

**ANNUAL
PERFORMANCE REPORT**

AGENCY: California Department of Fish and Game

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

PROJECT TITLE: Trinity River Basin Salmon and Steelhead Monitoring Project

PERIOD COVERED: July 1, 1997 through June 30, 1998

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

Specific Tasks were designed to complement restoration activities authorized by Public Law (P.L.) 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 Program Branch, 1416 Ninth Street, Sacramento, California 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 an additional three years ending September 30, 1998. This report is the third 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, Northern California-North Coast Region, 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 June 18, 1997, through September 30, 1997, 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 August 20, 1997, through November 18, 1997, 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 Willow Creek Weir (WCW) chinook, coho and steelhead were tagged.

At both weirs, personnel identified all salmon and steelhead captured to species, measured to the nearest cm fork length (FL), examined for hook and gillnet 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 nonreward 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 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 considered adults and steelhead \leq 41 cm FL were considered 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 the weir were 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 JCW while all fall chinook, coho and steelhead estimates are for fish migrating upstream of the WCW.

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 to 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 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 tagged (CWT) analysis was used for this determination. Each year a portion of spring and fall chinook produced at TRH is given an adipose-fin clip and CWT. These CWTs carry a binary code which identifies the origin of the fish carrying it. When the catch of fall CWT chinook exceeds spring CWT 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 CWT chinook captured at the weirs and returning to TRH indicates that all chinook captured at JCW and chinook trapped through September 9, 1997, at WCW were spring chinook. Chinook trapped after September 9, 1997, at WCW were considered fall chinook. Length frequency analysis indicated that spring grilse were ≤ 49 cm FL, fall grilse were ≤ 49 cm FL and coho grilse were ≤ 51 cm FL.

Junction City Weir

We installed and began fishing at JCW on June 18, 1997, and continued through September 30, 1997, fishing a total of 67 nights. During this period we caught 1,041 chinook (all spring) and 20 steelhead.

Based on length frequency analysis, the spring chinook trapped at JCW were composed of 11 grilse and 1,030 adults and the 20 steelhead were all adults. Of these, we effectively tagged 1,017 chinook; no steelhead were tagged.

Willow Creek Weir

WCW was installed and began fishing September 20, 1997, and continued through November 18, 1997. 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 63 nights and caught 370 spring and 748 fall chinook, 220 coho and 753 steelhead.

Length frequency analysis indicates our catch at WCW this season was composed of 21 grilse and 349 adult spring chinook, 132 grilse and 616 adult fall chinook, 165 grilse and 55 adult coho and 13 half-pounders and 740 adult steelhead. We effectively tagged 731 fall chinook, 202 coho and 703 steelhead. At WCW, CWT spring chinook are not used to generate estimates as we capture only a small portion of that run.

Trinity River Hatchery

Totals of 5,117 spring chinook, 6,207 fall chinook, 1,759 coho and 430 adult steelhead entered TRH this season. Project tags were recovered from 315 (6.2% of the total) spring chinook, 205 (3.3%) fall chinook, 44 (2.5%) coho and 57 (13.3%) adult steelhead.

Run-Size Estimates

This year's spring chinook run-size was estimated to be 20,039 fish composed of 768 grilse and 19,271 adults. Of these, anglers harvested an estimated 1,330 adults (no grilse were reported harvested), leaving 768 grilse and 17,941 adults available to spawn. This spawner escapement was composed of natural spawners (543 grilse and 13,094 adults) and TRH spawners (225 grilse and 4,892 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 21,347 fish composed of 3,767 grilse and 17,580 adults. Anglers harvested an estimated 102 grilse and 686 adults, leaving 3,665 grilse and 16,894 adults available to spawn. This spawner escapement was composed of natural spawners (2,845 grilse and 11,507 adults) and TRH spawners (820 grilse and 5,387 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 7,935 fish composed of 5,951 grilse and 1,984 adults. Anglers harvested 42 (all grilse) leaving 7,893 available to spawn. The spawner escapement was split between natural spawners (5,038 grilse and 1,097 adults) and TRH spawners (871 grilse and 887 adults). Coho run size upstream of WCW has ranged from 852 in 1994 to 59,079 in 1987 (Appendix 3).

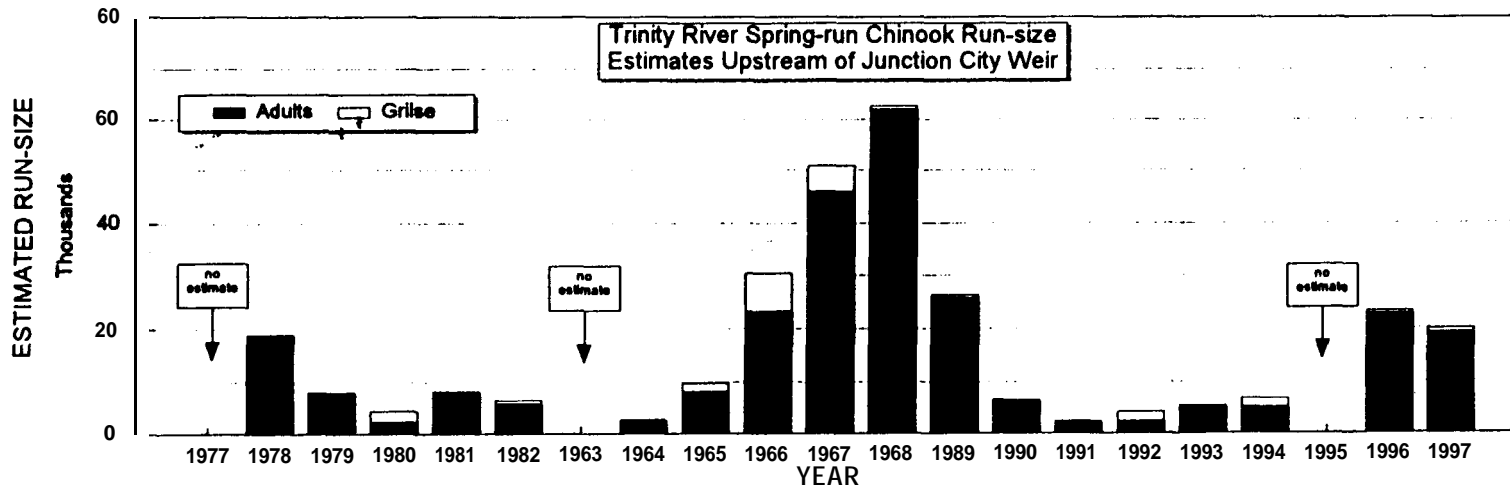
All steelhead released from TRH since the 1989 brood year (BY) have been fin-clipped. Recovery of these fin-clipped fish as adults at the weirs and TRH allow us to make independent run-size, spawner-escapement and angler-harvest estimates for hatchery- and naturally produced steelhead in the basin. The steelhead marking program at TRH was discontinued for the 1994 BY. As a result, we were not able to estimate hatchery/wild and natural components as in previous years.

Steelhead run size was estimated at 5,212 adults. Anglers harvested 516 adult steelhead leaving 4,696 to spawn. The spawner escapement was composed of 4,267 natural spawners and 429 TRH hatchery spawners. Steelhead run size upstream of WCW has ranged from 3,046 in 1992 to 37,276 in 1989 (Appendix 4).

Prepared by: Messrs. Michael R. Lau and Wade Sinnen
California Department of Fish and Game
November 18, 1998

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 1997.

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 estimate						No estimate		
1978	190	1.0%	16,616	99.0%	19,006	29	14,364	14,413	365	1,124	1,509	8	752	760
1979	113	1.4%	7,964	98.6%	6,077	0	5,008	5,008	113	1,668	1,771	0	1,296	1,296
1980	1,949	45.9%	2,301	54.1%	4,256	1,312	1,614	2,926	353	547	900	284	140	424
1981	347	4.2%	7,913	95.6%	6,260	242	3,362	3,604	95	2,405	2,500	10	2,146	2,156
1982	656	10.3%	5,731	69.7%	6,387	387	3,868	4,255	150	1,226	1,376	119	637	756
1983	No estimates					No estimates						No estimator		
1984	255	9.4%	2,465	90.6%	2,720	140	1,354	1,494	76	736	612	39	375	414
1985	1,434	14.6%	6,276	65.2%	9,712	799	4,697	5,696	506	2,645	3,153	127	736 b/	663
1986	7,016	23.1%	23,403	76.9%	30,421	4,335	13,371	17,706	1,461	7,083	6,544	1,222	2,949	4,171
1987	4,658	9.5%	46,016	90.5%	50,674	2,577	29,083	31,660	1,367	6,466	9,653	894	0,467	9,361
1988	720	1.1%	61,972	96.9%	62,692	241	39,329	39,570	377	13,905	14,282	102	8,736	8,840
1989	502	1.9%	25,804	98.1%	26,306	435	16,241	16,676	17	4,983	5,000	50	2,580	2,630
1990	265	4.1%	6,123	95.9%	6,388	126	2,080	3,006	104	2,433	2,537	35	810	645
1991	190	6.0%	2,191	92.0%	2,381	92	1,268	1,360	71	614	605	27	30s	336
1992	1,671	41.5%	2,359	56.5%	4,030	944	942	1,886	533	1,313	1,646	194	104 b/	298
1993		1.3%	5,164	96.7%	5,232	37	2,111	2,146	31	2,630	2,661	0	423 b/	423
1994	1,7	26.4%	4,995	73.6%	6,708	550	2,897	3,447	944	1,943	2,687	299	155 b/	454
1995	No estimate					No estimates						No estimates		
1996	46s	2.1%	22,927	97.9%	23,416	370	16,283	16,653	119	5,131	5,250	0	1,513 b/	1,513
1997	768	3.6%	19,271	96.2%	20,039	543	13,049	13,592	225	4,692	5,117	0	1,330 b/	1,330



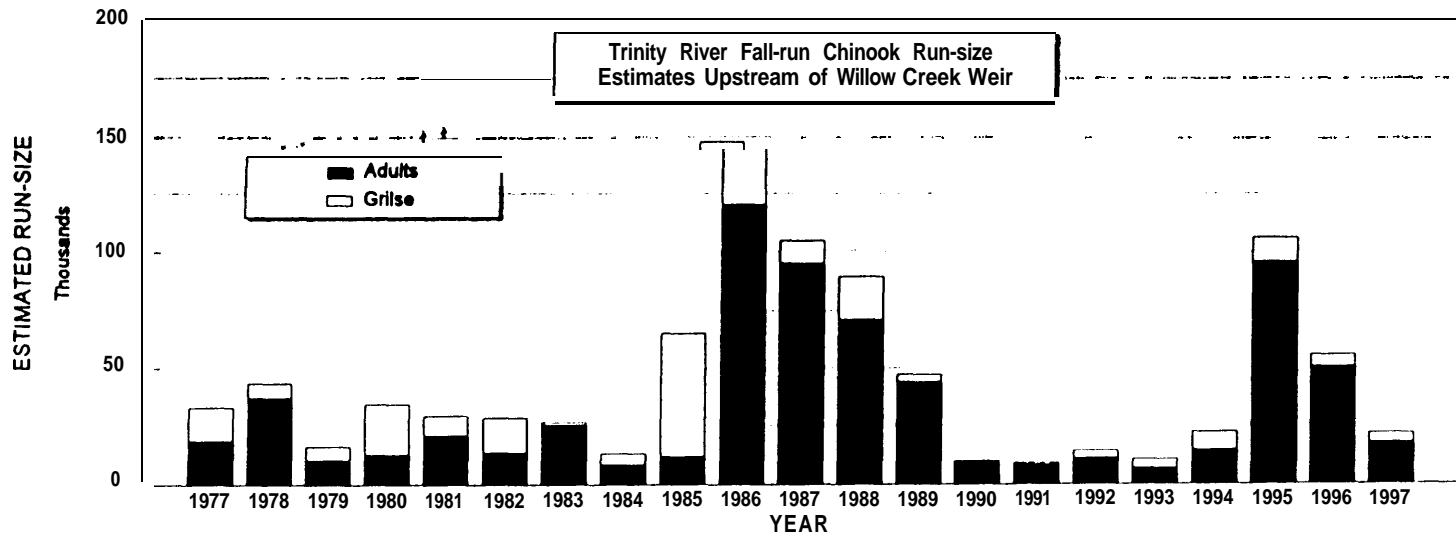
a/ The 1978 sport harvest of spring-run chinook was limited by a salmon fishing closure beginning 25 August 1978.
 b/ The sport harvest of adult spring-run chinook was limited by fishing closures to the taking chinook salmon greater than or equal to 56 cm total length during these years. The closures took effect 22 September in 1965, 5 November 1992, 9 October 1993, and 3 October 1994. The Trinity River was subject to seasonal closures during the 1995-97 seasons, commencing 9 September in the lower river. Various periods of openings and closures (seasons) were instituted along the river through November 30.

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 1997.

Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adults		Total	Natural		Trinity River Hatchery			Grilse	Adults	Total	
	Number	Percent	Number	Percent		Grilse	Adults	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	3,105	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 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	7,192	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	03.7%	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 w	563
1994	7,494	34.2%	14,430	65.8%	21,824	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 w	3,333
1996	5,072	9.1%	50,574	90.9%	55,648	4,478	42,646	47,124	249	6,411	6,660	345	1,517 w	1,862
1997	3,767	17.6%	17,580	82.4%	21,347	2,845	11,507	14,352	820	5,387	6,207	102	686 W	788

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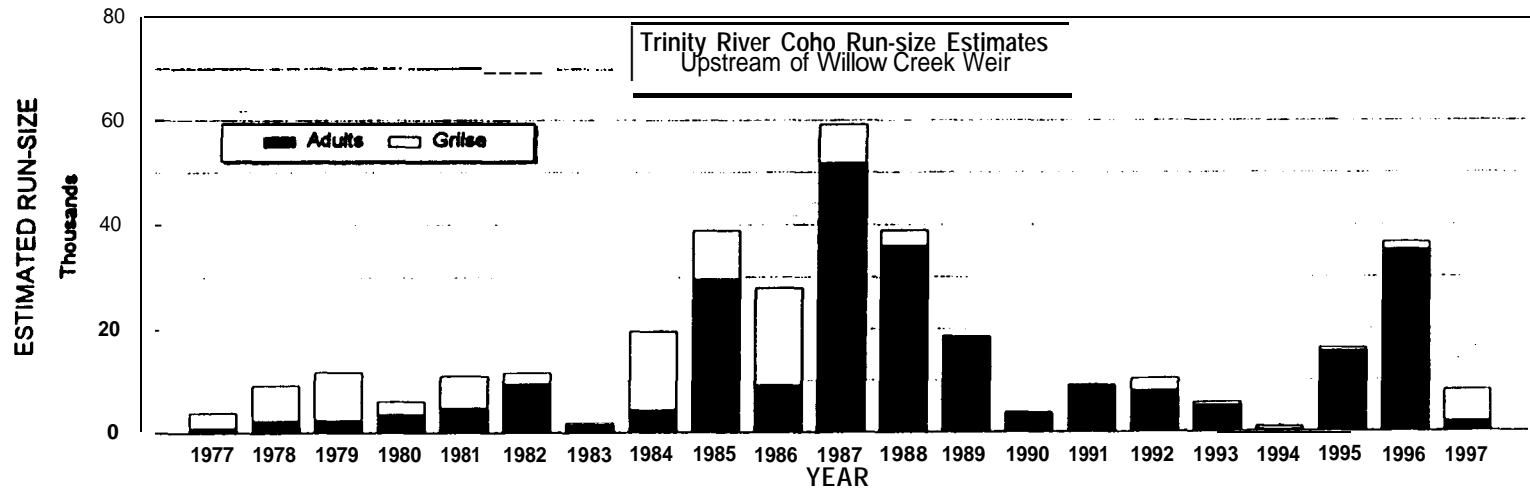
a/ The 1978 sport harvest of fall-run chinook was essentially eliminated by a salmon fishing closure beginning 25 August 1978.

b/ The sport harvest of 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, and 3 October 1994. The Trinity River was subject to seasonal closures during the 1995-'97 seasons, commencing 9 September in the lower river. Various periods of openings and res (seasons) were instituted along the river through November 30.

APPENDIX 3. Coho salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1997.

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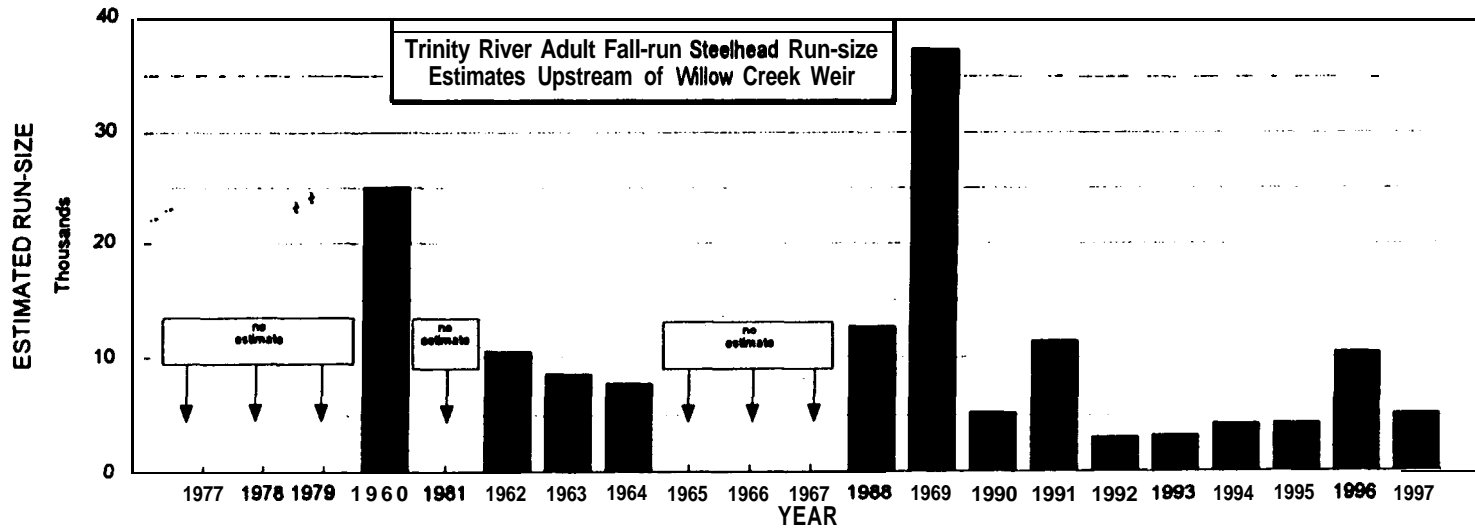
Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adult.		Total	Natural		Trinity River Hatchery			Grilse	Adults	Total	
	Number	Percent	Number	Percent		Grilse	Adults	Total	Grilse	Adults				Total
1977	3,106	60.5%	752	19.5%	3,656	1,756	25	1,761	1,230	698	1,928	120	29	149
1976	6,665	73.2%	2,447	26.6%	9,132	4,309	1,168	5,477	2,376	1,279	3,655	Fishing closure a/		
1979	9,067	78.0%	2,557	22.0%	11,624	5,567	1,695	7,262	2,793	742	3,535	707	120	027'
1980	2,499	41.0%	3,595	59.0%	6,094	954	1,617	2,771	1,545	1,778	3,323			a
1981	6,144	56.0%	4,626	44.0%	10,970	3,466		5,401	1,994	2,529	4,523	664	302	966i
1982	2,021	17.5%	9,508	62.5%	11,529	1,156		6,255	623	3,975	4,790	40	436	476i
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%	4,466	22.6%	19,694	6,166	2,971	9,159	7,727	1,134	6,661	1,293	361	1,674
1985	9,216	23.7%	29,717	76.3%	36,933	4,798	21,566	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	2,569	7,991	473	227	700
1987	7,253	12.3%	51,826	07.7%	59,079	3,975	28,398	32,373	2,665	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	136	1,823	1,961
1989	290	1.5%	18,462	98.5%	16,752	208	13,274	13,482	77	4,693	4,970	5	295	300
1990	412	10.6%	3,485	69.4%	3,697	234	1,961	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	96	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	573	10.2%	5,048	89.6%	5,621	416	3,024	3,440	93	2,024	2,117	64	0	64
1994	613	71.9%	239	28.1%	652	453	105	558	160	134	294	0	0	0
1995	634	3.9%	15,477	96.1%	16,111	370	10,660	11,050	264	4,503	4,767	0	294	294
1996	1,269	3.5%	35,391	96.5%	36,660	1,149	25,306	26,457	120	9,635	9,955	0	246	248 c
1997	5,951	75.0%	1,984	25.0%	7,935	5,038	1,097	6,135	671	687	1,756	42	0	42 c



a/ The 1976 sport harvest of coho was essentially eliminated by a salmon fishing closure beginning 25 August 1976.
 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.
 c/ The 1996-97 sport fishery was closed to the take of coho salmon.

APPENDIX 4. Fall-run adult steelhead run-size, spawner escapement and gharvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 1997. a/

Year	Run-size estimate				Total	Spawner escapement						Angler harvest		Total y
	Hatchery b/		Wild c/			Natural		Trinity River Hatchery				H a t	rWild e	
	Number	Percent	Number	Percent		Hatchery	Wild	Hatchery	Wild	Total				
1977			No estimate			No estimates		269	16	265		No estimates		
1978						"		626	55	663		"		
1979								329	53	362		"		
1980	6,449	33.7%	16,645	66.3%	25,094	5,101	14,462	19,563	1,903	102	2,005	1,445	2,061	3,526
1981			No estimate				No estimates		692	112	1,004		No estimate	
1982	2,106	20.0%	6,426	80.0%	10,532	971	6,889	7,860	634	79	713	501	1,456	1,859
1983	No estimates for hatchery/wild components				8,605			6,661			599			1,345
1984					7,833			6,430			142			1,261
1985			No estimate				No estimates				461		No estimates	
1986			"				"				3,760		"	
1987			"				"				3,007		"	
1988	No estimates for hatchery/wild components				12,743			11,926 d/			617		"	
1989			"		37,276			28,933			4,765		"	3,578
1990			"		5,346			3,188			930		"	1,230
1991			"		11,417			8,631			446		"	2,340
1992	1,315	43.2%	1,731	56.6%	3,046	759	1,540	2,299	430	25	455	126	166	292
1993		56.4%	1,349	41.6%	3,243	801	1,176	1,977	875	10	665	216	163	361
1994	1,477	34.6%	2,767	65.2%	4,244	878	2,410	3,266	403	6	411	196	349	545
1995	1,595	37.2%	2,693	62.6%	4,266	1,424	1,667	3,291	24	661	705	147	145	292
1996	6,596	62.4%	1,637	17.6%	10,435	4,127	1,703	5,830	3964	48	4,012	507	66	593
1997	No estimates for hatchery/wild components				5,212		No estimates	4,267		No estimates	429		No estimates	516



a/ Mutt steelhead are greater than 41 centimeters, fork length.

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 Soawner Escapement Made by Chinook and Coho Salmon Produced at Trinity River Hatchery (TRH)

Task Objectives:

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

Backaround:

To achieve Task 2 objective, representative samples from TRH's annual salmon production must be adipose-fin clipped (ad-clipped) and 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 CWT 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 CWT 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 CWT 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; $NW_{,,}$ = number of salmon observed at the weir with an ad clip; NW = total number of salmon observed at the respective weir; $NH_{,,}$ = number of salmon observed at TRH with an ad clip and a CWT; $NH_{,,}$ = total number of ad-clipped salmon observed at TRH; and $N_{run-size\ estimate}$ = 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:

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

where, $F_{\text{CWT group}}$ = fraction of the salmon population with a specific CWT code; and $NH_{\text{CWT group}}$ = 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:

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

where, $N_{\text{CWT group}}$ = 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:

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

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

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

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

where, $N_{\text{CWT escapement}}$ = 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:

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

where, $N_{\text{CWT natural escapement}}$ = 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 basinwide 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 CWT 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 to the river in 1995.

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

Results:

We recovered 1,555 ad-clipped chinook at TRH this season. These included TRH-produced chinook (633 spring and 919 fall) and 3 naturally produced chinook. The returning spring chinook CWT fish were composed of 10 release groups from the 1992 through 1995 BYs (Appendix 1). The fall chinook CWTs were from 12 groups representing the 1992 through 1995 BYs (Appendix 1). The naturally produced chinook were composed of three CWT groups from the 1993 BY (Appendix 1).

Return rates for spring chinook TRH CWT groups, based on the number released and their estimated run size as adults, ranged from 0.013% for the 1994 BY yearling release to 0.547% for the 1993 BY yearling release (Appendix 2). Return rates for fall chinook TRH CWT groups ranged from 0.005% (1992 BY yearling, five-year-old) to 0.523% (1994 BY yearlings) (Appendix 3).

Both spring and fall chinook release groups from the 1992 BY had exceptionally high return rates this year for five-year-old fish. For fall chinook returning as five-year-olds in 1996, the return rates were essentially zero.

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November 20, 1998

Appendix 1. Release and recovery data for adipose fin-clipped chinook recovered at Trinity River Hatchery (TRH) during the 1997-98 season.

CWT a/ code	Egg source	Brood year	Release data				Recovery data				Total
			Date	Number	Size (No./kg)	Site	Males		Females		
							No.	FL b/	No.	FL b/	
Spring-run chinook salmon											
0601040106	TRH	1992	06/15/93	215,038	97.9	TRH	2	79.5	3	79	5
065734	TRH	1992	10/1-7/93	53,875	25.1	TRH	1		2	75	3
065735	TRH	1992	10/1-7/93	56,281	25.1	TRH	2	87.5	0		2
0601040107	TRH	1993	06/01-10/94	222,056	116.8	TRH	51	81.1	77	74.6	128
065708	TRH	1993	10/3-14/94	53,738	23.6	TRH	70	78.5	75	70.2	145
065709	TRH	1993	10/3-14/94	57,787	23.6	TRH	68	75.9	88	69.7	156
065220	TRH	1994	06/6-9/95	113,236	139.0	TRH	28	62.3	14	60.4	42
065221	TRH	1994	10/1-3/95	113,124	28.0	TRH	61	60.6	27	59.2	88
085223	TRH	1995	06/3-13/96	196,211	118.8	TRH	15	43.6	0		15
065225	TRH	1995	10/1-7/96	101,934	26.4	TRH	14	38.7	0		14
100000 c/ d/							14	73.8	21	69.4	35
Spring-run chinook salmon totals:							326		307		633
Fall-run chinook salmon											
065733	TRH	1992	06/16/93	192,032	145.9	TRH	2	84.5	3	83	5
065748	TRH	1992	10/1-7/93	54,586	33.7	TRH	5	83.2	7	80.3	12
065749	TRH	1992	10/1-7/93	54,308	33.7	TRH	1	-	5	79.6	6
065704	TRH	1993	6/10-5/94	201,032	191.8	TRH	20	73.3	24	72.6	44
065705	TRH	1993	10/3-14/94	55,039	27.6	TRH	62	73.9	63	71.5	125
065706	TRH	1993	10/3-14/94	55,297	27.6	TRH	60	71.7	49	71.1	109
0601040108	TRH	1994	06/01-09/95	107,935	353.0	TRH	40	62.3	34	61.9	74
065021	TRH	1994	06/01-09/95	54,723	271.0	TRH	21	64.3	23	62.9	44
065022	TRH	1994	06/01-09/95	53,905	271.0	TRH	30	64.9	18	63	48
065222	TRH	1994	10/1-3/95	113,124	39.7	TRH	231	61.2	109	60.6	340
065224	TRH	1995	06/3-13/96	216,051	193.6	TRH	23	45.4	0		23
065226	TRH	1995	10/1-7/96	110,327	35.2	TRH	35	41.3	0	-	35
100000 c/ e/							34	62.1	20	64.1	54
Fall-run chinook salmon totals:							564		355		919
Naturally produced chinook salmon											
					Size (mm fl)						
0601080215	Wild	1993	03/22-4/2/94	9,998	46.1	Sheridan	1		0		1
0601080312	Wild	1993	04/6-7/94	10,856	53.9	Sheridan	1		0	-	1
0601080502	Wild	1993	04/9-12/94	11,837	53.9	Sheridan	0		1		1
Naturally produced chinook salmon totals:							2		1		3

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 1994 through 1997.

Release data						Estimated returns					
CWT a/ code	Brood year	Date b/	Number	Sic	Age	Run- size	% of release	River harvest	Spawning escapement		
									TRH c/	Natural	Total
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
					5	10	0.005	1	5	4	
					Totals: d/ Total Adults e/		1.022	0.475	36	1.945	341
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
					5	6	0.011	0	3	3	6
					Totals: d/ Total Adults: e/		445	0.829	27	316	250
065735	1992	10/01-07/93	56,261	TRH	2	16	0.026	83	9	4	13
					3 d/	-	-	-	175	-	175
					4	341	0.606	23	113	-205	318
					5	4	0.007	0	2	4	
					Totals: d/ Total Adults e/		361	0.641	106	299	21:
0601040107	1993	06/01-10/94	222,056	TRH	2 d/	-	-	-	32	-	32
					3	834	0.376	55	276	503	779
					4	259	0.117	18	128	113	241
					Totals: d/ Total Adults e/		1,127	0.510	131	637	727
065708	1993	10/03-14/94	53,736	TRH	2 d/	-	-	-	18	-	18
					3	130	0.242	9	43	78	121
					4	294	0.547	20	145	129	274
					Totals: d/ Total Adults e/		454	0.433	49	306	235
065709	1993	10/03-14/94	57,787	TRH	2 d/	-	-	-	8	-	8
					3	166	0.287	-11	55	100	155
					4	316	0.547	22	156	138	294
					Totals: d/ Total Adults e/		482	0.418	11	311	238
065220	1994	06/6-9/95	113,236	TRH	2	15	0.013	0	5	10	15
					3	85	0.075	6	42	37	79
					Totals: d/ Total Adults e/		100	0.088	6	47	47
065221	1994	10/2-13/95	113,491	TRH	2	24	0.021	0	9	18	27
					3	178	0.157	12	88	78	166
					Totals: d/ Total Adults e/		202	0.178	12	97	96
665223	1995	6/3-13/96	196,211	TRH	2	30	0.015	0	15	15	30
065225	1995	10/1-7/96	101,934	TRH	2	28	0.027	0	14	14	28

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/ Run-size estimates were not produced in 1995.

e/ Totals are presented only for brood year 1992. 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 1994 through 1997.

Release data						Estimated returns					
CWT a/ coda	Brood year	Date b/ Date	Number	Site	Age	Run- size	% of release	R i i r harvest	Spawning escapement TRH c/ Natural	Total	
065733	1992	06/16/93	192,032	TRH	2	436	0.227	32	235	169	404
					3	1760	0.917	51	427	1262	1709
					4	302	0.157	9	87	206	293
					5	9	0.005	0	5	4	9
					Totals: d/ Total Adults: e/		2,507 2,071	1.306 1.078	92	754	1,661
065746	1692	10/01-07/93	54,566	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
					5	21	0.036	1	12	6	20
					Totals: d/ Total Adults: e/		2,689 2,622	4.926 4.603	62	720	1,667
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	672	1.806	26	251	595	646
					5	10	0.016	0	6	4	10
					Totals: d/ Total Adults: e/		2,697 2,654	4.966 4.667	80	710	1,907
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
					4	77	0.036	3	44	30	74
									9		
065705	1993	10/03-14/94	55,039	TRH	2	37	0.067	2	57	26	35
					3	196	0.360	6	135	192	
					4	216	0.395	9	125	64	209
									6		
065706	1993	10/03-14/94	55,297	TRH	2	21	0.036	1	5	15	20
					3	118	0.213	4	34	60	114
					4	190	0.344	7	109	74	163
									6		
0601040106	1994	06/01-09/95	107,935	TRH	2	21	0.019	1	74	14	20
					3	129	0.120	5	50	124	
065021	1994	06/01-09/95	54,723	TRH	2	10	0.016	1	3	6	9
					3	77	0.141	3	44	30	74
065022	1994	06/01-09/95	53,905	TRH	2	17	0.032	1	5	11	16
					3	64	0.156	3	46	33	61
065222	1994	10/3-13/95	113,124	TRH	2	36	0.034	3	11	24	35
					3	592	0.523	23	340	229	569
065224	1695	06/3-13/96	216,651	TRH	2	40	0.019	1	23	16	39
065226	1995	10/1-7/96	110,327	TRH	2	61	0.055	2	35	24	59

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 1992. 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 Salmon in the Trinity River Basin

Task Objectives:

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

Procedures:

There are two phases involved in this task: marking all TRH-produced coho and recovering adult coho returning to the basin. The procedures for the marking phase will be discussed in this section and the adult recovery phase will be covered under Tasks 1 and 2.

Marking coho involved anaesthetizing them with carbon dioxide, removing their right maxillaries, 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.

To determine overall marking accuracy, we examined a sample of the marked coho just prior to their release into the river. These fish were anesthetized 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 number marked.

Results:

Staff personnel marked (right maxillary clip) 517,017 juvenile coho, representing the entire 1996 brood year at TRH. We began clipping December 31, 1997, and finished on February 26, 1998.

On March 2 and 3, 1998, we performed quality control evaluations (QC) on the marked coho just prior to their release from the hatchery. We measured 4,264 coho to the nearest mm FL and examined them for marking accuracy.

Fork lengths of the measured coho ranged from 90 to 285, averaging 157 mm. The table below summarizes release estimates based on our observed marking accuracy.

Stratum 1/	Percent in sample 2/	Estimated number released 3/
Incomplete RM	0.49%	2,529
Effective Clip	99.51%	513,663
Totals:	100.00%	516,192

1/ No clip = both maxillary bones completely intact
 Incomplete RM = $\geq 25\%$ and $\leq 100\%$ 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
 3/ Release estimates based on TRH estimates of total released; deducts hatchery mortality estimates from the total tagged.

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 November 12, 1998

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 prespawning mortality of naturally spawning chinook and coho salmon in the main stem Trinity River.

Procedures:

Our study area included the main stem Trinity River from the upstream limit of anadromous fish migration at Lewiston Dam (rkm 180.1) to the confluence of the North Fork Trinity River (rkm 116.7). We divided the survey area into seven zones (see Table 1) based on historic use by spawning adult salmon and accessibility to survey crews. This area was surveyed once a week throughout the salmon spawning season by personnel in rafts.

Table 1. Description and lengths of river zones used in the 1997-98 main stem Trinity River spawner survey.

River Zone	River km (range)	Length (km)	Zone Description
1	180.1-176.9	3.2	Lewiston Dam - Old Lewiston Bridge
2	176.9-169.0	7.9	Old Lewiston Bridge - Browns Mtn. Bridge
3	169.0-158.8	10.2	Browns Mtn. Bridge - Steel Bridge
4	158.8-148.4	10	Steel Bridge - Douglas City Camp
5	148.8-134.8	14	Douglas City Camp - Round House
6	134.8-124.8	10	Round House - Junction City campground
7	124.8-116.7	8.1	Junction City campground - Mouth of the North Fork Trinity River

All salmon carcasses encountered during this survey were examined to determine species, sex, spawning condition of the females, presence of fin clips, presence of spaghetti tags and general physical condition. Additionally, we measured 30 chinook from each survey zone each week to the nearest centimeter (cm) FL.

We flagged all chinook and coho carcasses which we believed 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 1½ by 1½ -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 which had died in each survey zone.

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

We did not conduct carcass surveys on tributaries to the main stem Trinity River this year. Studies conducted previous years have suggested that the tributaries are relatively unimportant in terms of chinook spawning. The relative importance of tributaries to coho spawning has not been determined.

Results:

We examined 3,897 chinook salmon carcasses during the main stem spawner survey. These included 58 ad-clipped fish, 101 program-marked fish, 1 which was ad-clipped and program-marked; 126 unmarked condition-one carcasses which we flagged and 3,611 unmarked condition-two carcasses.

Table 2. Distribution and estimated density of adult chinook salmon spawners during the 1997-1998 Trinity River survey.

Zone al	Number carcasses flagged	Flags recovered	Percent recovery b/	Total observed d/ c/	Expanded total d/	Percent distribution	Fish/ km e/
1	38	10	26.3%	1,548	5,882	25.4%	1,838
2	33	11	33.3%	1,010	3,030	13.1%	384
3	18	1	5.6%	386	6,948	30.0%	681
4	7	0	6.8%	271	3,985	17.2%	399
5	11	1	9.1%	134	1,474	6.4%	105
6	13	2	15.4%	207	1,346	5.8%	135
7	1	0	11.5%	54	470	2.0%	58
Total	121	25	20.6%	3,610	23,135	100.0%	365

a/ Zones described in Table 1.

b/ Computed from: total number of flags recovered/total number of carcasses flagged multiplied by 100. The percent recoveries for zones in which no flagged carcasses were recovered were estimated by dividing the sum of flagged carcasses recovered in the two adjacent zones by the sum of total carcasses flagged in those zones and multiplying by 100.

c/ Total adult chinook carcasses examined, excluding flag recoveries.

d/ Computed from: (total unflagged carcasses examined/(% flags recovered/100)).

e/ Computed from: expanded total/zone length (km).

We recovered a total of 58 adipose-fin clipped chinook during the main stem survey this season; CWTs were extracted from 49 of these. Fifteen different code groups from 4 brood years were represented (see Table 3). Based on the timing of CWT fish recovered in the survey, we assume that only spring chinook were recovered through October 31, after which only fall chinook were recovered.

Table 3. Release and recovery data for coded-wire tagged chinook salmon recovered in the 1997-98 Trinity River spawner survey.

CWT a/	Type b/	Brood year	Location c/	Number effectively tagged d/	Number recovered e/
601080402	F-f	1992	Lewiston	9,817	1
601080407	Wild	1992	Sky Ranch	7,993	1
601040107	S-f	1993	TRH	222,056	10
601080212	Wild	1993	Sheridan	9,177	1
601080312	Wild	1993	Sheridan	10,856	1
601080313	Wild	1993	Sheridan	11,699	2
601080502	Wild	1993	Sheridan	11,837	1
65705	F-y	1993	TRH	55,039	10
65706	F-y	1993	TRH	55,297	3
65708	S-y	1993	TRH	53,738	3
65709	S-y	1993	TRH	57,787	8
65021	F-f	1994	TRH	54,723	1
65022	F-f	1994	TRH	53,905	1
65220	S-f	1994	TRH	113,236	1
65221	S-f	1994	TRH	113,411	1
65222	F-y	1994	TRH	113,124	2
601040108	F-f	1994	TRH	107,935	1
601080206	Wild	1995	Lewiston	27,944	1
100000 f/					9
Total					58

- 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.
- f/ CWTs were either unreadable, shed, or lost while decoding.

Spring chinook females comprised 53.7% of the adults while fall chinook females comprised 54.0% of the total. Females accounted for 53.8% of the of the total (spring plus fall) adult recovery in the survey.

We observed a female prespawning mortality rate of 2.6% for spring chinook and 5.7% for fall chinook. The overall (spring and fall chinook) prespawning mortality rate for adult females was 3.5%. Prespawning 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, prespawning mortality in the Trinity River is directly related to escapement: as escapement increases; so does prespawning mortality.

We examined a total of 14 coho salmon carcasses during the main stem spawner survey. These included 10 which had received a right maxillary clip, and 4 unmarked fish.

Table 4. Adult coho salmon spawner distribution and estimated density by river zone during the 1997-98 Trinity River spawner survey.

Zone a/	Total observed	Observation efficiency b/	Expanded total c/	Percent distribution	Spawner density (fish/km) d/
1	8	26.3%	30	30.8	0.3
2	2	33.3%	6	6.1	0.1
3	3	5.6%	54	54.3	0.5
4	0	6.8%	0	0.0	0.0
5	0	9.1%	0	0.0	0.0
6	0	15.4%	0	0.0	0.0
7	1	11.5%	9	8.8	0.1
Total: Mean:	14	20.6%	99	100.0	1.6

a/ Zones described in Table 1.

b/ Recovery efficiencies described in Table 2.

c/ Computed from: (total unflagged examined/(% flags recovered/100)).

d/ Computed from: expanded total/zone length (km).

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

Task Objectives:

To capture, mark (ad-fin clip), tag (binary-coded wire) and release representative groups (up to 200,000 fish/group) of naturally produced chinook salmon fry and fingerlings. Releases are into the main stem Trinity River for subsequent determination of their survival and contribution to ocean and river fisheries and spawning escapement.

Procedures:

Task 5 is composed of three distinct phases: trapping, tagging and recovery. The trapping and tagging phases take place in the spring following the emergence of juvenile chinook salmon. The recovery phase takes place from two-to-five years later and involves the efforts of several agencies including the Department of Fish and Game (DFG), Hoopa Valley Tribal Fisheries Department, Yurok Tribal Fisheries Department and the Pacific Fisheries Management Council. This report will be concerned with the tagging and trapping phases of Task 5. The recovery phase will be discussed in a future report.

Trapping was conducted in the main stem Trinity River using from one to eight fyke nets per night. The nets were 3.1 m wide x 1.2 m high at the mouth; tapering 7.6 m to a 0.33-m by 0.33-m exit leading into dual live boxes. Each net was attached at the mouth to a 2.5cm diameter galvanized pipe frame 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 transferred to holding cages and 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). Usually two or three tagging machines were used depending on the availability of fish.

Each fish to be tagged was anesthetized with alka-seltzer gold, its adipose fin removed (ad-clip) and a one-half length CWT injected into its rostrum. Each day a sample of 100 juvenile chinook from each CWT group was retained for a quality control (QC) check and the remainder were released downstream of the trapping site. The QC fish were transferred to a live box and placed in the river for a minimum of 24 hours; after which they were examined for mortality, tag retention and ad-fin clip quality. Tag retention was verified by passing each fish through an electronic tag detector and ad-fin clip quality was verified by direct examination. The number of effectively tagged fish from each day's tagging effort was calculated by subtracting the estimated mortality, tag shedding, and poor ad-fin clips from the daily total tagged.

We measured a sample of 100 juvenile chinook to the nearest mm FL at least once a week. 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 counted automatically during the tagging process.

Results:

Our trapping efforts began on March 9 and concluded on May 28, 1998. Total effort during this period was 86 trap nights (one net fished for one night) and total catch was 4,161 chinook, 27 who and 77 steelhead.

The overall catch-per-unit effort (CPUE¹), during the historical peak emigration period (March 5 through May 27) was 56 this year, the lowest recorded since we began tagging naturally produced juvenile chinook in 1989. The CPUEs recorded during previous years have ranged from 2,343 (1990) to the previous low of 77 recorded during 1997. The low CPUE this year was the result of emergency flow increases from Lewiston Dam and El Nino rains. On several occasions, the US Bureau of Reclamation increased releases from Trinity Reservoir to reduce the rate of increase in storage and spill rate from Lewiston Dam. The resulting high flows reduced the efficiency of our traps, washed away equipment and ultimately forced us to discontinue Task 5 operations. Furthermore, high flows prior to March 9 washed fry downstream before we were able to start trapping.

We began CWT operations on March 17 and finished on May 28. Project personnel CWT 2,633 juvenile chinook this season. After subtracting for tagging mortality, tag shedding and poor fin clips, we effectively tagged a total of 2,376 naturally produced chinook (Table 1). Prior years' effective tagging totals are: 15,704 (1988-89), 112,133 (1989-90), 72,865 (1990-91), 56,610 (1991-92), 44,565 (1992-93) 92,486 (1993-94), 123,610 (1995-96), and 38,263 (1997-98).

Coho CPUE ranged from 0 to 5 with a season average of 0 fish per trap night. Steelhead CPUE ranged from 0 to 2 fish with a season average of 1 fish per trap night.

Chinook trapped throughout the season ranged in FL from 35 to 84 mm, averaging 51 mm. The overall average FL of CWT fish was 51 mm.

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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.

Table 1. Summary of coded-wire tagging of naturally produced chinook in the Trinity River basin, 1997-98 season.

Coded-Wire Tag Number	Inclusive Tagging Dates	Number Effectively Tagged	Average Fork Length (mm)
0601080506	Mar 17 - May 28	2,376	51.0
Season Total		2,376	51.0

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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 by 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 residence times in the SFTR basin.
4. To describe age compositions and life-history patterns of adult and juvenile salmonids through scale pattern analysis.

Introduction:

We used several methods to achieve the objectives of Task 6. These methods included snorkel surveys, redd counts, carcass counts and trapping of juvenile salmon and steelhead.

Procedures:

Snorkel Survey: From August 19-28, 1997, teams of two to three individuals equipped with mask, snorkel, wet suit and wading shoes examined a total of 144.1 RKM (divided into 16 adjacent sections) within the SFTR basin. Fourteen sections were located between the EF (East Fork) of the SFTR to the confluence with the main stem Trinity River and 2 sections were located in lower Hayfork Creek (see attached map). Each section was surveyed once. The surveyors floated or swam downstream recording the number of adult chinook, grilse chinook, adult steelhead, and half-pound steelhead. They also noted habitat types where adult chinook and steelhead were observed and any adverse habitat conditions.

Redd Survey and Carcass Recovery:

Personnel surveyed the SFTR from the air three times to determine the onset of spawning and the distribution of spawning activity. Sections which contained the highest concentrations of adult chinook and redds (based on historical data, the August snorkel survey and aerial surveys) were subsequently surveyed on foot by crews of two to three individuals. Each redd was measured (length and width) and its approximate location recorded on a topographical map. Brightly colored flagging was tied to riparian vegetation directly opposite the redd. The date of observation and redd length and width measurements were recorded on the flagging. The run size was calculated from the total number of redds observed multiplied by 2.25, plus live fish counted on the last survey date.

All carcasses recovered during the redd surveys were identified to species, sexed, examined for external tags and fin clips and measured to the nearest 1 cm FL. Scales were taken from carcasses in good condition. Spawning success was assessed based on a visual estimate of the percent of eggs or amount of sperm remaining in the carcass. Pectoral fins were collected for the Yurok Tribal Fisheries Department and organs (heart, liver, gill arch and eye) were collected for the National Marine Fisheries Service for DNA analysis. Adult chinook and redds observed upstream of Hitchcock Creek (RKM 57.9) were considered to be spring-run fish.

Juvenile Trapping: We captured juvenile salmon and steelhead using fyke nets attached to trap boxes. The nets were constructed of 1.3 cm nylon mesh and had a 1.2 m by 3 m upstream opening and extended 10 m to a trap attachment frame at the terminal end. Trap boxes were constructed of plywood and hardware cloth and measured 0.8 m wide by 1.2 m long and 0.5 m in depth (vertical dimension). We fished the traps overnight once per week (depending on flow and temperature conditions) at 13 locations in the SFTR basin from April 1997 through December 1997; and from April 1998 to September 30, 1998. We suspended trapping operations at a particular station when morning water temperatures exceeded 68 degrees F. We identified trapped juvenile salmonids to species and measured them to the nearest 1 mm fork length (FL). We collected scales from all juvenile salmon greater than 55 mm FL and steelhead greater than 60 mm FL.

Results:

Adult Salmon Population Monitoring:

Snorkel Survey: We counted 647 adult spring-run chinook and 95 adult steelhead during the August snorkel survey (see Table 1). The majority were observed holding in pools and all appeared to be in excellent condition.

Redd and Carcass Surveys: We conducted redd surveys for spring-run chinook salmon during the weeks ending (WE) October 17 and November 7 (see Table 1). The preliminary run size estimate calculated for spring-run chinook salmon was approximately 720 fish. Carcasses recovered and measured during the redd surveys ranged in size from 50 cm FL to 97 cm FL, and no tagged or marked fish were recovered. Prespawning mortality for spring-run chinook was calculated to be approximately 15%.

Due to dangerous flow conditions, we did not conduct foot or snorkel surveys to count adult fall chinook or redds. Instead, personnel counted redds and live fish from a California Highway Patrol helicopter flying at an altitude of approximately 400 feet over the SFTR. Based on the number of redds and live fish counted in sections downstream of Hitchcock Creek (RKM 57.9) to the confluence with the Trinity River, the preliminary run size estimate for fall-run chinook salmon was calculated to be approximately 1,210 fish.

Table 1. Summary of 1997 South Fork Trinity River Snorkel and Redd Counts.

Section	River km (range)	Snorkel Survey		Redd survey	
		Fish counted		Chinook redds counted	
		Chinook	Steelhead	Spring-Run	Fall-Run
A	0-6.5 (East Fork SFTR)	0	0	.*	.*
B	112.0-117.8	0	0	**	**
C	117.8-111.3	9	1	.*	**
D	111.3-102.7	34	2	.*	.*
E	102.7-89.5	45	5	59	67
F	89.5-77.7	114	22	36	45
G	77.7-68.4	281	8	153	128
H	68.4-57.9	113	5	72	120
I	57.9-49.6	7	7	37	38
J	49.6-40.2	15	11	211	197
K	40.2-31.7	10	6	0	52
L	31.7-22.5	1	8	0	36
M	22.5-13.2	0	0	0	46
N	13.2-2.3	1	1	0	121
Y	0-8.0 (Hayfork Creek)	10	17	83	0
Z	8.0-15.6 Hayfork Creek)	7	2	.*	.*
Totals		647	95	651	850

.* Sections not surveyed.

Juvenile Outmigrants Monitoring

Juvenile Trappings: Between July and November 1997, juvenile chinook salmon were captured only at the mouth of HayforkCreek; Juvenile steelhead were captured at all stations. No juvenile who salmon were captured. Peak catches of juvenile steelhead varied from location to location (see Table 2).

Between April and July 1998 juvenile chinook were captured at the "Curved Bridge", Forest Glen sites on the SFTR main stem and at the mouth of Hayfork Creek. Juvenile steelhead were captured at all stations. No juvenile who were captured. The peak catches of juvenile steelhead varied from location to location (see Table 2).

Table 2. Total number of juvenile salmon and steelhead caught in fyke traps throughout the South Fork Trinity River basin from July 1997 through June 1998.

Location	River (km)	Time span	Total captured		
			Chinook	Steelhead	Coho
South Fork Trinity River					
Sandy Bar	2.2	7/1/97 to 7/14/97	0	17	0
Curved Bridge	49.6	7/2/97 to 10/30/97	0	203	0
		4/30/98 to 6/25/98	61	154	0
Forest Glen	89.5	7/9/97	0	3	0
		6/4/98 to 6/25/98	2	42	0
Above EF of SFTR	117.8	7/2/97 to 11/13/97	0	201	0
		5/7/98 to 6/23/98	0	90	0
Hayfork Creek					
Mouth	0.1	7/2/97 to 10/30/97	4	799	0
		4/30/98 to 6/25/98	10	357	0
near Big Creek	32.6	7/3/97 to 7/17/97	0	83	0
Wildwood	54.0	7/10/97 to 11/13/97	0	5	0
		4/17/98 to 6/24/98	0	21	0
near Dubakella Creek	58.4	7/10/97 to 11/13/97	0	3	0
		5/13/98 to 6/25/98	0	4	0

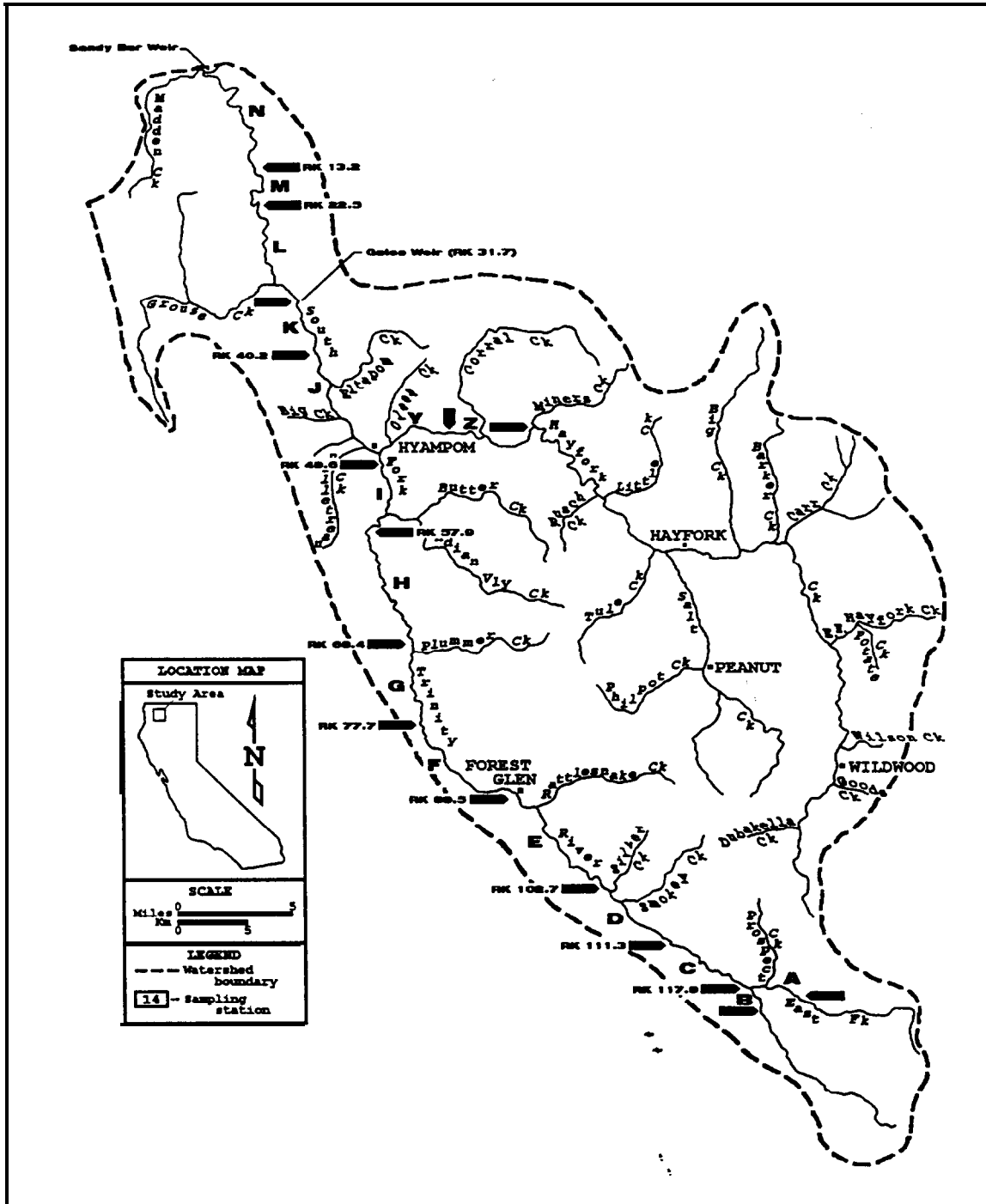
Table 2. Continued

Other Tributaries			Total captured		
Location	River (km)	Time span	Chinook	Steelhead	Coho
EF SFTR	0.1	07/1 1/97 to 11 /13/97 5/7/98 to 6/23/98	0 0	73 68	0 0
Eltapom Creek	0.1	7/2/97 to 1 0/1 4/97	0	17	
EF Hayfork Cr.	0.1	7/9/97 to 7/1 5/97 4/3/98 to 6/24/98	0 0	40 238	0 0
Pelletreau Creek	0.3	7/2/97 to 7/25/97	0	16	0
Butter Creek	0.2	09/24/97 to 1 0/1 4/97	0	32	0
Lower Madden Cr.	0.2	09/30/97 to 10/29/97	0	6	0
Upper Madden Cr.	2.5	10/07/97 to 10/29/97	0	2	031

Life History Patterns:

Scales collected during field activities are currently being analyzed and results will be reported in the future.

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Map of the South Fork Trinity River Basin Depicting the Locations of Major Landmarks and Snorkel Survey Sections Examined During August 1997.