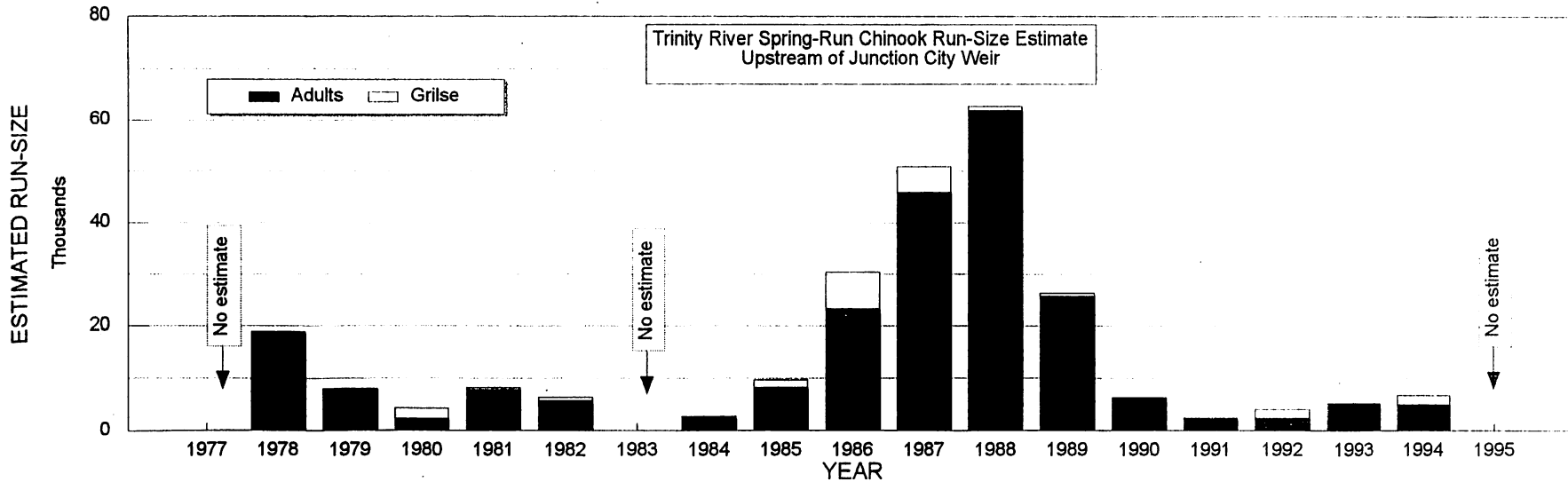
hatchery-produced fish spawning naturally and 24 wild and 681 hatchery-produced fish spawning in the hatchery. Steelhead run size upstream of WCW has ranged from 3,046 in 1992 to 37,276 in 1989 (Appendix 4).

Prepared by: \_\_\_\_\_ Date: July 10, 2008

Mark Zuspan

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 1995.

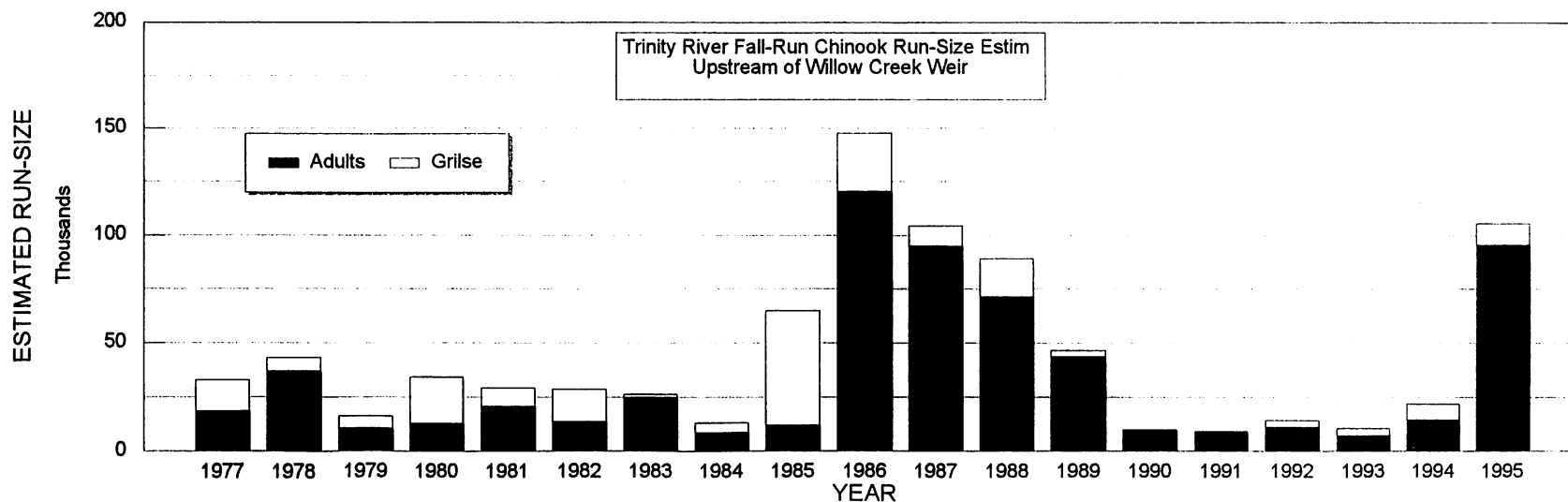
Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adults		Total	Natural			Trinity River Hatchery			Grilse	Adults	Total
	Number	Percent	Number	Percent		Grilse	Adults	Total	Grilse	Adults	Total			
1977	No estimates					No estimates			385	1,124	1,509	No estimates		
1978	190	1.0%	18,816	99.0%	19,006	29	14,384	14,413	153	3,680	3,833	8	752	760 a/
1979	113	1.4%	7,964	98.6%	8,077	0	5,008	5,008	113	1,658	1,771	0	1,298	1,298
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 b/	863
1986	7,018	23.1%	23,403	76.9%	30,421	4,335	13,371	17,706	1,461	7,083	8,544	1,222	2,949	4,171
1987	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	4,983	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 b/	298
1993	68	1.3%	5,164	98.7%	5,232	37	2,111	2,148	31	2,630	2,661	0	423 b/	423
1994	1,793	26.4%	4,995	73.6%	6,788	550	2,897	3,447	944	1,943	2,887	299	155 b/	454
1995	No estimates					No estimates			307	8,722	9,029	No estimates		



a/ The 1978 sport harvest of spring-run chinook was limited by a salmon fishing closure beginning August 25 1978.  
 b/ 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 September 22 in 1985, November 5 in 1992, October 9 in 1993, and October 3 in 1994.

APPENDIX 2. Fall-run chinook salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1995.

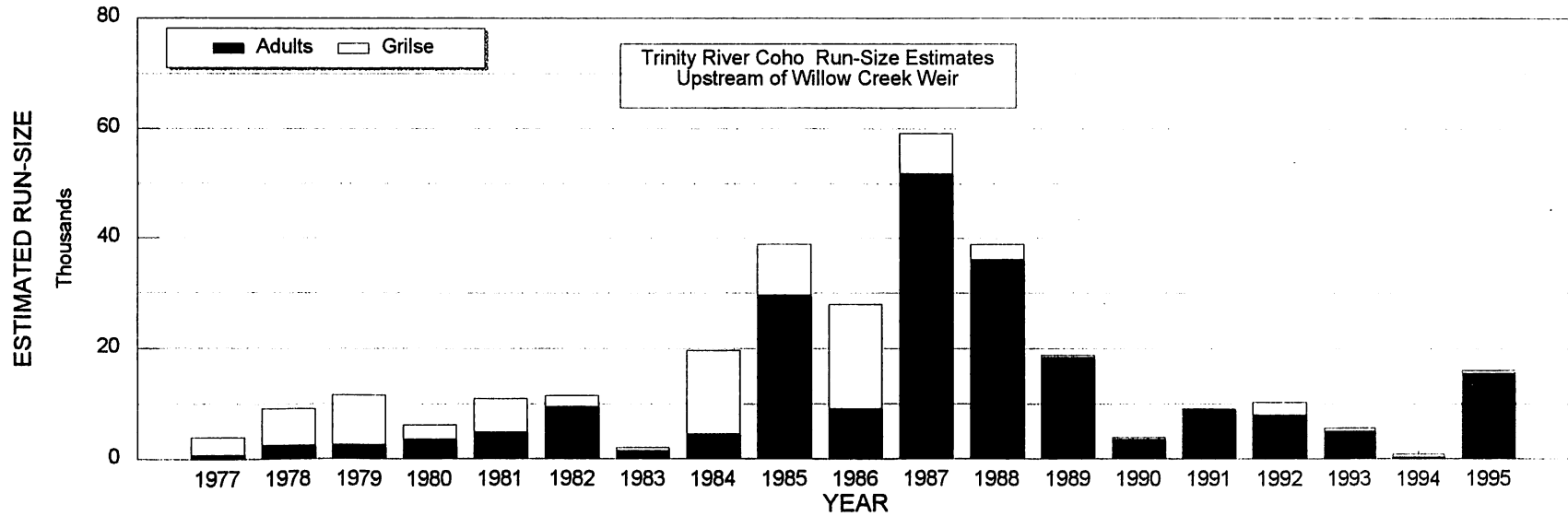
Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adults		Total	Natural			Trinity River Hatchery			Grilse	Adults	Total
	Number	Percent	Number	Percent		Grilse	Adults	Total	Grilse	Adults	Total			
1977	14,318	43.5%	18,596	56.5%	32,914	9,737	13,501	23,238	2,177	2,035	4,212	2,404	3,060	5,464
1978	6,037	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%	34,346	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	4,630
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	5,654	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 b/	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	16,387	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	79.3%	14,164	2,563	7,139	9,702	211	3,779	3,990	158	314 b/	472
1993	3,381	32.2%	7,104	67.8%	10,485	2,473	5,898	8,371	736	815	1,551	172	391 b/	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 b/	807
1995	9,892	9.4%	95,833	90.6%	105,725	9,262	77,876	87,138	76	15,178	15,254	554	2,779 b/	3,333



a/ The 1978 sport harvest of fall-run chinook was essentially eliminated by a salmon fishing closure beginning 25 August 1978.  
 b/ 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 September 22 in 1985, November 5 in 1992, October 9 in 1993, October 3 in 1994 and October 1 through October 28 1995.

APPENDIX 3. Coho salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1995.

Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adults		Total	Natural			Trinity River Hatchery			Grilse	Adults	Total
	Number	Percent	Number	Percent		Grilse	Adults	Total	Grilse	Adults	Total			
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	700
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	1,462	1,635	5	42	47
1991	265	2.9%	8,859	97.1%	9,124	164	6,163	6,327	98	2,590	2,688	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	578	10.2%	5,063	89.8%	5,641	421	3,039	3,460	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



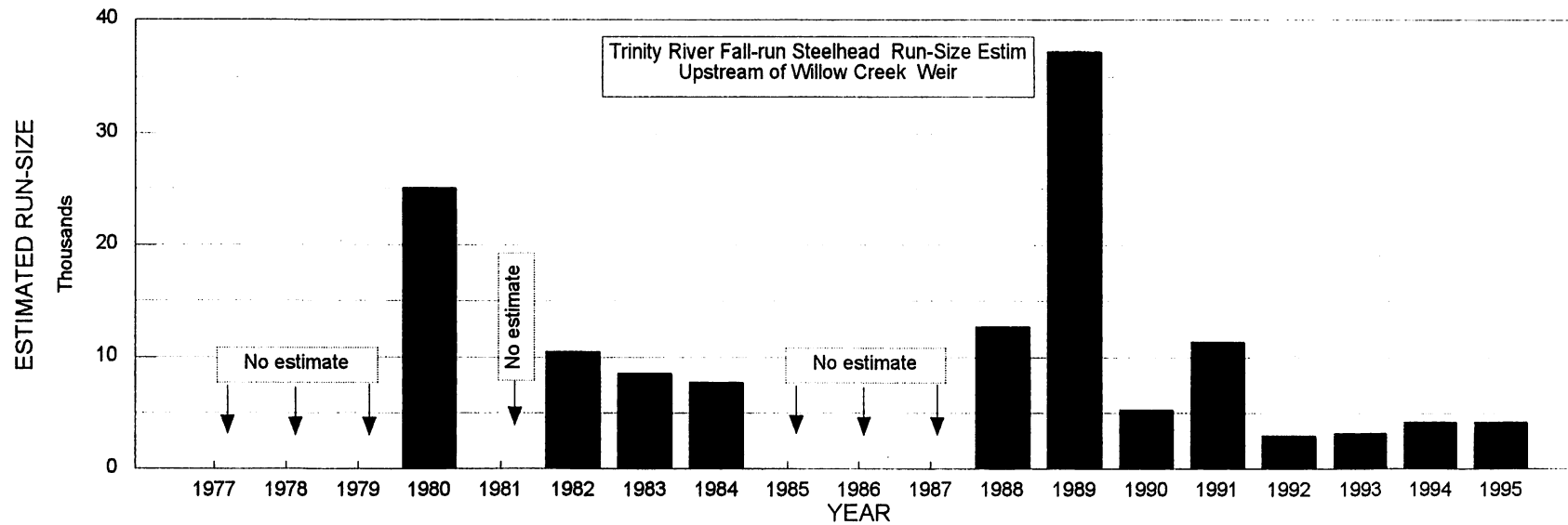
a/ The 1978 sport harvest of coho was essentially eliminated by a salmon fishing closure beginning 25 August 1978.

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 steelhead run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1995.

Year	Run-size estimate					Spawner escapement						Angler harvest		
	Hatchery a/		Wild b/		Total	Natural			Trinity River Hatchery			Hatchery	Wild	Total
	Number	Percent	Number	Percent		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%	16,645	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%	8,426	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		
1984	"				7,833				6,430			142		
1985	No estimates					No estimates			461			No estimates		
1986	"					"			3,780			"		
1987	"					"			3,007			"		
1988	No estimates for hatchery/wild components				12,743				11,926 c/			817		
1989	"				37,276				28,933			4,765		
1990	"				5,348				3,188			930		
1991	"				11,417				8,631			446		
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	41.6%	3,243	801	1,176	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



a/ Trinity River Hatchery-produced steelhead.

b/ Naturally produced steelhead.

c/ 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:

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

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;  $NH_{ADclip}$  = total number of Ad-clipped salmon

observed at TRH; and  $N_{\text{run-size estimate}} = \text{run-size estimate}$ .

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:

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

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

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

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

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

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:

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

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

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

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

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

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

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

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

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 4,533 ad-clipped salmon at TRH this season. These included 2,513 spring chinook, 1,499 fall chinook and 514 coho. The returning spring chinook CWTed fish were composed of ten release groups from the 1990 through 1993 Brood years (BY)s (Appendix 1). The fall chinook CWTs were also from ten groups representing the 1990 through 1993 BYs (Appendix 1). Only one coho CWT group was recovered at TRH this season (Appendix 1).

Return rates for hatchery spring chinook were not determined this year because we unable to produce a spring chinook run-size estimate (see Task 1 above). Unfortunately, hatchery recovery alone would not be a good indication of the performance of individual CWT groups. Due to exceptionally high run size, the hatchery ladder was operated on a part-time basis. Many fish, including ad-clipped fish, were denied access to the hatchery during the times the ladder was closed. Therefore, the count of ad-clipped fish at TRH is less, by an unknown number, than it would have been under normal hatchery operation.

Of the ten fall chinook CWT groups returning to TRH this season, the 1992 BY released as yearlings were by far the most prevalent. This season's return rates for fall CWTed chinook ranged from .006% (1990 BY yearlings) to 3.263% (1992 BY yearlings) (Appendix 2). Historic return rates of three-year old yearling-released fall chinook have ranged from 0.06% (1990 BY) to 5.73% (1983 BY).

The 1992 BY fall chinook fingerling release group returning as three-year old fish also performed well, with a return rate of 0.92% (Appendix 2). Historic return rates of fingerling-release three-year old returnees have ranged from 0.95% (1985 BY) to 0.01% (1989 BY).

We estimated that 1,511 coho salmon from the 1992 BY returned to the Trinity River basin upstream of WCW this season. Of these, anglers harvested 29 leaving 463 to spawn in the hatchery and 1,020 to spawn naturally. The return rate of this release group was 2.761%.

All coho and fall chinook release groups from the 1992 BY had exceptionally high return rates this year. This is attributable to good survival of the 1992 BY both in the riverine and marine environment.

Prepared by: \_\_\_\_\_ Date: July 10, 2008  
Mark Zuspan

APPENDIX 1. Release and recovery data for adipose fin-clipped chinook and coho salmon recovered at Trinity River Hatchery (TRH) during the 1995-96 season.

CWT a/ code	Egg source	Brood year	Release data				Recovery data				Total No.
			Date	Number	Size (No./kg)	Site	Males		Females		
							No.	FL b/	No.	FL b/	
<b>Spring-run chinook salmon</b>											
065636	TRH	1990	10/08/91	48,553	21.8	TRH	0		1		1
065640	TRH	1990	10/08/91	46,086	21.8	TRH	0		1		1
0601040105	TRH	1991	06/05/92	198,277	74.8	TRH	5	75.0	16	70.4	21
065658	TRH	1991	10/02/92	110,797	18.0	TRH	1		2	75.5	3
0601040106	TRH	1992	06/15/93	215,038	97.9	TRH	820	71.0	925	65.8	1,745
065734	TRH	1992	10/1-7/93	53,675	25.1	TRH	182	66.1	109	62.6	291
065735	TRH	1992	10/1-7/93	56,281	25.1	TRH	106	65.2	69	62.2	175
0601040107	TRH	1993	06/01-10/94	222,056	116.8	TRH	29	50.4	3	61.3	32
055708	TRH	1993	10/3-14/94	53,738	23.6	TRH	17	44.0	1		18
065709	TRH	1993	10/3-14/94	57,787	23.6	TRH	7	45.4	1		8
100000 c/ d/							110	71.7	108	65.0	218
Spring-run chinook salmon totals:							1,277		1,236		2,513
<b>Fall-run chinook salmon</b>											
065638	TRH	1990	10/09/91	103,040	25.7	TRH	1		2	73.5	3
0601040104	TRH	1991	06/22/92	206,416	85.0	TRH	6	76.2	8	74.9	14
065731	TRH	1991	10/02/92	58,580	21.3	TRH	3	82.7	2	76.5	5
065732	TRH	1991	10/02/92	56,720	21.3	TRH	2	75.5	8	76.0	10
065733	TRH	1992	06/16/93	192,032	145.9	TRH	264	71.6	163	68.1	427
065748	TRH	1992	10/1-7/93	54,586	33.7	TRH	291	65.9	120	65.2	411
065749	TRH	1992	10/1-7/93	54,308	33.7	TRH	324	66.5	106	64.7	430
065704	TRH	1993	6/10-15/94	201,032	191.8	TRH	5	45.4	0		5
065705	TRH	1993	10/3-14/94	55,039	27.6	TRH	8	45.8	0		8
065706	TRH	1993	10/3-14/94	55,297	27.6	TRH	5	45.4	0		5
100000 c/ e/							94	69.8	87	67.3	181
Fall-run chinook salmon totals:							1,003		496		1,499
<b>Coho salmon</b>											
065760	TRH	1992	03/15-28/94	54,723	22.7	TRH	212	69.3	251	68.0	463
100000 c/							16	66.0	35	67.1	51
Coho salmon totals:							228		286		514

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 fall-run chinook salmon returning to the Trinity River upstream of Willow Creek Weir during the period 1992 through 1995.

Release data					Estimated returns						
CWT a/ code	Brood year	Date b/ Date b/	Number	Site	Age	Run- size	% of release	River harvest	Spawning escapement		
									TRH c/	Natural	Total
065638	1990	10/09/91	103,040	TRH	2	18	0.009	1	10	7	17
					3	60	0.029	3	39	19	58
					4	76	0.037	1	41	34	75
					5	12	0.006	0	3	9	12
					Totals: d/	166	0.161	5	93	69	162
Total adults: e/	148	0.144	4	83	62	145					
0601040104	1991	06/22/92	206,416	TRH	2	268	0.140	14	174	81	255
					3	612	0.319	11	330	271	601
					4	58	0.028	2	14	42	56
065731	1991	10/02/92	58,580	TRH	2	18	0.033	1	12	5	17
					3	189	0.346	3	102	84	186
					4	21	0.010	1	5	15	20
065732	1991	10/02/92	56,720	TRH	2	18	0.033	1	12	5	17
					3	230	0.424	4	124	102	226
					4	41	0.020	1	10	30	40
065733	1992	06/16/93	192,032	TRH	2	436	0.217	32	235	169	404
					3	1760	0.917	51	427	1282	1709
065748	1992	10/01-07/93	54,586	TRH	2	67	0.122	5	36	26	62
					3	1694	3.103	49	411	1234	1645
065749	1992	10/01-07/93	54,308	TRH	2	43	0.078	3	23	17	40
					3	1772	3.263	51	430	1291	1721
065704	1993	6/10-15/94	201,032	TRH	2	21	0.010	1	5	15	20
065705	1993	10/03-14/94	55,039	TRH	2	37	0.067	2	9	26	35
065706	1993	10/03-14/94	55,297	TRH	2	21	0.038	1	5	15	20

a/ 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/ Totals are presented only for brood year 1989. 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.

f/ Tagged and released by Trinity River Hatchery personnel.

---

**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 TRH-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:

We began marking the 1994 BY TRH coho on 02/28/96 and finished on 03/11/96. All 72,311 fish from this BY received a right-maxillary clip. On 3/28/96 we measured and checked 1,645 marked coho for clip effectiveness. All fish were properly marked and the group averaged 160.0 mm FL. The entire BY was released from the hatchery release facility on 4/2/96.

Coho from the 1994 BY should begin to show up as two-year old fish during the fall of 1996.

Prepared by: \_\_\_\_\_ Date: July 10, 2008

Mark Zuspan

**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:

Personnel from the Resource Conservation District in Weaverville conducted the spawner survey this year. They followed methods used by the Department of Fish and Game in previous year's surveys. Data collected in this year's survey were compiled, edited and analyzed by the Department.

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 1995 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





Zone	Number carcasses flagged	Flags recovered	% recovery	Total observed	Expanded total	% distribution	Spawner density (fish/km)
4	177	30	16.9%	1,067	6,295	8.9%	605
5-7	116	4	3.4%	691	20,039	28.2%	632
Total	3,599	1,823	50.7%	25,095	71,095	100%	1,121

We recovered a total of 1,030 adipose-fin clipped chinook during the main stem survey this season. Coded-wire tags were extracted from 864 of these and represented 32 different code groups from four brood years (BY) (Table 3). Based on timing of CWTed fish recovered in the survey, we assume that only spring chinook were recovered through 10/29 after which only fall chinook were recovered.

Table 3. Release and recovery data for coded-wire tagged chinook salmon recovered in the 1995 Trinity River spawner survey.

CWT a/	Type b/	Brood year	Location c/	Number effectively tagged d/	Number recovered
601080112	Wild	1990	Steelbridge	19,090	1
601080113	Wild	1990	Sky Ranch	26,741	1
601080114	Wild	1990	Sky Ranch	27,034	1
65636	S-y	1990	TRH	48,553	1
601080304	Wild	1991	Sky Ranch	9,408	1
601080308	Wild	1991	Hardhat	4,260	1
0601040104	F-f	1991	TRH	206,416	7
0601040105	S-f	1991	TRH	198,277	3
065658	S-y	1991	TRH	110,797	3
065731	F-y	1991	TRH	58,580	6
065732	F-y	1991	TRH	56,720	3
0601040106	S-f	1992	TRH	215,038	449
0601080402	Wild	1992	Hardhat	9,816	12
0601080403	Wild	1992	Sky Ranch	7,781	4
0601080404	Wild	1992	Sky Ranch	7,495	4
0601080405	Wild	1992	Sky Ranch	6,568	3
0601080407	Wild	1992	Sky Ranch	7,993	2
065733	F-f	1992	TRH	192,032	143
065734	S-y	1992	TRH	53,575	61
065735	S-y	1992	TRH	56,281	52
065748	F-y	1992	TRH	54,586	49
065749	F-y	1992	TRH	54,308	44

CWT a/	Type b/	Brood year	Location c/	Number effectively tagged d/	Number recovered
0601040107	S-f	1993	TRH	222,056	3
0601080212	Wild	1993	Sheridan	9,177	1
601080214	Wild	1993	Sheridan	7,125	1
0601080313	Wild	1993	Sheridan	11,699	1
0601080502	Wild	1993	Sheridan	11,837	2
601080503	Wild	1993	Sheridan	10,115	1
065704	F-f	1993	TRH	201,032	1
065705	F-y	1993	TRH	55,039	1
065706	F-y	1993	TRH	55,297	1
065708	S-y	1993	TRH	53,738	1
100000 e/					166
Totals:					1,030

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 62.1% of the adults while fall chinook females comprised 59.0% of the total. Females accounted for 59.6% of the of the total (spring plus fall) adult recovery in the survey.

We observed a female pre-spawning mortality rate of 16.0% for spring chinook and 27.3% for fall chinook. The overall (spring and fall chinook) pre-spawning mortality rate for female adults was 24.8%. 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 577 adult coho salmon this season. Based on the efficiency rates developed from chinook flag recovery, we estimated 1,361 adult coho died in the main stem survey area this season (Table 4). Spawner density was highest in zone 1 (177 fish per km) and lowest in zone 4 (3 fish per km) with a overall average of 22 fish per km (Table 4).

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

Zone	Total observed	Observation efficiency (%)	Expanded total	% distribution	Spawner density (fish/km)
1	320	56.5	566	41.6	177
2	183	58.3	314	23.1	40
3	59	32.6	181	13.3	18
4	6	16.9	36	2.6	3
5-7	9	3.4	265	19.4	8
Total	577		1,361	100.0	22

We recovered 64 chinook and 10 coho carcasses and observed a total of 585 redds during the tributary surveys. Based on the proportion of chinook to coho carcasses, the redds were composed of 479 chinook redds and 106 coho redds. The number of redds observed ranged from 21 in Weaver Creek to 123 in the North Fork of the Trinity River (Table 5).

Table 5. Observed salmon redd numbers and distribution for the 1995-1996 Trinity River tributary spawner survey.

Tributary	Number observed			Proportional redd distribution a/	
	Chinook	Coho	Redds	Chinook	Coho
Rush Creek	16	3	88	74	14
Grass Valley Creek	17	4	106	86	20
Indian Creek	5	1	60	50	10
Reading Creek	0	1	33	0	33
Browns Creek	1	1	58	29	29
Weaver Creek	2	0	21	21	0
Canyon Creek	6	0	67	67	0
N. F. Trinity River (NFT)	17	0	123	123	0
E. Fork of the NFT	0	0	29	29	0
Totals:	64	10	585	479	106

a/ The number of redds, by species, was derived by proportioning the total number of redds by the ratio of chinook to coho carcasses observed in the survey.

Prepared by: \_\_\_\_\_ Date: July 10, 2008

Mark Zuspan

**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 seven 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 March 20 and concluded on May 10, 1996. Total effort during this period was 171 trap nights (one net fished for one night) and total catch was 142,817 chinook, 178 coho and 1,019 steelhead.

While we caught more chinook this season than any past season, catch could have been much higher. Trapping results indicate fish were migrating both before we began and after we completed our efforts. We were unable to trap earlier due to funding uncertainties and scheduled high flows from Lewiston Dam beginning May 12 prevented further trapping.

We began coded-wire tagging operations on April 9 and finished on May 11. Project personnel coded-wire tagged 132,637 chinook this season. After subtracting for tagging mortality, tag shedding and poor fin clips, we effectively tagged a total of 123,610 naturally produced chinook. Prior year's effective tagging totals are; 15,704 (1988-89), 112,133 (1989-90), 72,865 (1990-91), 56,610 (1991-92), 44,565 (1992-93) and 92,486 (1993-94).

We coded-wire tagged five groups of naturally produced chinook this season. The number of fish effectively tagged in each group ranged from 29,007 to 16,353 (Table 1).

Chinook catch per unit effort (CPUE), as measured by the weekly average number of fish caught per trap night, ranged from 304 (April 30 - May 6) to 1,324 (April 2-8), averaging 835 fish through the season. Coho CPUE ranged from zero to three with a season average of one fish per trap night. Steelhead CPUE ranged from two to twelve fish averaging six fish per trap night.

Chinook trapped throughout the season ranged in fork length (FL) from 36 to 84 mm averaging 48.6 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 season.

Coded-wire tag number	Inclusive tagging dates	Number effectively tagged	Average fork length (mm)
0601080115	April 4-23	23,248	46.1
0601080201	April 15-24	27,057	47.6
0601080202	April 22-30	29,007	50.0
0601080206	April 30-May 9	27,945	56.0
0601080207	May 9-11	16,353	54.1
Season Total		123,610	48.6

Prepared by: \_\_\_\_\_ Date: July 10, 2008

Mark Zuspan



**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:

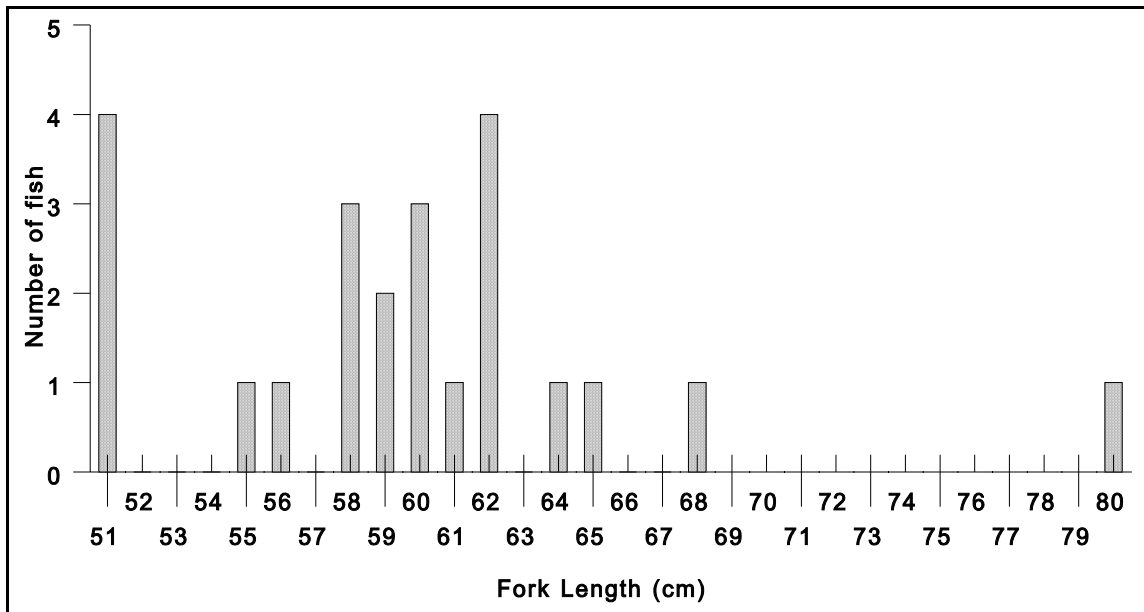
Work on Task 6 was initiated at the end of May 1996, when approval to begin work was received. At that time few seasonal employees were available to assist with equipment fabrication and procurement, and field work. The amount of work that was completed during this report period is therefore small.

Procedures:

Weir. The Gates Weir was installed at river km (RK) 31.7 to capture upstream migrants for examination and tagging; provision was made to trap downstream migrating steelhead. The weir was fished five nights/week. All salmon and steelhead captured were examined to determine species, sex, and fork length. Hatchery marks and other scars were recorded if present. Captured fish judged in good condition received an anchor tag and secondary fin clip, and then released to continue their migration.

Results:

Weir. The Gates Weir was installed June 19, 1996 and removed July 8, 1996. Totals of 32 spring-run chinook salmon (4 grilse and 28 adults) and 2 adult steelhead were captured. Twenty one spring-run chinook salmon were effectively tagged. Spring-run chinook salmon averaged 60.1 cm FL, and ranged in length from 51 to 80 cm, FL (Figure



1). The two captured steelhead were 46 and 58 cm, FL. The weir was removed when morning water temperatures exceeded 15 deg. C to reduce the risk of handling mortality.

Juvenile outmigrant trapping. We are now in the process of hiring seasonal staff, and preparing equipment to conduct juvenile outmigrant sampling. Sampling will commence in early July.

Prepared by: \_\_\_\_\_ Date: July 10, 2008

Bill Jong