

ANNUAL REPORT
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT
2002-03 SEASON

TASK 1
ANNUAL RUN-SIZE, HARVEST, AND SPAWNER ESCAPEMENT ESTIMATES FOR
TRINITY RIVER BASIN CHINOOK AND COHO SALMON AND STEELHEAD

by

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ABSTRACT

The California Department of Fish and Game's Trinity River Project conducted tagging and recapture operations from June 2002 through March 2003 to obtain spring and fall run chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and adult fall run steelhead (*O. mykiss*) run-size, angler harvest, and spawner escapement estimates in the Trinity River basin. The project was conducted by the California Department of Fish and Game with cooperation from the Hoopa Valley Tribal Fisheries Department. We placed weirs in the Trinity River near the towns of Junction City and Willow Creek, and trapped 2,377 chinook salmon, 223 coho salmon, 1,694 fall steelhead and 95 brown trout (*Salmo trutta*).

Based on tagged fish recovered at Trinity River Hatchery and on the return of reward tags by anglers, we estimated that 38,485 spring chinook salmon migrated into the Trinity River basin upstream of Junction City Weir and that 1,871 (4.9%) of these were caught by anglers, leaving 36,614 fish as potential spawners. We estimated 18,156 fall chinook salmon migrated past Willow Creek Weir and that 727 (4.0%) of these were caught by anglers, leaving 17,429 as potential spawners.

The coho salmon run in the Trinity River basin upstream of Willow Creek Weir was estimated to be 16,016 fish. No coho salmon were estimated to be harvested, thus we assume all coho were potential spawners.

An estimated 19,058 (4,650 naturally produced and 14,408 hatchery produced) adult fall run steelhead entered the Trinity River basin upstream of Willow Creek Weir. Anglers harvested 754 (4.0%) of the adult fall steelhead that migrated past Willow Creek Weir, leaving 18,304 fish as potential spawners.

An unprecedented fish "die off" occurred in the lower Klamath River during September, 2002. An estimated 32,553 Klamath and Trinity Basin fall run Chinook salmon died during the event, constituting the majority of the more than 33,000 total fish estimated to have died. Our data indicates that Trinity River fall Chinook stocks were significantly impacted by this large scale mortality event. Monitoring data for Trinity River spring Chinook salmon, coho salmon, and

steelhead indicate that these stocks were far less impacted by the fish kill than fall Chinook in 2002.

JOB 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 in-river angler harvest and spawner escapements of Trinity River chinook and coho salmon, and steelhead.

INTRODUCTION

The California Department of Fish and Game's (CDFG) Trinity River Project (TRP), in cooperation with the Hoopa Valley Tribe (HVT) conducts annual tagging and recapture operations for chinook and coho salmon, and fall adult steelhead in the mainstem Trinity River. This effort determines the composition (race and proportion of hatchery-marked^{1/} or Project-tagged^{2/} fish), distribution, and timing of chinook and coho salmon, and fall steelhead runs in the Trinity River basin. Recaptures of hatchery-marked or Project-tagged fish are used to develop run-size, angler harvest, and spawner escapement estimates for chinook and coho salmon, and steelhead runs.

This is a continuation of studies that began in 1977 with the trapping, tagging, and recapture of fall-run chinook salmon (fall chinook), coho salmon (coho), and fall steelhead (steelhead) in the Trinity River in order to determine run-size and angler harvest rates. In 1978, similar studies were added to include spring-run chinook salmon (spring chinook). Steelhead were dropped from the program in 1985 through 1989 and reinstated in 1990. Results of these studies are available from California Department of Fish and Game (Heubach 1984a, 1984b; Heubach and Hubbell 1980; Heubach et al. 1992a, 1992b; Lau et al. 1994; Zuspan et al. 1985; Zuspan et al. 1995; Zuspan and Sinnen 1995, Zuspan 1996, Zuspan 1997, Lau and Sinnen 1998, Lau and Sinnen 2000, Sinnen et al. 2000, and Reese, 2001.

^{1/} Adipose fin-clipped and coded-wire-tagged (Ad+CWT), hatchery-produced chinook and right-maxillary-clipped coho salmon.

^{2/} Spaghetti tags applied by CDFG personnel to returning sea-run fish.

Earlier studies were funded variously by the U.S. Bureau of Reclamation (USBR), and with Anadromous Fish Act funds administered by the U.S. Fish and Wildlife Service and National Marine Fisheries Service. The USBR has funded the program from 1 October 1989 through the present.

Prior to the current program, all efforts to measure salmon and steelhead populations in the Trinity River basin had been restricted to portions of the upper mainstem Trinity River and certain of its tributaries, including the South Fork Trinity River and some of its tributaries (Gibbs 1956; La Faunce 1965a, 1965b, 1967; Miller 1975; Moffett and Smith 1950; Rogers 1970, 1972, 1973a, 1973b, 1982; Smith 1975; Weber 1965). Earlier efforts did not include fish which used the mainstem and tributaries of the lower Trinity River or attempt to determine the proportion of hatchery fish in the runs and the rates at which various runs contributed to the fisheries. To develop a comprehensive management plan for the Trinity River basin, all salmon stocks utilizing the basin must be considered.

METHODS

Trapping and Tagging

Trapping Locations and Periods

Trapping and tagging operations were conducted by TRP and HVT personnel from June through mid December 2002 at temporary weir sites near the towns of Willow Creek and Junction City in the mainstem Trinity River. The downstream site, Willow Creek Weir (WCW), was located 4.5 km downstream from the town of Willow Creek, 36.5 km upstream from the Trinity River's confluence with the Klamath River, and 143.5 km downstream from Trinity River Hatchery (TRH) (Figure 1). The upstream site, Junction City Weir (JCW), was located 5.4 km upstream from the town of Junction City, 132.7 km upstream from the Klamath River confluence, and 47.1 km downstream from TRH (Figure 1). Prior to 1995, JCW was operated from May through November. Currently, JCW is operated from late June through September. WCW is generally operated from mid-August through November. Most fall Chinook salmon spawning occurs upstream of WCW, while the majority of spring Chinook spawning occurs upstream of JCW.

The WCW is used to obtain Trinity River run-size and angler harvest estimates for fall chinook, coho, and steelhead. The JCW is used to obtain run-size and angler harvest estimates of spring chinook as far downstream as is feasible during periods of high spring flows. We operated the WCW from September 5 through December 11, 2002 and the JCW from June 13 through September 26, 2002.

At both weir sites, we attempted to trap during a five day period beginning late-afternoon on Sunday and ending mid-afternoon on Friday. We opened the weir each trapping day for

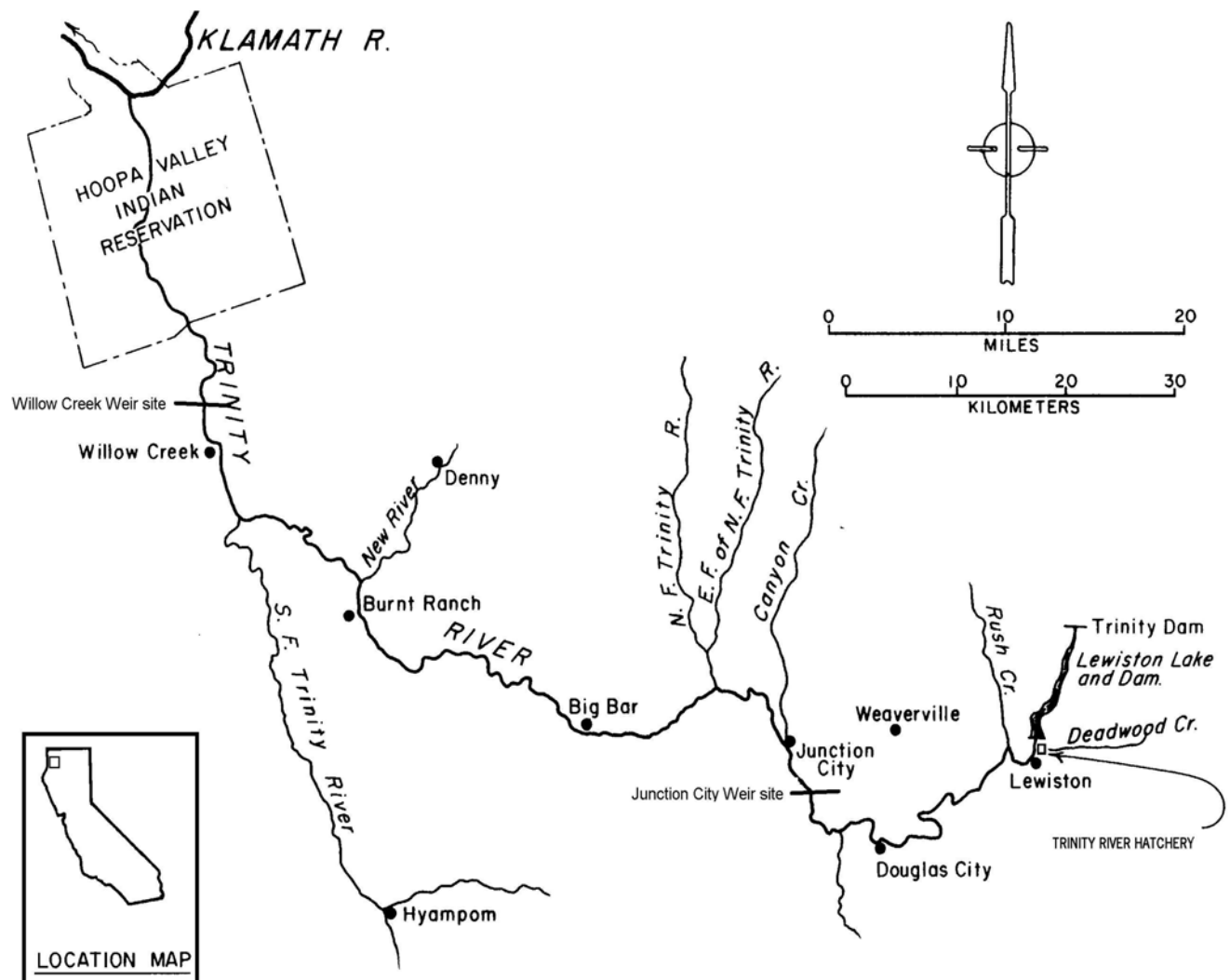


Figure 1. Location of trapping and tagging weirs for anadromous salmonids near Willow Creek and Junction City in the mainstem Trinity River, 2002-03 season.

approximately four hours allowing fish to pass unimpeded. Occasionally, trapping schedules were modified to allow for holidays or high flows which prevented trapping in a safe manner. Trapping and tagging were not conducted if stream temperatures exceeded 22 degrees Celsius.

Weir and Trap Design

Since 1989, we have used the Bertoni (Alaskan) weir design at both sites (Figures 2-4). The weir was supported by wooden tripods set 2.5 m apart. Weir panels consisted of 3.0-m X 1.9-cm (10-ft X ¾-in) electrical conduit spaced 5.1 cm apart on center, leaving a gap of 3.2 cm between conduits. Conduits were supported by three pieces of aluminum channel arranged 0.92 m apart, that connected to the supporting tripods. We anchored the tripods with cable attached to

1.8-m stakes driven into the stream bottom. The weir panels were angled, with the top of the weir standing 1.8 m above the river bottom.

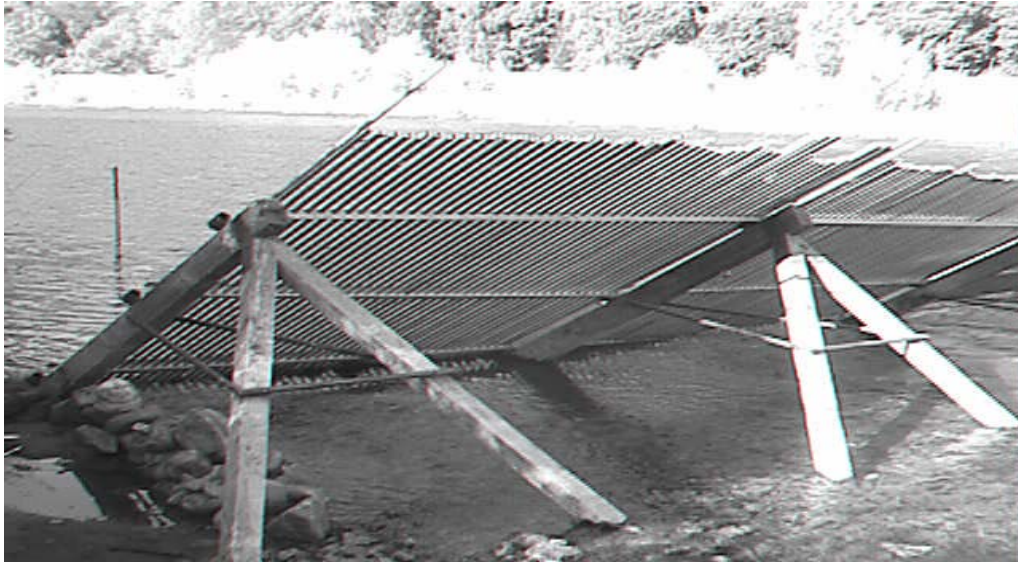


Figure 2. Photograph of Alaskan style weir tripods, support channels and conduit.



Figure 3. Photograph of upstream view of Alaskan weir. Note the panel boat gate (left center of picture).



Figure 4. Photograph of Alaskan weir showing the trapping box on the upstream side of the weir.

The trap was made of 1.9-cm electrical conduit spaced 2.5 cm apart and welded into panels. The panels were wired together at the corners to produce a 2.4-m square box which was bolted to a plywood floor and covered with plywood to prevent fish from jumping out. A fyke, also made of conduit panels, was installed in the trap. Its purpose was to guide the fish into the trap and prevent their escape. The trap was placed on the upstream side of the weir. About 12 weir conduits were raised creating an opening approximately 60 cm, to allow fish to pass through the weir into the trap. A gate, inserted between two weir panels, allowed boat passage at both weirs. The gate was made of welded conduit panels with 2.5-cm spacing between conduits. The gate spanned approximately 6 m.

Processing of Fish

At both weirs, we identified all trapped salmonids to species, measured them to the nearest cm fork length (FL), and examined them for hook, predator, and gill-net scars, fin clips, and tags. Each untagged salmonid judged in good condition and unspawned was tagged with a serially numbered FT-4^{3/} spaghetti tag (Project-tagged). Tags were inserted using an applicator needle through the fishes back approximately two cm below the posterior insertion point of the dorsal fin. To determine angler harvest and catch-and-release rates upstream of the weirs, one-third of the chinook salmon received \$10-reward tags, while the remaining tags were non-reward. At WCW, half of the steelhead received reward tags, while the remaining received non-reward. Coho were tagged with non-reward tags due to their status as threatened under the Endangered

^{3/} The use of brand or trade names is for identification purposes only, and does not imply the endorsement of any product by the CDFG.

Species Act (ESA) which prohibits their take by sport anglers. At JCW, steelhead and coho were not tagged.

Determining the Separation Between Spring and Fall Chinook Salmon Runs at the Weirs

Each year there is a temporal overlap in the spring and fall chinook runs in the Trinity River. Since the timing of runs varies between years, each season we assign new dates separating the two runs so that numbers of spring and fall chinook used to estimate the run size and angler harvest could be determined. We compared the proportions of known and estimated spring and fall chinook trapped at the weirs each week. Generally, the week at which the proportion of fall chinook exceeded spring chinook was designated as the first week of the fall at that weir. If there are two consecutive weeks with nearly identical proportions, then the first week is designated as spring and the following as fall. A recovered tagged chinook was identified as either a spring or fall chinook based on two separate criteria. First, some chinook tagged at the weirs carried coded-wire tags (CWT's), placed in their snouts as juveniles at TRH. These fish were given an adipose fin clip as well. If these fish were recovered at the hatchery or during spawning surveys, the CWT code indicated whether they were spring or fall fish. Second, non-CWTed chinook tagged at the weir and recovered at the hatchery were classified as either spring or fall fish based on the date they entered the hatchery. If they entered the hatchery during the period associated with the spring run (based on CWT recoveries at the hatchery) they were considered spring chinook. Those chinook entering the hatchery during the period associated with the fall run (again, based on CWT recoveries) were considered fall chinook.

Estimating Numbers of Spring and Fall Chinook Salmon at Trinity River Hatchery

As at the weirs, there is an overlap in the migration of spring and fall chinook into TRH. To estimate the respective numbers of spring and fall chinook without CWT's entering TRH, we expanded the numbers of tags recovered from each returning CWT group by the ratio of tagged to total chinook salmon (production multiplier) when they were originally released (same strain, brood year [BY], release site, release group and date). For example, 44,654 fall chinook of CWT group 06-52-54 plus 438,756 unmarked fall chinook were released directly from TRH in June of 2000. The expanded estimate for each return of this group is 10.83 $(44,654 + 438,756 / 44,654)$. Thus, each CWT return was expanded by its production multiplier to estimate the total number of spring and fall Chinook that entered the hatchery.

If more chinook salmon entered the hatchery on a particular sorting day than could be accounted for by the expansion of all CWT groups, we assumed the additional fish were naturally produced. We designated these fish as spring or fall in the same proportions that were determined by the expansion of the CWT groups on that day.

For the purpose of estimating spring- and fall Chinook run-sizes, we assigned a separation date at the hatchery between the two runs. The separation date was the week in which fall Chinook out- numbered spring chinook based on the expansion of coded-wire tags.

Size Discrimination Between Adult and Grilse Chinook and Coho Salmon

We designated the size separating an adult fish from a grilse for spring and fall chinook based on length frequency data obtained at the two trapping sites and at TRH, compared against length data obtained from groups of CWT'ed fish that entered TRH whose exact age was known. Daily chinook salmon FL data from TRH were assigned to either spring or fall chinook only when the expansion of the number of CWTs indicated $\geq 90\%$ of the chinook salmon entering TRH were from either spring or fall runs.

Since we did not coded-wire tag coho salmon, exact ages are unknown. We therefore relied on length frequency analysis to separate grilse and adults. The length data collected at the weirs and TRH were smoothed with a moving average of five, 1-cm increments to determine the nadir separating grilse and adults.

Size Discrimination Between Adult and Immature Steelhead

All steelhead >41 cm FL were considered adults, and steelhead ≤ 41 cm FL captured at the weirs were assumed to be half-pounders (assumed to have migrated to the ocean). Steelhead ≤ 41 cm FL that entered TRH were classified as sub-adults, since we did not know whether they had migrated to the ocean or were residual fish.

Recovery of Tagged Fish

Weir Recovery

We examined dead salmonids recovered against the weir for tags, fin clips, and spawning condition, and measured them to the nearest cm FL. Heads of adipose fin-clipped (Ad-clipped) (potentially hatchery-marked) fish were removed for the recovery of the CWT. After examination, the carcasses were cut in half to prevent recounting and returned to the river downstream of the weir.

Tagging Mortalities

Tagged salmonids recovered dead at the weir, in spawning surveys, or reported dead by anglers were considered tagging mortalities, if there was no evidence they had spawned and they were recovered dead ≤ 30 days after tagging. Tagged fish recovered dead more than 30 days after tagging, or those that had spawned, regardless of the number days after tagging, were not considered tagging mortalities.

Angler Tag Returns

We used the information from Project-tags returned by anglers to assess sport harvest. All the tags placed on fish at the weirs were inscribed with our address so anglers could return the tags to us. All anglers that returned tags were sent questionnaires asking the date and location of their catch and whether they harvested (kept) or released their catch. The questionnaire informed them of the fish's tagging date and location.

Tags returned to us through May 1, 2003 were used to assess harvest and catch-and-release rates. Tags returned after that date were processed for payment but not used for analysis. This date

was chosen due to time constraints associated with the completion of this report and because the vast majority of tags have been returned by this date in previous years.

Trinity River Hatchery

The TRH fish ladder was open from 09 September 2002 through 11 March 2003. Hatchery personnel conducted fish sorting and spawning operations generally two days per week. We considered the initial day a fish was observed during sorting as the day it entered the hatchery.

On all sorting days, salmon and steelhead entering TRH were identified to species, sexed, and examined for tags and fin clips. We measured all salmon to the nearest cm FL, except those that were Project-tagged fish from the weirs. Project-tagged salmon and steelhead recovered at TRH were assigned the FL recorded for them at the weir where they were originally tagged.

During each sorting week, we gave a distinguishing fin-clip to Ad-clipped and project tagged-chinook that were placed in ponds to ripen, so the week they initially entered the hatchery (i.e., were sorted) could be determined when they were spawned. Fish that were neither Ad-marked or project-tagged were tallied. On the day they were spawned, we removed the heads of all Ad-clipped salmon and placed each in a plastic bag with a serially numbered tab noting the date and location of recovery, species, sex, and FL. Project personnel later performed CWT extraction and decoding.

Spawner Surveys

In cooperation with the U.S. Fish and Wildlife Service, U.S. Forest Service and Yurok Tribe, we conducted spawner surveys in the upper Trinity River from Cedar Flat (RK 78) upstream to Lewiston Dam (RK 180). Tagged fish recovered in these surveys were examined for spawning success and project tag numbers. Fish which were unspawned and recovered within 30 days of tagging were considered tagging mortalities. Results of these surveys are presented in Task 4.

Statistical Analyses

Effectively Tagged Fish

We estimated the number of effectively tagged fish by subtracting from the total tagged, those fish we classified as tagging mortalities, tagged-fish recovered downstream of the tagging site, and angler-caught-and-released fish.

Run-size Estimates

We determined the run-size estimates by using Chapman's version^{4/} of the Petersen Single Census Method:

$$N = \frac{(M+1)(C+1)}{(R+1)}, \text{ where}$$

N = estimated run-size

M = the number of effectively tagged fish

C = the number of fish examined at TRH

R = the number of Project-marked fish recovered in the hatchery sample.

We attempted to tag and recover enough fish to obtain 95% confidence limits within $\pm 10\%$ of the run-size estimate. We used criteria established by Chapman (1948) to select the type of confidence interval estimator. We used the proportions of grilse and adult salmon trapped at each weir to estimate the numbers of grilse and adults comprising the run upstream of that respective weir. We did not stratify the estimates into grilse and adult salmon because there were not sufficient grilse and adult salmon recovered to obtain 95% confidence of $\pm 10\%$ of each of the stratified portions of the run

All steelhead run-size estimates were for adults only. Since the 1997 BY, all TRH-produced steelhead have been adipose-fin-clipped. We determined the proportion of the run that was hatchery produced based upon the percentage of adipose fin clipped steelhead observed at Willow Creek Weir.

For the run-size estimates, we assumed that: 1) fish trapped and released from the weir were a random sample representative of the population; 2) tagged and untagged fish were equally vulnerable to recapture at TRH; 3) all Project tags were recognized upon recovery; 4) tagged and untagged fish were randomly mixed throughout the population and among the fish recovered at TRH; and 5) we accounted for all tagging mortalities.

Angler Harvest and Catch-and-Release Rates and Harvest Estimates

Generally, anglers will return reward tags at a rate higher or nearly equal to that of non-reward tags. When this was the case, we used only reward tag returns to determine harvest rates. When non-reward tags were returned at higher rates than reward tags, we combined the two to determine harvest rates.

^{4/} Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological census. Univ. Calif. Publ. Stat. 1:131-160, As cited in Ricker (1975).

We computed the harvest rate for each species (and race of chinook) by dividing the number of angler-returned tags from harvested fish by the number of fish we effectively tagged. We calculated independent harvest rates for grilse and adult salmon.

The assumptions for the numbers of effectively reward- and non-reward-tagged fish released were the same as those for determining the run-size estimate (See "Run-size Estimates" above).

We computed the catch-and-release rate for each species (and race of chinook) by dividing the number of angler-returned tags from caught and released fish by the number of fish effectively tagged plus the number of fish reported as released.

We estimated the numbers of fish harvested upstream of each weir by multiplying the harvest rates (for each species and race) by their respective run sizes upstream of each weir.

Use of Standard Julian Week

Weekly sampling data collected by Project personnel at the weirs are presented in Julian week (JW) format. Each JW is defined as one of a consecutive set of 52 weekly periods, beginning 1 January, regardless of the day of the week on which 1 January falls. The extra day in leap years is included in the ninth week (Appendix 1). This procedure allows inter-annual comparisons of identical weekly periods.

RESULTS

Trapping and Tagging

Chinook Salmon

Spring-Fall Chinook Separation and Run Timing. Based upon CWT's the proportion of fall chinook tagged at WCW exceeded spring chinook throughout the entire season, so for the purpose of analysis all chinook salmon trapped at the WCW were considered fall-run (Figure 5).

Fall chinook average weekly catch at WCW peaked (31.4 fish/night) during JW 37. Catches declined from that point and tapered off considerably after October 7th (Table 1, Figure 6). Both the run timing and the strength of the run for fall Chinook were probably greatly influenced by the fish die off in the lower Klamath River in late September.

Spring chinook were the predominant race at JCW throughout the season. For the purpose of analysis all of the 1,734 chinook trapped at JCW were spring chinook (Figure 5). At JCW, spring chinook catch peaked during JW 26 (68.8 fish/night). Catch declined thereafter but fluctuated through JW 38, the last week of the season (Table 2, Figure 7).

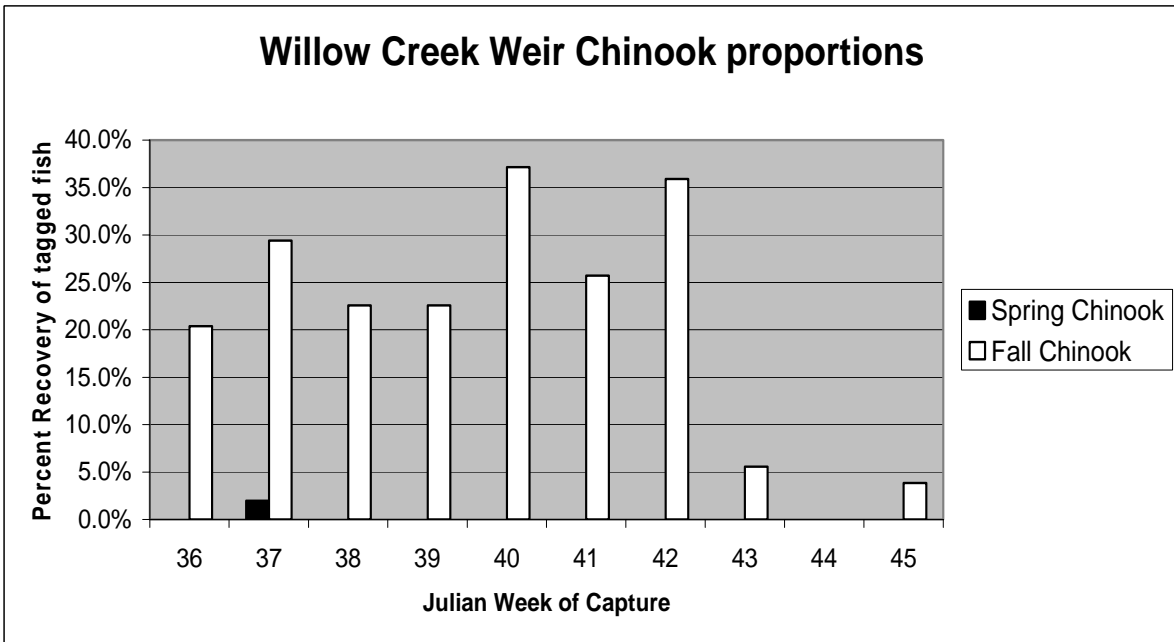
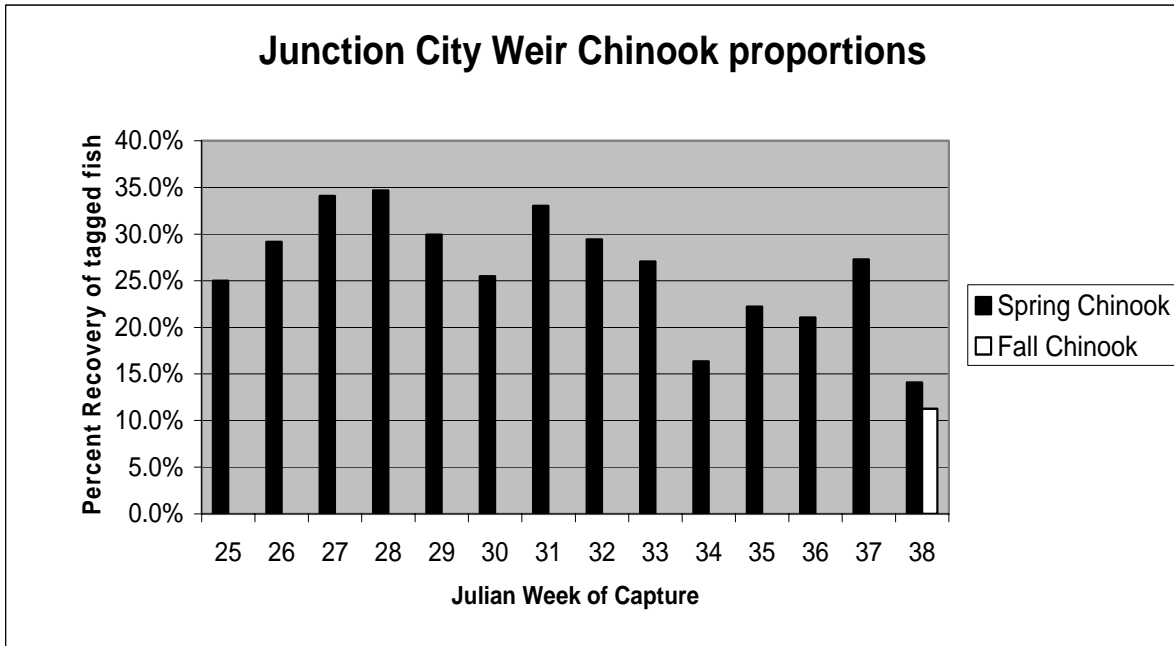


Figure 5. Weekly proportions of spring and fall Chinook salmon at the Junction City and Willow Creek weirs observed during the 2002-03 season. Chinook salmon were designated as either spring- or fall-run based on recoveries of coded-wire tags or entry timing into Trinity River Hatchery. For the purposes of analysis, Chinook salmon captured at Willow Creek Weir were considered fall-run and Chinook salmon captured at Junction City Weir were considered spring-run.

Table 1. Weekly summary of fall-run chinook salmon trapped in the Trinity River at Willow Creek Weir during the 2002-03 season. For the purpose of analysis there were no spring-run chinook salmon trapped at the Willow Creek Weir. a/

Julian Week	Inclusive dates	Nights Trapped	Number Trapped			fish/night
			Grilse b/	Adults	Total	
36	3-Sep - 9-Sep	3	11	44	55	18.3
37	10-Sep - 16-Sep	5	27	130	157	31.4
38	17-Sep - 23-Sep	5	14	84	98	19.6
39	24-Sep - 30-Sep	5	33	68	101	20.2
40	1-Oct - 7-Oct	5	30	45	75	15.0
41	8-Oct - 14-Oct	5	8	29	37	7.4
42	15-Oct - 21-Oct	5	9	34	43	8.6
43	22-Oct - 28-Oct	5	1	19	20	4.0
44	29-Oct - 4-Nov	5	2	24	26	5.2
45	5-Nov - 11-Nov	3	0	31	31	10.3
46	12-Nov - 18-Nov	1				0.0
47	19-Nov - 25-Nov	5				0.0
48	26-Nov - 2-Dec	5				0.0
49	3-Dec - 9-Dec	5				0.0
50	10-Dec - 16-Dec	2				0.0
Total:		64	135	508	643	
Mean:						10.0

a/ Trapping Willow Creek took place from 5 September (Julian Week 36) through 11 December (Julian Week 50) of 2002.

b/ Fall run chinook ≤ 60 cm, FL were considered grilse.

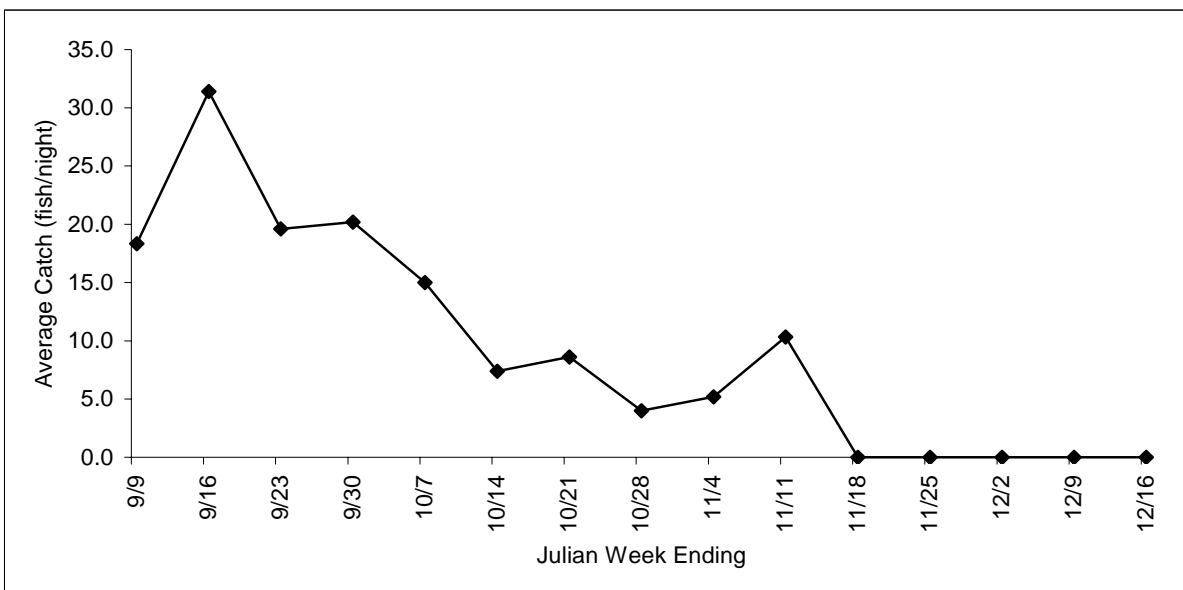


Figure 6. Average catch of fall-run chinook salmon in the Trinity River at Willow Creek Weir during the 2002-03 season.

Table 2. Weekly summary of spring-run chinook salmon trapped in the Trinity River at Junction City Weir during the 2002-03 season. For the purposes of analysis there were no fall-run chinook salmon trapped at the Junction City Weir. a/

Julian Week	Inclusive dates	Nights Trapped	Number Trapped			fish/night
			Grilse b/	Adults	Total	
25	18-Jun - 24-Jun	4		72	72	18.0
26	25-Jun - 1-Jul	5	2	342	344	68.8
27	2-Jul - 8-Jul	3	3	181	184	61.3
28	9-Jul - 15-Jul	5	8	150	158	31.6
29	16-Jul - 22-Jul	5	19	160	179	35.8
30	23-Jul - 29-Jul	5	15	93	108	21.6
31	30-Jul - 5-Aug	5	20	91	111	22.2
32	6-Aug - 12-Aug	5	12	125	137	27.4
33	13-Aug - 19-Aug	5	20	203	223	44.6
34	20-Aug - 26-Aug	5	3	48	51	10.2
35	27-Aug - 2-Sep	4	0	18	18	4.5
36	3-Sep - 9-Sep	5	3	16	19	3.8
37	10-Sep - 16-Sep	5	2	36	38	7.6
38	17-Sep - 23-Sep	5	9	83	92	18.4
Total:		66	116	1,618	1,734	
Mean:						26.3

a/ Trapping Junction City took place from 5 June (Julian Week 25) through 23 September (Julian Week 50) of 2002.

b/ Spring-run chinook ≤ 55 cm, FL were considered grilse.

c/ There was a temporal overlap of spring and fall-run chinook during Julian Week 38. For the purpose of analysis all chinook were considered spring run.

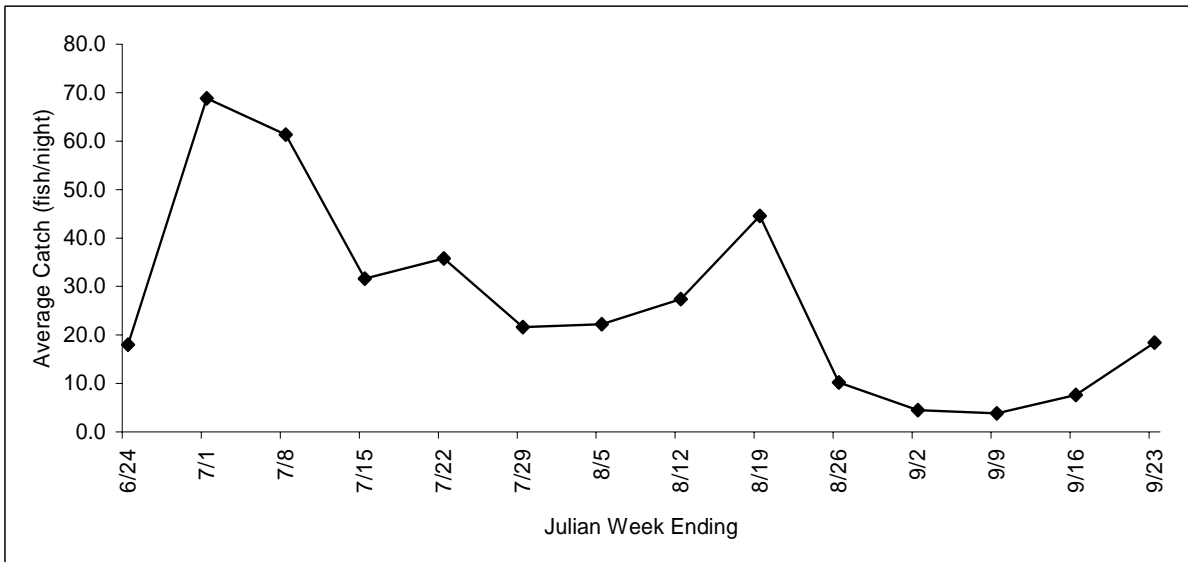


Figure 7. Average catch of spring-run chinook salmon in the Trinity River at Junction City Weir during the 2002-03 season.

Sizes of Trapped Fish.

Spring chinook trapped at JCW averaged 72.2 cm FL and 71.8 cm FL at TRH. Information from known-age, hatchery-marked spring chinook that entered TRH suggested generally grilse were ≤ 55 cm FL and adults were larger (Figure 8, Appendix 2). Grilse comprised 6.7% and 5.6% of the spring chinook observed at JCW and TRH, respectively.

Fall chinook trapped at WCW averaged 71.5 cm FL and 69.8 cm FL at TRH. The FL distribution for the two sites indicated generally grilse were ≤ 60 cm FL and adults were larger (Figure 9). Size data of known-age, hatchery-marked fall chinook entering TRH also supported this size separation (Appendix 3). Therefore, we considered fall chinook in the Trinity River basin ≤ 60 cm FL to be grilse. Fall chinook grilse comprised 21.1% and 23.7% of the run observed at WCW and TRH, respectively.

Effectively Tagged Fish. We trapped 1,734 spring chinook at JCW, of which 1,673 (111 grilse and 1,562 adults) were effectively tagged (Appendix 4). There were 12 tagging mortalities, 21 poor-condition untagged fish, and 24 spring chinook from which anglers reported removing tags that were not considered effectively tagged. There were 569 (32.8 %) reward-tagged spring chinook (37 grilse and 532 adults). The remaining fish received non-reward tags.

We trapped 643 fall chinook at WCW and 605 of them (128 grilse and 477 adults) were effectively tagged (Appendix 5). Due to poor condition we did not tag 14 fall-run chinook, anglers removed the tags from 5, and there were two tagging mortalities. We placed reward tags on 200 (46 grilse and 154 adults), or 31.1%, of the effectively tagged fall chinook at WCW.

Incidence of Tags and Fin Clips. Two of the chinook tagged at WCW were subsequently recaptured at JCW this year. Ad-clipped fish comprised 15.2% (263/1,734) of the spring chinook at JCW (Appendix 4). One hundred-three of the 263 Ad-clipped chinook tagged at JCW were subsequently recovered at TRH (table 3). These were predominantly from release groups CWT code 0625250 (spring chinook released as yearlings in October of 1998), 065258 (spring chinook released as yearlings in 1999), and CWT codes 065252 and 065253 (spring chinook released as fingerlings in 1999 (Table 3).

Ad-clipped fish comprised 12.6% (81/643) of the fall chinook observed at WCW (Appendix 5). Thirty (37.0%) of the Ad-clipped fall chinook tagged at WCW were recovered at TRH (Table 3). Of these, the vast majority were fall chinook released from TRH as yearlings in 1998 and 1999 (062641 from BY 1998 and CWT code 065259 from BY 1999). Returns to the hatchery of fall Chinook were made up of approximately equal numbers of three and four year old fish (Table 3).

Incidence of Gill-net Wounds, Hook Scars, and Predator Wounds. One hundred eighty-three (10.5%) of the 1,743 spring chinook trapped at JCW had gill-net wounds. The average size of gill-net-wounded vs. spring chinook without gill net wounds was 69.2 and 72.5 cm FL,

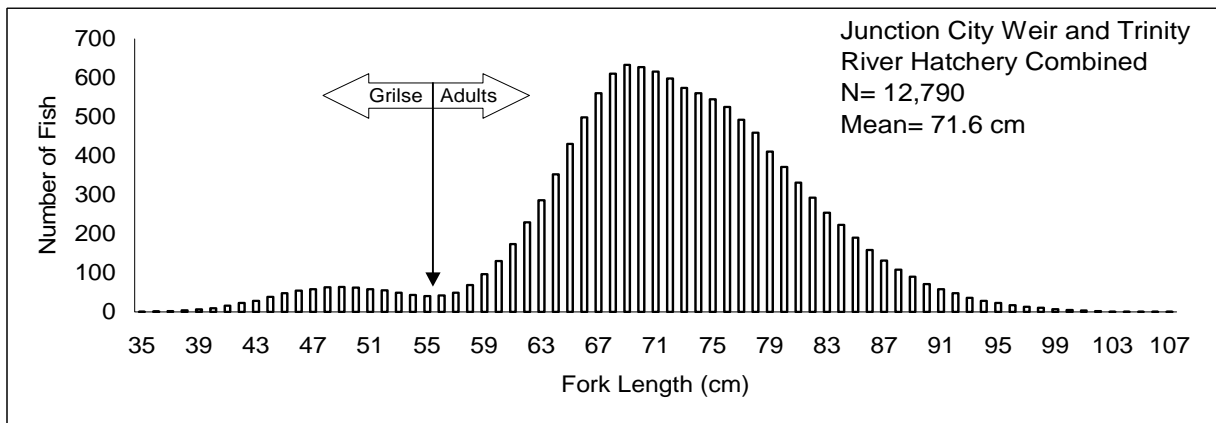
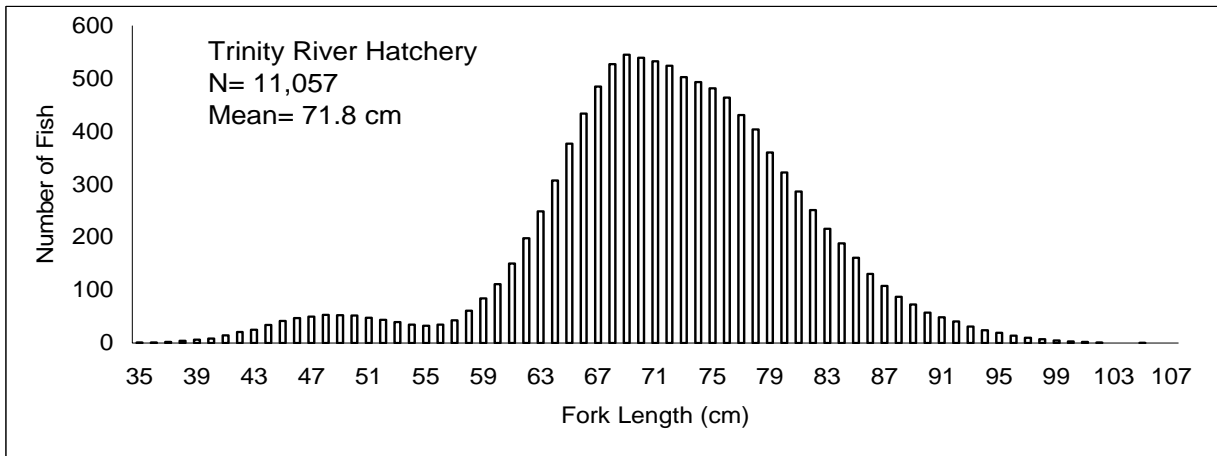
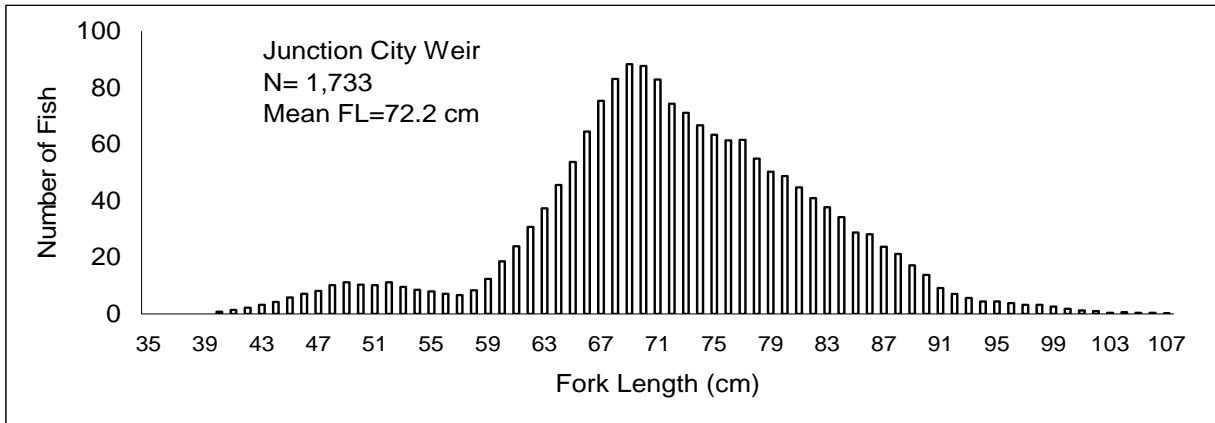


Figure 8. Spring-run Chinook salmon fork lengths (cm) observed at Junction City Weir and Trinity River Hatchery during the 2002-03 season. The number of fish at each fork length is shown as a moving average of five, 1-cm increments. The arrow denotes the size we used to separate grilse and adults for analysis.

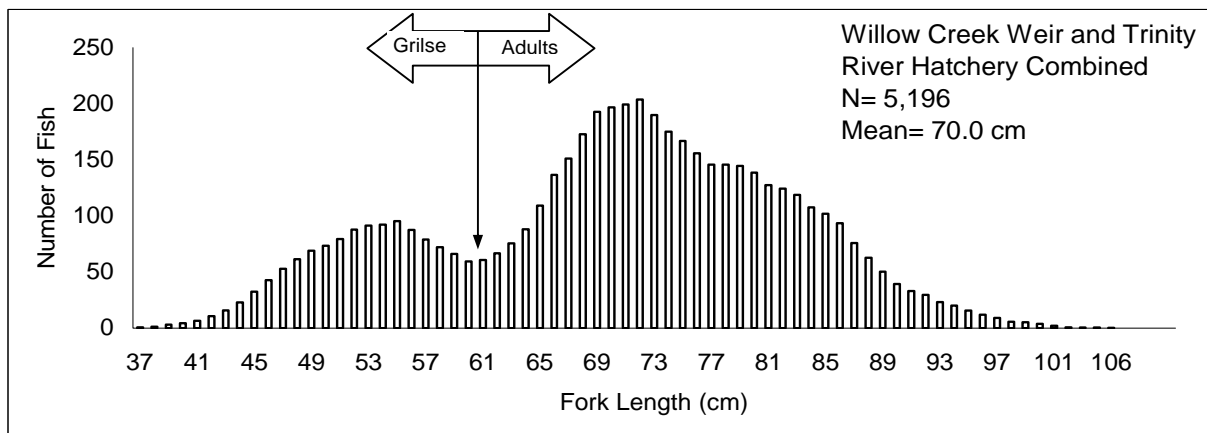
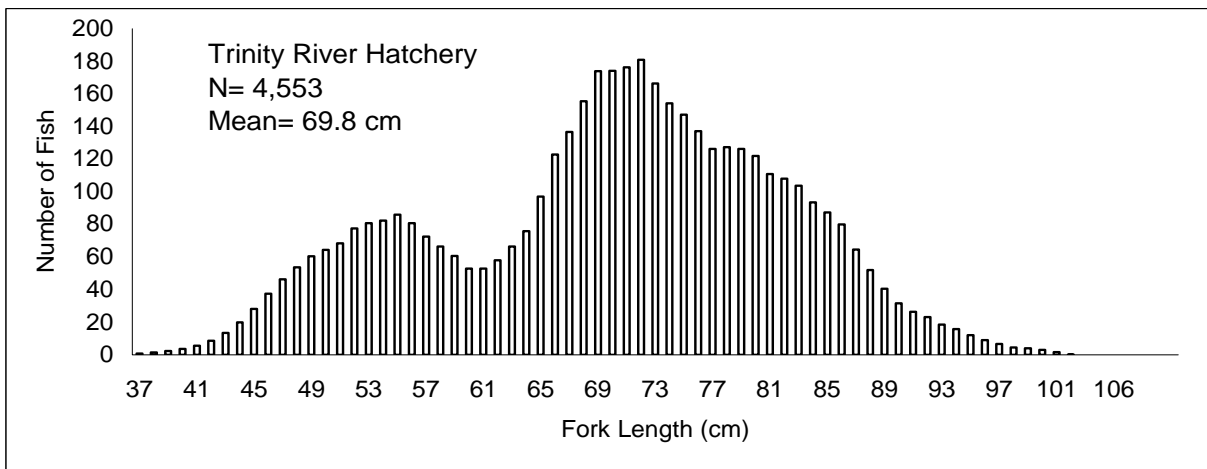
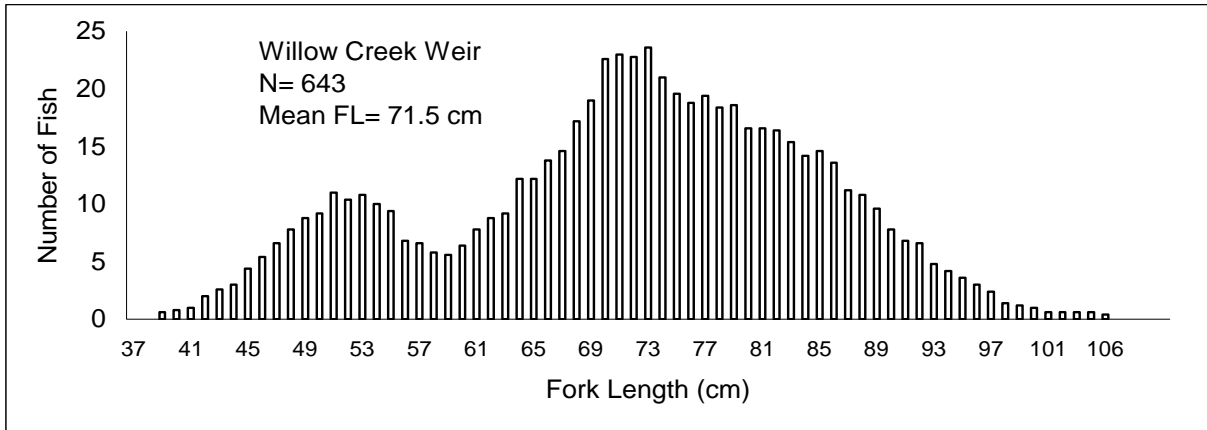


Figure 9. Fall-run Chinook salmon fork lengths (cm) observed at Willow Creek Weir and Trinity River Hatchery during the 2002-03 season. The number of fish at each fork length is shown as a moving average of five, 1-cm increments. The arrow denotes the size we used to separate grilse and adults for analysis.

Table 3. Release data and recoveries of coded-wire tagged (CWT) and maxillary-clipped salmon trapped in the Trinity River at Willow Creek and Junction City weirs, and recovered at Trinity River Hatchery during the in the 2002-03 season.

CWT and release type a/	Species	Race	Release data				Numbers recovered from tagging site: b/	
			Brood year	Date	Number of fish	Site c/	WCW	JCW
065237-f	chinook	spring	1997	06/15/98	104,577	TRH	0	0
065238-f	chinook	spring	1997	06/15/98	104,578	TRH	0	0
065240-y	chinook	spring	1997	10/01-07/98	147,507	TRH	0	0
065247-f	chinook	spring	1998	06/01-07/99	54,378	TRH	0	1
065248-f	chinook	spring	1998	06/01-07/99	61,516	TRH	0	0
065249-f	chinook	spring	1998	06/01-07/99	61,074	TRH	0	1
065250-y	chinook	spring	1998	10/4-13/99	137,602	TRH	0	24
065251-f	chinook	spring	1999	06/01-07/00	49,421	TRH	0	7
065252-f	chinook	spring	1999	06/01-07/00	51,993	TRH	0	21
065253-f	chinook	spring	1999	06/01-07/00	46,966	TRH	0	12
065258-y	chinook	spring	1999	10/03-06/00	129,919	TRH	0	27
065260-f	chinook	spring	2000	06/06-13/05	33,049	TRH	0	0
065261-f	chinook	spring	2000	06/06-13/06	32,621	TRH	0	0
065262-f	chinook	spring	2000	06/06-13/07	24,480	TRH	0	0
065263-f	chinook	spring	2000	06/06-13/08	34,385	TRH	0	0
065264-f	chinook	spring	2000	06/06-13/09	31,857	TRH	0	0
065269-f	chinook	spring	2000	06/06-13/10	52,491	TRH	0	1
065270-f	chinook	spring	2000	06/06-13/11	52,580	TRH	0	1
065279-y	chinook	spring	2000	10/01-10/01	99,304	TRH	0	1
shed tag d/	chinook	spring					0	4
Total spring-run chinook:							0	100
065233-f	chinook	fall	1997	06/15/98	50,947	TRH	0	0
065234-f	chinook	fall	1997	06/15/98	49,353	TRH	0	0
065235-f	chinook	fall	1997	06/15/98	49,786	TRH	0	0
065236-f	chinook	fall	1997	06/15/98	48,382	TRH	0	0
065239-f	chinook	fall	1997	06/15/98	18,304	TRH	0	0
065241-y	chinook	fall	1997	10/01-07/98	313,080	TRH	0	0
062641-y	chinook	fall	1998	10/4-13/99	334,726	TRH	11	1
065242-f	chinook	fall	1998	06/01-07/99	46,399	TRH	1	0
065642-f	chinook	fall	1998	10/4-13/99	16,673	TRH	0	0
065243-f	chinook	fall	1998	06/01-07/99	42,659	TRH	0	0
065244-f	chinook	fall	1998	06/01-07/99	49,332	TRH	0	0
065245-f	chinook	fall	1998	06/01-07/99	46,391	TRH	0	0
065254-f	chinook	fall	1999	06/01-07/00	44,654	TRH	0	0
065255-f	chinook	fall	1999	06/01-07/00	42,549	TRH	2	0
065257-f	chinook	fall	1999	06/01-07/00	50,533	TRH	3	0
065256-f	chinook	fall	1999	06/01-07/00	43,565	TRH	0	0
065259-y	chinook	fall	1999	10/03-06/00	296,892	TRH	6	2
065265-f	chinook	fall	2000	06/06-13/03	32,795	TRH	1	0
065266-f	chinook	fall	2000	06/06-13/04	33,806	TRH	0	0
065267-f	chinook	fall	2000	06/06-13/07	34,852	TRH	0	0
065268-f	chinook	fall	2000	06/06-13/11	33,240	TRH	0	0
065271-f	chinook	fall	2000	06/06-13/01	54,867	TRH	1	0
065272-f	chinook	fall	2000	06/06-13/02	36,035	TRH	0	0
065273-f	chinook	fall	2000	06/06-13/08	57,444	TRH	0	0
065274-f	chinook	fall	2000	06/06-13/09	32,096	TRH	1	0
065275-f	chinook	fall	2000	06/06-13/05	64,250	TRH	1	0
065276-f	chinook	fall	2000	06/06-13/06	27,159	TRH	1	0
065277-f	chinook	fall	2000	06/06-13/12	56,582	TRH	0	0
065278-f	chinook	fall	2000	06/06-13/13	34,183	TRH	0	0
065280-y	chinook	fall	2000	10/01-10/01	216,593	TRH	1	0
065643-f	chinook	fall	2000	06/06-13/10	25,007	TRH	0	0
shed tag d/	chinook	fall					1	0
Total fall-run chinook:							30	3
RM e/	coho		1999	03/15-22/01	513,500	TRH	56	0
RM e/	coho		2000	03/15-22/02	530,285	TRH	31	0
Total coho:							87	0

a/ CWT=coded-wire tag.

b/ Tagging site: WCW=Willow Creek Weir; JCW=Junction City Weir.

c/ Release site: TRH=Trinity River Hatchery

d/ Fish with shed CWTs were designated as spring- or fall-race based on the date they were trapped at the weirs.

e/ Since 1996, all coho produced at TRH have received a right maxillary clip (RM). Coho less than 59 cm, FL were classified as brood year 2000 and coho greater than 58 cm, FL were classified as brood year 1999. Age cutoff based on fork length distribution.

respectively. Three fresh hooking scars, eight predator scars, and 21 wounds of unknown origin were observed on spring chinook at JCW.

For fall chinook, 4.3% (28/643) of the fish trapped at WCW were gill-net-wounded. The average size of gill-net-wounded fish was 76.0 cm FL and non-gill-net-wounded fall chinook averaged 71.3 cm, FL. Hooking scars, one ocean and nine fresh, were observed on fall chinook at WCW. Predator wounds were observed on 43 of the fall chinook and twelve fish had wounds of unknown origin.

Coho Salmon

Run timing. We trapped the first coho at WCW on 12 September, 2002 (JW 37). Coho trapping peaked during JW 41 when average catch was 12.8 fish/night (Table 4, Figure 10). We trapped 223 coho salmon (99 grilse and 124 adults) at WCW.

Size of Fish Trapped. Coho trapped at WCW ranged from 32 to 79 cm, FL and averaged 59.1 cm, FL (Figure 11, Appendix 6). The size separating grilse and adult coho was based on the combined length data from coho trapped at WCW and that entered TRH (Figure 11). This year all coho ≤ 57 cm FL were considered grilse, while larger coho were adults. Grilse coho comprised 43.9% and 9.8 % of the coho trapped at WCW and TRH respectively.

Effectively Tagged Fish. Of the 223 coho salmon trapped at WCW, 197 were effectively tagged (Appendix 6). To discourage anglers from harvesting coho, all fish received non-reward tags.

Incidence of Tags and Fin Clips. Ninety five percent (211/223) of the coho salmon we trapped at WCW (91 grilse and 120 adults) bore right maxillary (RM) clips (Appendix 6). Eighty-seven of the project tagged, RM-clipped coho, were recovered at TRH (Table 3).

Incidence of Gill-net Wounds, Hook Scars and Predator Wounds. Six (4.5%) of the coho observed at WCW were gill-net-wounded, two had fresh hook wounds, four had wounds of unknown origin, and 32 were observed to have predator scarring.

Fall Steelhead

Run Timing. We trapped steelhead every week of trapping at WCW (Table 5, Figure 12). There was a peak in late September and early October with trapping rates of over 79 steelhead/night and we trapped a total of 1,608 steelhead (19 half-pounders and 1,589 adults). We trapped steelhead during every week at JCW but average catch rates never exceeded 4 fish/night (Table 6, Figure 13). We trapped five half-pounders and 81 adult steelhead at JCW.

Size of Fish Trapped. Steelhead caught at WCW, JCW, and TRH averaged 61.3, 60.0 and 62.8 cm FL, respectively (Figure 14). Adult steelhead (> 41 cm, FL) made up 94.2%, 98.8% and 97.9% of the steelhead trapped at JCW, WCW and TRH respectively.

Table 4. Weekly summary of coho salmon trapped in the Trinity River at Willow Creek Weir during the 2002-03 season.

Julian Week	Inclusive dates	Nights Trapped	Number Trapped			fish/night
			Grilse b/	Adults	Total	
36	3-Sep - 9-Sep	3			0	0.0
37	10-Sep - 16-Sep	5	2		2	0.4
38	17-Sep - 23-Sep	5	9	1	10	2.0
39	24-Sep - 30-Sep	5	7	0	7	1.4
40	1-Oct - 7-Oct	5	25	5	30	6.0
41	8-Oct - 14-Oct	5	41	23	64	12.8
42	15-Oct - 21-Oct	5	10	11	21	4.2
43	22-Oct - 28-Oct	5	2	52	54	10.8
44	29-Oct - 4-Nov	5	3	21	24	4.8
45	5-Nov - 11-Nov	3	0	6	6	2.0
46	12-Nov - 18-Nov	1		0	0	0.0
47	19-Nov - 25-Nov	5		0	0	0.0
48	26-Nov - 2-Dec	5		0	0	0.0
49	3-Dec - 9-Dec	5		5	5	1.0
50	10-Dec - 16-Dec	2			0	0.0
Total		64	99	124	223	
Mean:						3.5

a/ Trapping Willow Creek took place from 5 September (Julian Week 36) through 11 December (Julian Week 50) of 2002.

b/ Coho salmon ≤ 57 cm, FL were considered grilse. Larger coho salmon were considered adults.

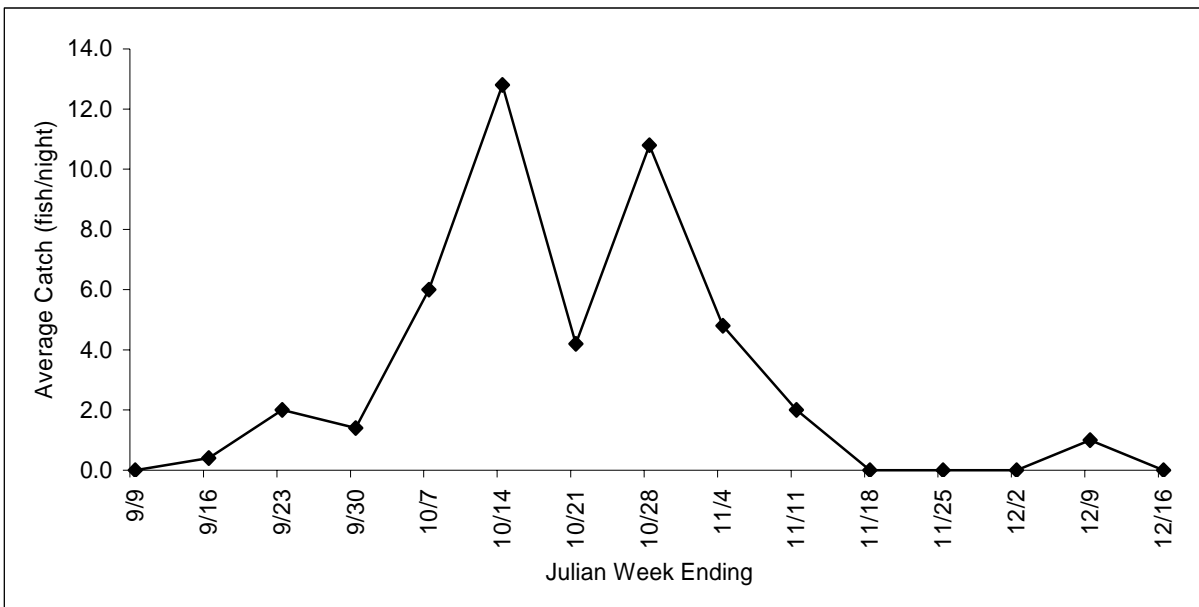


Figure 10. Average catch of coho salmon in the Trinity River at Willow Creek Weir during the 2002-03 season.

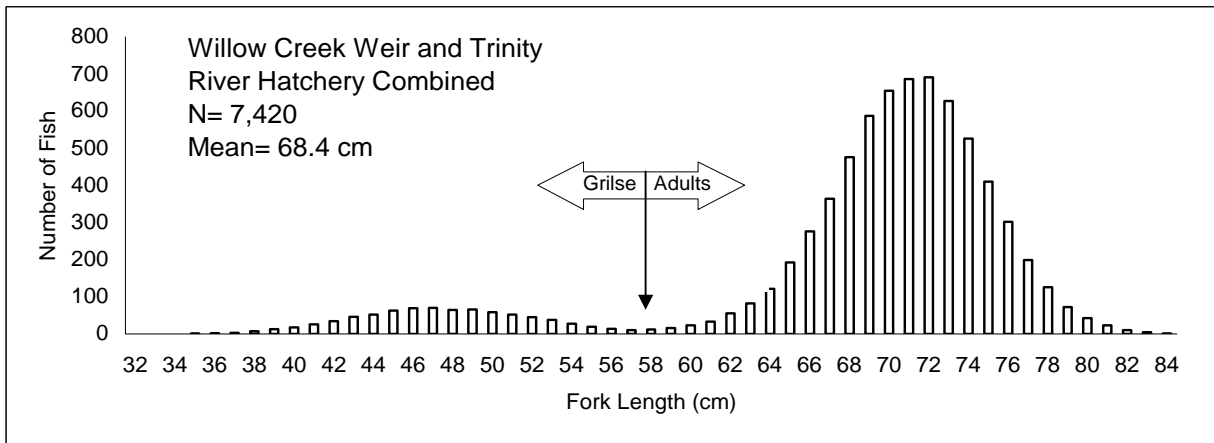
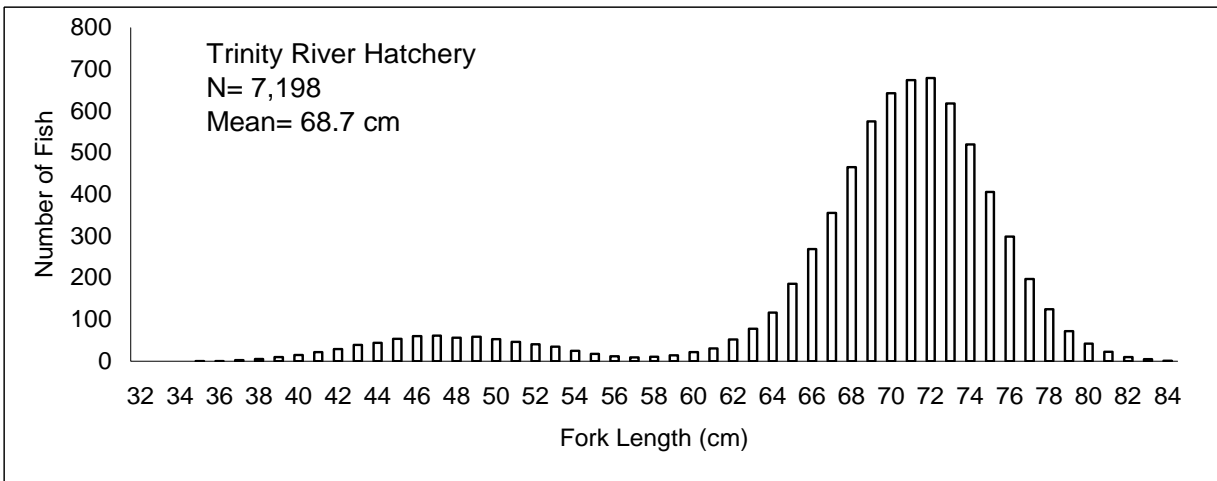
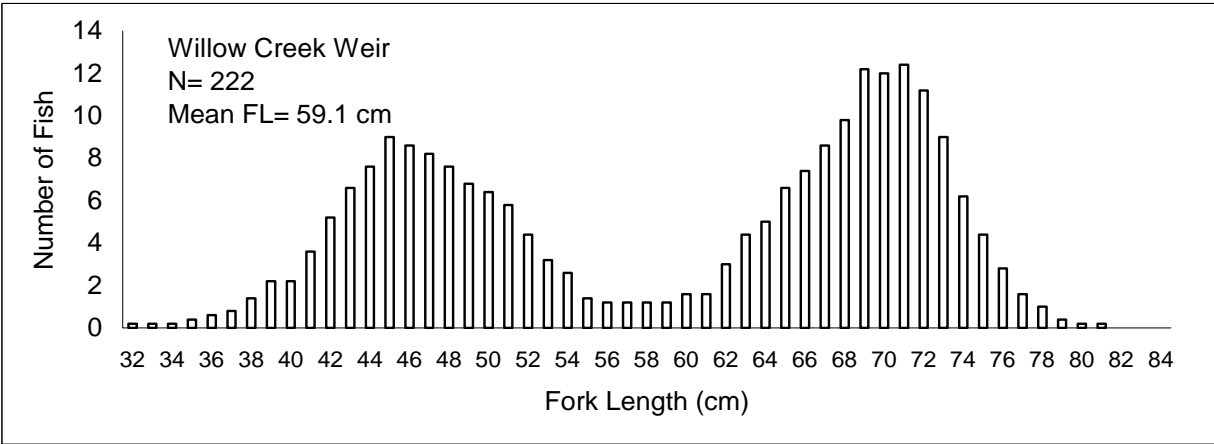


Figure 11. Coho salmon fork lengths (FL) observed at the Willow Creek Weir and Trinity River Hatchery during the 2002-2003 season. The number of fish at each FL is shown as a moving average of five, 1-cm increments. The arrow denotes the size we used to separate grilse and adults for analysis.

Table 5. Weekly summary of steelhead trapped in the Trinity River at Willow Creek Weir during the 2002-03 season.

Julian Week	Inclusive dates	Nights Trapped	Number Trapped			fish/night
			1/2 lbers b/	Adults	Total	
36	3-Sep - 9-Sep	3		58	58	19.3
37	10-Sep - 16-Sep	5		137	137	27.4
38	17-Sep - 23-Sep	5	2	172	174	34.8
39	24-Sep - 30-Sep	5	7	390	397	79.4
40	1-Oct - 7-Oct	5	3	255	258	51.6
41	8-Oct - 14-Oct	5	7	191	198	39.6
42	15-Oct - 21-Oct	5		171	171	34.2
43	22-Oct - 28-Oct	5		133	133	26.6
44	29-Oct - 4-Nov	5		19	19	3.8
45	5-Nov - 11-Nov	3		36	36	12.0
46	12-Nov - 18-Nov	1		2	2	2.0
47	19-Nov - 25-Nov	5		14	14	2.8
48	26-Nov - 2-Dec	5		2	2	0.4
49	3-Dec - 9-Dec	5		2	2	0.4
50	10-Dec - 16-Dec	2		7	7	3.5
Total		64	19	1,589	1,608	
Mean:						25.1

a/ Trapping Willow Creek took place from 5 September (Julian Week 36) through 11 December (Julian Week 50) of 2002.

b/ Steelhead \leq 41 cm, FL were considered 1/2 half-pounders; larger steelhead were considered adults.

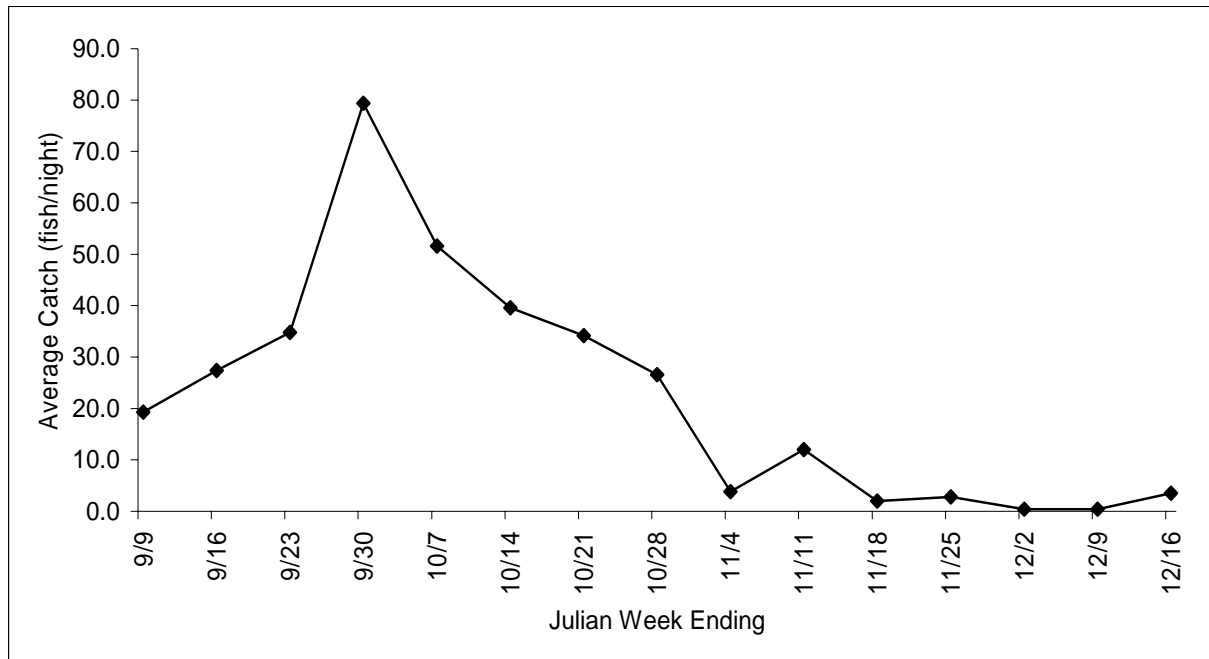


Figure 12. Average catch of steelhead in the Trinity River at Willow Creek Weir during the 2002-03 season.

Table 6. Weekly summary of steelhead trapped in the Trinity River at Junction City Weir during the 2002-03 season.

Julian Week	Inclusive dates	Nights Trapped	Number Trapped			fish/night
			1/2 lbers b/	Adults	Total	
25	18-Jun - 24-Jun	4		4	4	1.0
26	25-Jun - 1-Jul	5		12	12	2.4
27	2-Jul - 8-Jul	3		6	6	2.0
28	9-Jul - 15-Jul	5		7	7	1.4
29	16-Jul - 22-Jul	5		6	6	1.2
30	23-Jul - 29-Jul	5		3	3	0.6
31	30-Jul - 5-Aug	5		0	0	0.0
32	6-Aug - 12-Aug	5		1	1	0.2
33	13-Aug - 19-Aug	5		8	8	1.6
34	20-Aug - 26-Aug	5		3	3	0.6
35	27-Aug - 2-Sep	4		1	1	0.3
36	3-Sep - 9-Sep	5	2	7	9	1.8
37	10-Sep - 16-Sep	5	3	5	8	1.6
38	17-Sep - 23-Sep	5		18	18	3.6
Total		66	5	81	86	
Mean:						1.3

a/ Trapping Junction City took place from 19 June (Julian Week 25) through 23 September (Julian Week 38) of 2002.

b/ Steelhead <= 41 cm, FL were considered 1/2 half-pounders; larger steelhead were considered adults.

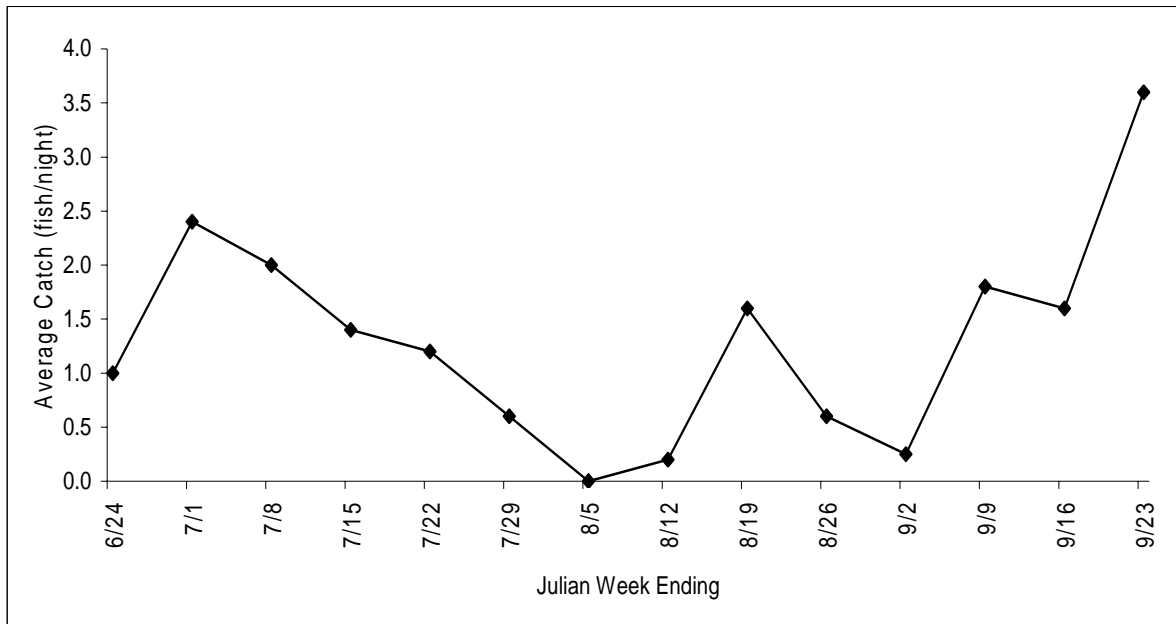


Figure 13. Average catch of steelhead in the Trinity River at Junction City Weir during the 2002-03 season.

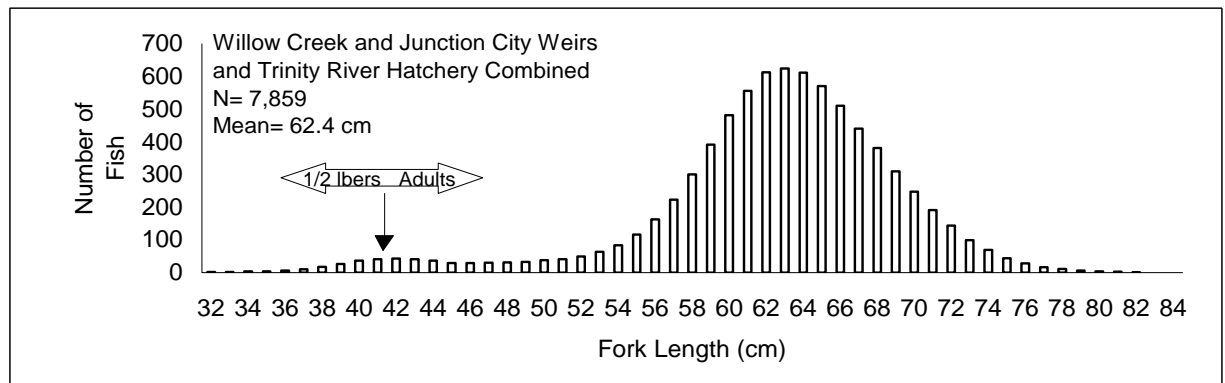
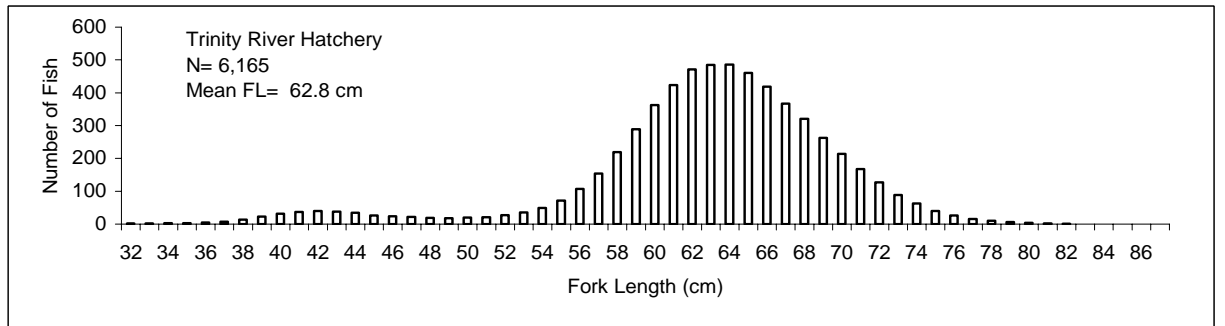
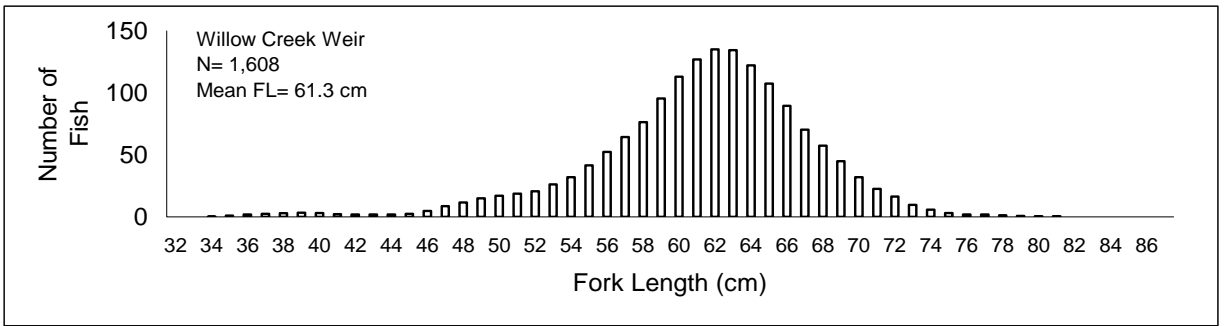
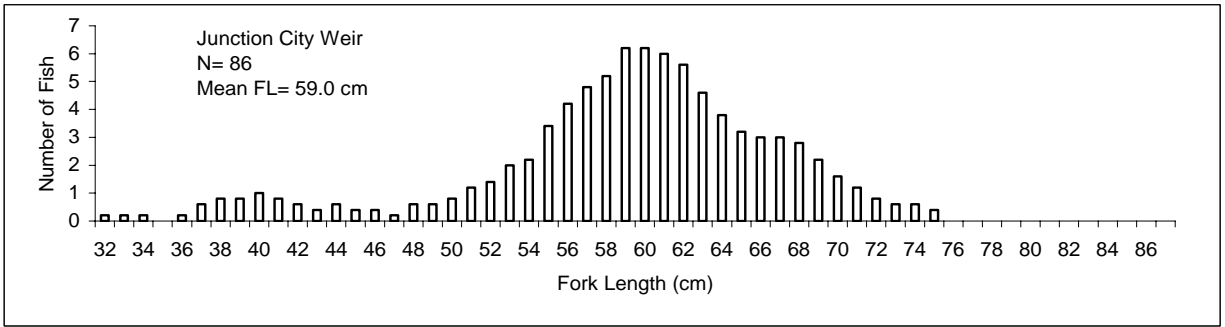


Figure 14. Fall-run steelhead fork lengths observed at Junction City and Willow Creek weirs and Trinity River Hatchery during the 2002-03 season. The number of fish at each fork length is shown as a moving average of 5, 1-cm increments. The arrow denotes the size we used to separate half-pounders and adults for analysis.

Effectively Tagged Fish. We trapped 1,608 adult steelhead at WCW and 1,417 of those were effectively tagged (Appendix 7). We detected no tagging mortalities, 50 fish were not tagged, and anglers reported removing tags from 35. Six hundred ninety-nine of the effectively tagged adults were reward-tagged, the remainder received non-reward tags. Steelhead were not tagged at JCW.

Incidence of Tags and Fin Clips. We observed adipose-fin-clips on 1,217 (75.7 %) steelhead at WCW, and 56 (65.1 %) at JCW (Appendix 8). All steelhead released from TRH have been adipose-fin-clipped prior to release since brood year 1997.

Incidence of Gill-net Wounds, Hook Scars and Predator Wounds. At WCW, 25 of the steelhead trapped had gill net wounds, two had ocean hook wounds, 11 had fresh hook wounds, 24 had unknown wounds, and 175 had predator wounds. At JCW two of the steelhead had gill-net wounds and no other marks were observed on steelhead.

Recovery of Tagged Fish

Total Recoveries. Fish tagged at JCW and WCW were recovered from four different sources; at TRH, during upper Trinity River spawner surveys, from angler returns, and as tagging mortalities found on or near the tagging weirs. Length frequencies of spring and fall chinook, coho, and steelhead tagged at the weirs and subsequently recovered are presented in appendices 9-12.

Thirty-nine percent of the effectively tagged spring chinook at JCW and 34% of the fall chinook at WCW were recovered. Forty five percent of the effectively tagged coho and 41% of the effectively tagged steelhead from WCW were recovered. As expected, the highest number of recoveries for all species occurred at TRH.

Tag Returns by Anglers

Angler Harvest Regulations. Department of Fish and Game fishing regulations can affect the return of tags each year by limiting harvest. Special quota restrictions were in place during the season but they did not effect harvest because the quotas were not met (Appendix 13). The adult fall chinook salmon sport quota for the Trinity River during the 2002-03 season was 6,864 fish, split equally between the lower River (Weitchpec to Cedar Flat) and the upper River (Cedar Flat to Lewiston). Additionally, anglers were allowed to retain adipose-fin-clipped steelhead only. The take of coho was prohibited.

Spring Chinook. Anglers returned 27 reward and 31 non-reward tags from harvested spring chinook tagged at JCW from two grilse and 56 adults (appendix 9). We estimated harvest rate, based on the return of reward tags, at 2.9% for grilse and 5.0% for adults. Anglers reported releasing eight reward-tagged adult and two reward tagged grilse spring chinook. Using reward tagged fish we estimated the catch-and-release rate to be 1.5% for adults and 5.4% for grilse spring chinook.

Fall Chinook. Anglers returned 17 tags from harvested fall chinook salmon tagged at WCW (appendix 10). Based on the return of reward tags, the estimated harvest rate upstream of WCW was 3.9% for adults and 4.4% for grilse fall chinook. Anglers returned an additional 2 reward tags from fish that were caught and released (appendix 10). Using reward tagged fish; we estimated that the catch-and-release rate upstream of WCW was 0.7% for adults and 2.2% for grilse fall run chinook salmon.

Coho Salmon. To discourage the harvest of threatened coho salmon, we tagged coho at WCW with non-reward tags only. No tags were returned from angler caught or caught and released coho (Appendix 11). Therefore, we conclude that no coho salmon were harvested above WCW. No coho were tagged at JCW.

Fall Steelhead. Anglers returned 45 tags from harvested WCW-tagged steelhead (appendix 12). Based on the reward tags returned, we estimated that anglers harvested 4.0% of the steelhead migrating upstream of WCW. None of the steelhead captured at JCW were tagged this year. Anglers returned 139 tags from steelhead reported as caught and released (appendix 12). Based on the return of reward tags, we estimated that anglers caught and released 10.3% of the steelhead migrating upstream of the WCW.

Spawner Surveys

Spring Chinook. A total of 63 adult and 3 grilse spring chinook tagged at JCW were subsequently recovered during spawner carcass surveys (appendix 9). Mean FL of both the spring chinook in the carcass surveys and those tagged at JCW was 72.1 cm.

Fall Chinook. Zero grilse and 28 adults from WCW were recovered during the spawner survey (appendix 10). The mean fork length of these fish was 75.9 cm while fall chinook salmon tagged at WCW averaged 71.5 cm FL.

Coho. No adult and one grilse coho salmon tagged at WCW were subsequently recovered during the spawner surveys this year (appendix 11). Since coho spawn later in the year (December through February), it is likely that the time frame of the spawner surveys (October through December) inhibited full recovery of coho salmon.

Steelhead. One steelhead 57 cm long was recovered during spawner surveys (Appendix 12).

Trinity River Hatchery

Operation Dates. The fish ladder and trapping facilities at TRH operated from September 9th, 2002 (JW 37) through March 11th, 2003 (JW 11). The ladder and trap were closed for a two week period from 10 October through 24 October. The closure was implemented to allow for separation of the spring and fall runs of chinook. The ladder is also occasionally closed at the discretion of the hatchery manager for fish health concerns or labor constraints.

Spring Chinook. Based on CWT recoveries, spring chinook began entering TRH during JW 36 (3-9 Sept 2002) and continued through JW 45 (Figure 15, Table 7). Based upon CWT expansion, we estimated that 11,112 spring chinook entered TRH (Figure 15). For the purpose of estimating spring chinook run-size, the 11,061 chinook which entered TRH prior to Julian week 43 were considered spring.

We recaptured 29.1% (487/1,673) effectively tagged spring chinook from JCW at TRH (Table 8). The mean FL of effectively tagged JCW fish (72.2 cm) was approximately the same as fish recovered at TRH (71.9 cm) (appendix 4).

We recovered 2,315 Ad-clipped fall chinook at TRH, from which we recovered 2,176 CWTs (Table 7). The age structure of TRH spring chinook was dominated by a mix of age three and four year old returns.

Fall Chinook. Based on the recovery of CWTs, the first fall chinook entered TRH during JW 37 of 2002. The run peaked during JW 45 when 1,259 chinook salmon entered the facility, decreasing thereafter until the last chinook entered during JW 52 (Figure 15, Table 9). We estimated that 4,498 fall chinook entered TRH (Figure 15). For the purpose of estimating fall chinook run-size, the 4,549 chinook which entered TRH after JW 42 were considered fall run.

Hatchery recovery of fall chinook tagged at WCW consisted of 38 grilse and 115 adults. This total represented 25.3% (153/605) of those effectively tagged at WCW (Table 8, Appendix 5). The mean FL of effectively tagged chinook at WCW was slightly higher than for chinook from WCW that subsequently entered TRH; 71.3 cm and 69.5 cm respectively.

We recovered 971 Ad-clipped fall chinook at TRH, from which we recovered 927 CWTs (Table 9). Similar to spring chinook, the age structure of TRH fall chinook was dominated by a mix of age three and four year old returns.

Coho Salmon. The first coho entered TRH on 3 October 2002. The coho run peaked during Julian week 48 and the last coho entered TRH on 14 January 2003 (Table 8). We recovered 7,198 coho (703 grilse and 6,495 adults) at TRH. We recovered 88 WCW-tagged coho (31 grilse and 57 adults) at TRH (44.7 % of those effectively tagged). The mean FL of WCW-tagged coho recovered at TRH was 61.5 cm, which was slightly larger mean FL of 59.2 cm for those effectively tagged (Appendix 6). Coho were not tagged at JCW this year.

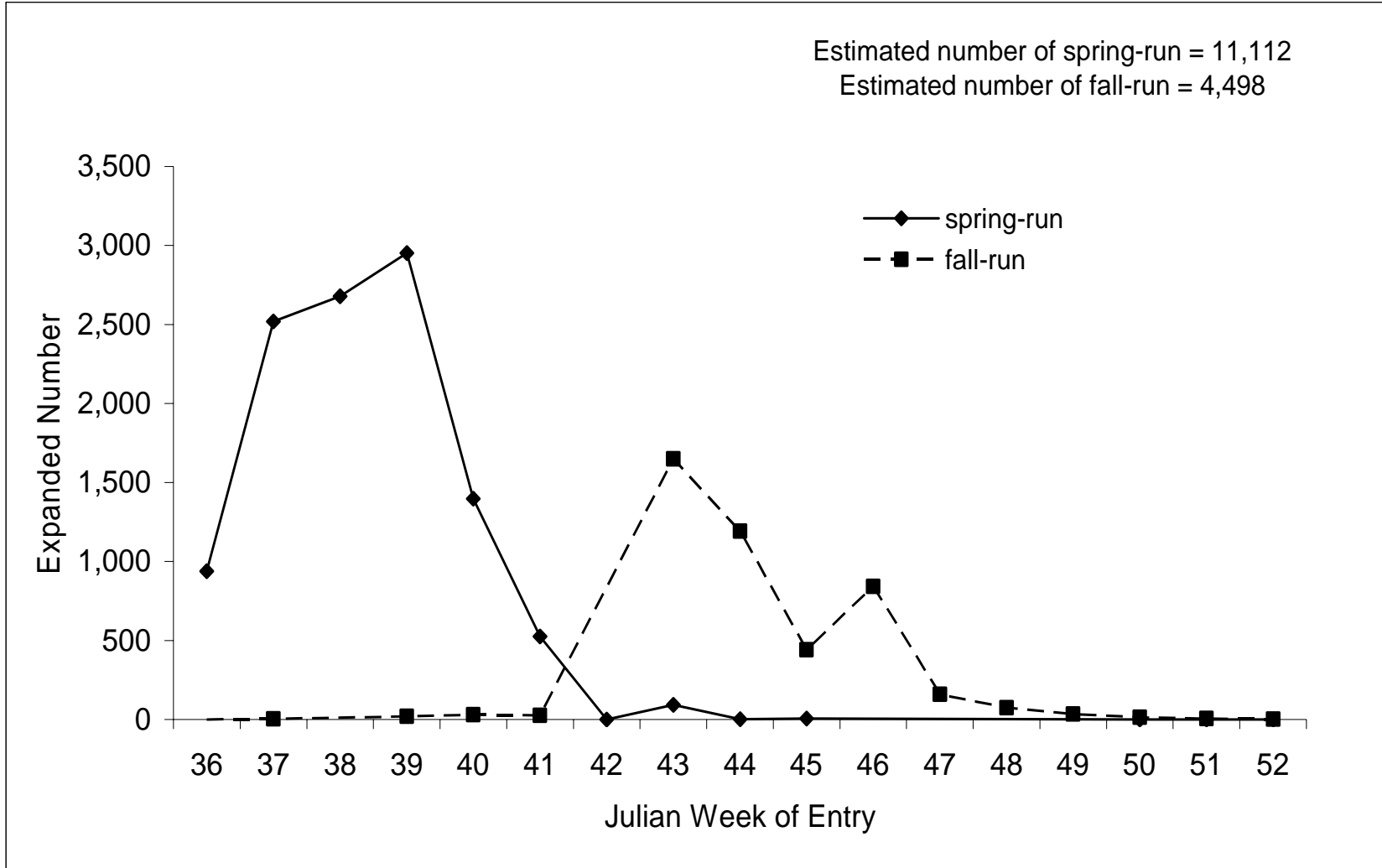


Figure 15. Estimated numbers of spring- and fall-run Chinook salmon that entered Trinity River Hatchery during the 2002-03 season, based on expansion of coded-wire tagged fish.

Table 7. Recoveries at Trinity River Hatchery of coded-wire tagged, spring-run chinook salmon during the 2002-03 season. a/

Coded-wire tag number and release type c/	Brood year	Julian week of entry b/										Totals	
		36	37	38	39	40	41	42 d/	43	44	45		
065238-f	1997		1	0	0	1							2
065240-y	1997						1						1
065247-f	1998	4	8	6	7								25
065248-f	1998	2	9	8	6	5							30
065249-f	1998	4	10	8	4								26
065250-y	1998	31	100	85	145	68	36	0	4	1			470
065251-f	1999	59	105	124	78	29	4						399
065252-f	1999	20	85	101	92	42	7	0	1				348
065253-f	1999	8	27	42	58	59	25	0	6				225
065258-y	1999	57	135	117	127	65	20	0	3				524
065260-f	2000	2	1	3	3	2							11
065261-f	2000		4	5	6	1	1						17
065262-f	2000		2	2	1								5
065263-f	2000		3	5	4	1	2						15
065264-f	2000	1	1	1	2	2	4	0	1	0	1		13
065269-f	2000	2	5	7	9	4	2						29
065270-f	2000	1	0	2	5	8	2						18
065279-y	2000	1	2	4	8	0	3						18
Shed tag e/		9	24	37	44	16	9						139
Weekly totals:		201	522	557	599	303	116	0	15	1	1		
Grand Total:												2,315	

a/ The fish ladder was open from September 10, 2002 through March 12,2003 (Julian Week 36-11)

b/ Entry week was the week that fish were initially sorted, although they may have actually entered the hatchery during the previous sorting week.

c/ Release types are either fingerling (f) or yearling (y).

d/ The hatchery was closed to fish entry this week.

e/ No CWT's were recovered from these Ad-clipped fish. Chinook salmon with shed tags recovered after October 21,2003 (JW 42) were considered fall-run and are shown on Table 9.

Table 8. Total number and numbers of Project-tagged chinook and coho salmon that entered Trinity River Hatchery (TRH) during the 2002-2003 season. a/

Julian Week of entry c/	Inclusive Dates	Total entering TRH d/	Numbers of chinook salmon				Numbers of coho salmon	
			Spring-run from tagging site b/		Fall-run from tagging site b/		Total entering TRH d/	From tagging site WCW
			WCW	JCW	WCW	JCW		
36	09/03/02 - 09/09/02	320		20				
37	09/10/02 - 09/16/02	2,054		103				
38	09/17/02 - 09/23/02	3,258		121				
39	09/24/02 - 09/30/02	3,492		153				
40	10/01/02 - 10/07/02	1,405		57			5	
41	10/08/02 - 10/14/02	531		26	2		5	
42	10/15/02 - 10/21/02	0		0	0		0	
43	10/22/02 - 10/28/02	1,259		6	45		93	5
44	10/29/02 - 11/04/02	1,347		1	61		100	5
45	11/05/02 - 11/11/02	570			14		35	0
46	11/12/02 - 11/18/02	1,021			22		651	26
47	11/19/02 - 11/25/02	212			6		1,072	17
48	11/26/02 - 12/02/02	80			0		1,851	16
49	12/03/02 - 12/09/02	35			2		1,407	9
50	12/10/02 - 12/16/02	16					1,453	8
51	12/17/02 - 12/23/02	7					387	0
52	12/24/02 - 12/31/02	2					104	1
1	01/01/03 - 01/07/03						33	1
2	01/08/03 - 01/14/03						2	
3	01/15/03 - 01/21/03							
4	01/22/03 - 01/28/03							
5	01/29/03 - 02/04/03							
6	02/05/03 - 02/11/03							
7	02/12/03 - 02/18/03							
8	02/19/03 - 02/25/03							
9	02/26/03 - 03/04/03	1			1			
Totals:		15,610	0	487	153	0	7,198	88

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian Week 36-11)

b/ Tagging site: WCW= Willow Creek Weir; JCW= Junction City Weir.

c/ Entry week was the week that fish were initially sorted, although they may have actually entered the hatchery during the previous sorting week.

d/ Numbers shown include tagged fish recovered the same week.

Table 9. Recoveries at Trinity River Hatchery of fall-run chinook salmon with coded wire tags indicating origin at Trinity River Hatchery during the 2002-03 season. a/

Coded-wire tag number and release type c/	Brood year	Julian week of entry b/																Totals
		37	38	39	40	41	42 d/	43	44	45	46	47	48	49	50	51	52	
065236-f	1997							1										1
065239-f	1997							1										1
065241-y	1997					2	0	7	1	1	2	1						14
062641-y	1998			2	2	0	0	40	72	19	47	15	8	9	1			215
065242-f	1998							1	4	1	1							7
065243-f	1998							1	1	0	1							3
065244-f	1998							3	1									4
065245-f	1998							2	1									3
065642-y	1998							2	1	1	4	2						10
065254-f	1999				1	0	0	20	17	4	2							44
065255-f	1999							5	7	7	5	2	0	0	0	0	1	27
065256-f	1999							6	2	2	4	2	0	0	1			17
065257-f	1999							1	4	2	8	4	1					20
065259-y	1999			1	3	3	0	88	75	27	77	14	10	3	2	1		304
065265-f	2000					1	0	9	7	1								18
065266-f	2000							8	4	3	3							18
065267-f	2000							2	3	1	2							8
065268-f	2000							3	1	0	1	1						6
065271-f	2000			1	0	0	0	23	19	2	2							47
065272-f	2000					1	0	11	2	0	3	1						18
065273-f	2000	1	0	0	0	0	0	9	5	1	4	0	1					21
065274-f	2000								8	1	4	1						14
065275-f	2000							10	8	3	2							23
065276-f	2000			1	0	0	0	5	4	1								11
065277-f	2000								1	1	1	2						5
065278-f	2000							1	4	1	3	1						10
065280-y	2000			1	0	0	0	15	24	3	11	0	1					55
065643-f	2000							1	1	0	1							3
Shed tags e/								16	12	2	6	1	5	1	0	1		44
Weekly totals:		1	0	5	7	7	0	275	277	82	188	46	21	12	4	1	1	
Grand total:																		971

- a/ The fish ladder was open from September 10, 2002 through March 12,2003 (Julian Week 36-11)
- b/ Entry week was the week that fish were initially sorted, although they may have actually entered the hatchery during the previous sorting week.
- c/ Release types are either fingerling (f) or yearling (y).
- d/ The hatchery was closed to fish entry this week.
- e/ No CWT's were recovered from these Ad-clipped fish. Chinook salmon with shed tags recovered prior to October 21,2003 (JW 42) were considered spring-run and are shown on Table 7.

Of the 7,198 coho recovered at TRH, 7,097 (98.6%) were observed to have right maxillary (RM) clips, indicating they were of TRH origin (Table 10). Based on length frequency analysis, we apportioned TRH-produced, RM-clipped coho, into two brood years. Coho ≤ 57 cm, FL were considered grilse (age 2) from the 2000 brood year and accounted for 9.8% (703/7,198) of the total, the remaining 6,495 were considered adults (age 3), progeny of the 1999 brood year. The 101 unmarked coho which entered the hatchery were also considered grilse or adults based on their length (Appendix 14). Unmarked coho entering TRH had a slightly smaller mean fork length (68.0 cm) than marked coho (68.8 cm).

Fall Steelhead. Appreciable numbers of steelhead did not enter the hatchery until late October (Table 11). A total of 127 sub-adults (<42 cm, FL) and 6,038 adult steelhead entered TRH and 448 WCW-tagged steelhead (31.6% of those effectively tagged) entered TRH (Table 11).

At WCW, 1,217 of 1,608 (75.7%) steelhead were Ad-clipped, averaging 62.3 cm FL, slightly larger than their unmarked counterparts, which averaged 58.2 cm. At JCW, 56 of the 86 (65.1%) steelhead were Ad-clipped. Ad-clipped steelhead trapped at JCW also had a larger mean fork length than their unmarked counterparts (60.2 vs. 59.5 cm). Steelhead recovered at TRH were composed of 6,122 Ad-marked fish and 43 unmarked fish. Unmarked steelhead were slightly smaller, on average, than Ad-clipped fish (62.8 vs. 59.2 cm). Sub-adult steelhead, less than 42 cm, FL, comprised 2.1% of the total number of steelhead entering TRH. All but one of the sub-adults were Ad-marked fish (Appendix 8). Beginning with the 1997 brood year, all steelhead released from TRH have been adipose-fin-clipped prior to their release. Recoveries of these fish were made at both weirs and TRH (Appendix 8).

Table 10. Recovery of maxillary-clipped coho salmon that returned to Trinity River Hatchery during the 2002-2003 season. a/

Julian Week of entry c/	Inclusive Dates	1999	2000	Total
40	10/01/02 - 10/07/02		5	5
41	10/08/02 - 10/14/02		5	5
42	10/15/02 - 10/21/02		0	0
43	10/22/02 - 10/28/02	1	89	90
44	10/29/02 - 11/04/02	4	93	97
45	11/05/02 - 11/11/02	1	33	34
46	11/12/02 - 11/18/02	325	318	643
47	11/19/02 - 11/25/02	1,003	57	1,060
48	11/26/02 - 12/02/02	1,788	39	1,827
49	12/03/02 - 12/09/02	1,361	28	1,389
50	12/10/02 - 12/16/02	1,414	16	1,430
51	12/17/02 - 12/23/02	378	1	379
52	12/24/02 - 12/30/02	99	4	103
1	12/31/02 - 01/06/03	33		33
2	01/07/03 - 01/13/03	2		2
Total:		6,409	688	7,097

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian Week 36-11)

b/ Brood year determinations were estimated using length frequency analysis; coho less than or equal to 57 cm, fl were considered to be from the 2000 brood year, larger coho from the 1999 brood year.

c/ Entry week was the week the fish were initially sorted, although they may have actually entered the hatchery during the previous sorting week.

Table 11. Total number and numbers of Project-tagged steelhead that entered Trinity River Hatchery (TRH) during the 2002-2003 season. a/

Julian Week of entry c/	Inclusive Dates	Number entering TRH Brood year b/		Total	Recoveries from tagging site b/ WCW
		Adults	Sub adults d/		
37	09/10/02 - 09/16/02	4		4	
38	09/17/02 - 09/23/02	1		1	
39	09/24/02 - 09/30/02	7		7	
40	10/01/02 - 10/07/02	6		6	
41	10/08/02 - 10/14/02	4		4	
42	10/15/02 - 10/21/02	0		0	
43	10/22/02 - 10/28/02	56	1	57	2
44	10/29/02 - 11/04/02	16	0	16	0
45	11/05/02 - 11/11/02	11	0	11	0
46	11/12/02 - 11/18/02	296	4	300	14
47	11/19/02 - 11/25/02	153	8	161	13
48	11/26/02 - 12/02/02	75	5	80	8
49	12/03/02 - 12/09/02	127	8	135	11
50	12/10/02 - 12/16/02	628	18	646	54
51	12/17/02 - 12/23/02	1,212	20	1,232	100
52	12/24/02 - 12/31/02	297	3	300	27
1	01/01/03 - 01/07/03	291	2	293	26
2	01/08/03 - 01/14/03	371	5	376	29
3	01/15/03 - 01/21/03	602	12	614	47
4	01/22/03 - 01/28/03	647	9	656	38
5	01/29/03 - 02/04/03	331	8	339	25
6	02/05/03 - 02/11/03	172	6	178	14
7	02/12/03 - 02/18/03	307	3	310	17
8	02/19/03 - 02/25/03	200	10	210	8
9	02/26/03 - 03/04/03	154	3	157	9
10	03/05/03 - 03/11/03	70	2	72	6
Totals:		6,038	127	6,165	448

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian Week 36-11)

b/ Tagging site: WCW = Willow Creek Weir

c/ Entry week was the week the fish were initially sorted, although they may have actually entered the hatchery during the previous sorting week.

d/ Steelhead less than or equal to 41 cm FL are considered sub-adults; larger fish were adults.

Run-size, Angler Harvest, and Spawner Escapement Estimates

We tagged and recovered too few grilse salmon to stratify our estimates by adults and grilse so we combined the numbers of adults and grilse tagged and recovered for calculating the population estimate and stratified the estimate based on the ratio of adults and grilse observed at each of the respective weirs.

Spring Chinook Salmon

We estimated that 38,485 (35,910 adults and 2,575 grilse) spring chinook (including those harvested) migrated into the Trinity River basin upstream of JCW. Based on the Poisson Approximation, the 95% confidence interval for the run-size estimate was 35,247– 42,151 spring Chinook salmon (Table 12). We estimated that the spawning escapement above JCW was 34,114 adult fish, including 10,440 adult spring chinook that entered TRH (Table 13). Mean spring chinook run-size since 1978, excluding two years in which no estimate was made, is 17,770. Estimated spring chinook run-size has ranged from 62,692 fish in 1988 to 2,381 fish in 1991 (Appendix 15). Anglers caught and kept an estimated 75 (2.9%) of the grilse and 1,796 (5.0%) of the adults from the spring run (Table 13).

Fall Chinook Salmon

We estimated that 18,156 (14,344 adults and 3,812 grilse) fall chinook (including those harvested) migrated into the Trinity River basin upstream of WCW. Based on the Poisson Approximation, the 95% confidence interval for the fall chinook run-size estimate upstream of Willow Creek Weir was 15,562-21,406 (Table 12). We estimated the Trinity River fall chinook spawner escapement at 13,785 adult fish upstream of WCW, including 3,475 adult fall chinook that entered TRH (Table 13). The estimated total fall chinook run-size upstream of WCW has ranged from 147,888 fish in 1986 to 9,207 fish in 1991. Estimated adult escapement has ranged from a high of 120,382 in 1986 to a low of 7,104 in 1991 (Appendix 16). Mean fall chinook escapement since 1977 is 43,016 fish, including grilse. We estimated that anglers harvested 559 (3.9%) adults and 168 (4.4%) grilse (Table 13).

Coho Salmon

We estimated that 16,016 (14,344 adults and 13,812 grilse) coho migrated upstream of WCW. Based on the Poisson Approximation, the 95% confidence interval for the coho run-size estimate upstream of WCW was 13,090-19,873 fish (Table 12). The spawning escapement estimate for coho upstream of WCW this year was 16,016 fish, 7,198 of which entered TRH (Table 13). Estimated coho salmon run size upstream of WCW has ranged from 59,079 fish in 1987 to 852 fish in 1994 (Appendix 17). The mean run-size since 1977 is 16,567 fish. None of the tags applied to coho salmon at WCW were returned by anglers this year as harvested. We therefore estimate that none of the coho migrating upstream of WCW were harvested (Table 13).

Adult Fall Steelhead

We estimated that 19,058 adult steelhead migrated upstream of WCW. The 95% confidence interval for our estimate, based on the Normal Approximation, was between 17,400-20,939 adult

Table 12. Run-size estimates and confidence limits for Trinity River basin spring and fall-run chinook and coho salmon, and adult fall-run steelhead during the 2002-2003 season.

Species/ race	Area of Trinity River basin for run size estimate	Stratum a/	Trinity River Hatchery recoveries			Run-size estimate d/	Confidence limits 1-p= 0.95	Confidence limit estimator
			Number effectively tagged b/	Number examined for tags c/	Number of tags in sample			
Spring-run chinook	Upstream of Junction City Weir	Grilse	112	617	24	2,575	35,247 - 42,151	Poisson Approximation
		Adults	1,561	10,440	456	35,910		
		Total	1,673	11,057	480	38,485		
Fall-run chinook	Upstream of Willow Creek Weir	Grilse	128	1,078	38	3,812	15,562 - 21,406	Poisson Approximation
		Adults	477	3,475	113	14,344		
		Total	605	4,553	151	18,156		
Coho	Upstream of Willow Creek Weir	Grilse	86	703	31	1,709	13,090 - 19,873	Poisson Approximation
		Adults	111	6,495	57	14,307		
		Total	197	7,198	88	16,016		
Fall-run steelhead	Upstream of Willow Creek Weir	Adults	1,416	6,038	448	19,058	17,400 - 20,939	Normal Approximation

a/ Stratum: Grilse = two year old salmon, Adults = three years old or older, Steelhead adults were fish greater 41 cm FL.

b/ The number of effectively tagged fish was corrected for tagging mortalities, fish not tagged and fish which had their tags removed (caught and released).

c/ Numbers of spring and fall-run chinook were estimated from expansion of coded-wire-tag recoveries at Trinity River Hatchery, coho and steelhead numbers were actual recoveries.

d/ Estimates for grilse and adult spring and fall-run chinook and salmon were based on proportioning the total run size by the ratio of grilse to adults observed at the respective weirs. Combined TRH and WCW grilse and adult ratios were used to proportion coho salmon estimates.

Table 13. Estimates of Trinity River basin spring and fall-run chinook and coho salmon, and adult fall-run steelhead run size, angler harvest, and spawner escapements during the 2002-2003 season.

Species/ race	Area of Trinity River basin for run size estimate	Stratum a/	Run-size estimate	Angler Harvest		Spawner Escapement		
				Harvest rate b/	Number of fish c/	Natural d/	Trinity River Hatchery	Total
Spring-run chinook	Upstream of Junction City Weir	Grilse	2,575	0.029	75	1,883	617	2,500
		Adults	<u>35,910</u>	0.050	<u>1,796</u>	<u>23,675</u>	<u>10,440</u>	<u>34,115</u>
		Total	<u>38,485</u>	0.049	<u>1,870</u>	<u>25,558</u>	<u>11,057</u>	<u>36,615</u>
Fall-run chinook	Upstream of Willow Creek Weir	Grilse	3,812	0.044	168	2,566	1,078	3,644
		Adults	<u>14,344</u>	0.039	<u>559</u>	<u>10,310</u>	<u>3,475</u>	<u>13,785</u>
		Total	<u>18,156</u>	0.040	<u>727</u>	<u>12,876</u>	<u>4,553</u>	<u>17,429</u>
Coho	Upstream of Willow Creek Weir	Grilse	1,709	0	0	1,006	703	1,709
		Adults	<u>14,307</u>	0	<u>0</u>	<u>7,812</u>	<u>6,495</u>	<u>14,307</u>
		Total	<u>16,016</u>	0	<u>0</u>	<u>8,818</u>	<u>7,198</u>	<u>16,016</u>
Fall-run adult steelhead	Upstream of Willow Creek Weir	Natural	4,650	0.012	57	4,551	42	4,593
		Hatchery	<u>14,408</u>	0.048	<u>697</u>	<u>7,715</u>	<u>5,996</u>	<u>13,711</u>
		Total	<u>19,058</u>		<u>754</u>	<u>12,266</u>	<u>6,038</u>	<u>18,304</u>

a/ Stratum: Grilse = two year old salmon, Adults = three years old or older, Steelhead adults were fish greater 41 cm FL.

b/ Harvest rates were based on the return of reward tags, except for coho, which were based on return of non-reward tags.

c/ Calculated as the run size times the harvest rate.

d/ Calculated as run size minus angler harvest minus hatchery escapement.

steelhead upstream of WCW (Table 12). The adult steelhead spawning escapement was composed of 6,038 fish which entered TRH and 12,266 fish that spawned in natural areas (Table 13).

Intermittent fall steelhead run-size estimates made since 1980 have ranged from 37,276 in 1989 to 3,046 in 1992 (Appendix 18). Mean run-size for fall adult steelhead, for years in which we have estimates, is 10,394 fish. Anglers harvested an estimated 754 (4.0%) adult steelhead (Table 13).

DISCUSSION

Trinity River fall-run chinook salmon seem to have been hit particularly hard by the fish kill that occurred in the Lower Klamath River in late September. The US Fish and Wildlife Service reported that at least 32,533 chinook salmon died in the fish kill (Guillen, 2003). The USFWS also reported that their estimate was a conservative estimate. Our data suggests large numbers of fall-run chinook from the Trinity River died in the kill. Run timing for fall chinook was dramatically different than the previous 25 years. The season at WCW began with strong numbers of fall-run chinook that fell off sharply after the fish kill. For the past 25 years chinook salmon numbers at WCW have increased to a peak in late September to early October which declined thereafter. Fall chinook enjoyed the same favorable ocean conditions as the other runs of fish in the Trinity River but the fall run was less than half of the average since 1978. Indeed, chinook salmon runs were high throughout the Northwest (Simmons et al. 2003). Furthermore, since we began monitoring in 1978, the spring run has never been larger than the fall run until this year. There were over twice as many fish in the spring run as the fall run this year.

With the exception of fall chinook, all the species and races we monitored this season had run size estimates higher than their respective mean run sizes since 1977. The good ocean conditions that bolstered last year's runs continued and the 2002-03 estimated run-sizes for spring run chinook salmon and steelhead to the Trinity Basin all increased over last year. Runs for coho declined from last year but were still above the average for the past 26 years. Runs of chinook for both spring and fall were comprised of a mix of age three returns and age four returns.

We trapped too few coho salmon and fall chinook salmon at WCW to obtain estimate confidence intervals of $< \pm 10\%$ ($\sim +21\%$ and $\sim 16\%$ respectively). Although we were able to trap enough spring chinook at JCW to estimate a confidence interval of approximately 9%, we were not able to trap during the earliest part of the upstream immigration season. This year we trapped enough steelhead to estimate a confidence interval of approximately 9% but we also were not able to trap steelhead or coho into the latter part of their upstream migration. Although WCW remained fished until mid December, we did not fish for several weeks in mid November due to high water. The fact that our weirs are not able to capture the beginning of the spring chinook run or the end of the coho salmon and steelhead runs could create bias in the estimates because we assume the weirs capture naturally produced and hatchery fish at equal rates. We do not know if the run timing of naturally produced and hatchery fish varies.

Unaccounted tagging mortality creates a positive bias in all mark-recapture studies (Hankin 2001). Although we attempt to account for these mortalities through recovery of tagged fish found dead at the weirs or in carcass surveys, we can not be sure that all mortalities are recovered. Since most of our tagging mortalities from WCW are observed during the early part of the season when water temperatures are high (near 22° C), we believe that tagging mortality is not a constant rate and is a function of water temperature. This postulation leads to difficulty in applying a potential tagging mortality rate for the season. Hankin (2001) concluded that tagging mortality could substantially positively bias our estimates. Using Hankin's example, if 90% of untagged fish passing WCW survive to arrive at TRH (assuming that they are otherwise programmed to arrive at that destination), but only 75% of WCW-tagged fish survive to arrive at TRH, then the approximate positive proportional bias would be almost 30%. We have attempted to partially address this concern through our tagging protocols at the weirs. Fish are not tagged if deemed in poor condition, if they have already spawned, or if water temperatures exceed 21°C.

RECOMMENDATIONS

1. Tagging and recapture operations for adult spring and fall chinook and coho salmon, and adult fall steelhead in the Trinity River basin should be continued during the migration season, using the capture sites near Willow Creek and Junction City.
2. An alternate weir site for the Junction City area should be investigated. The current site does not allow for trapping at flows that exceed approximately 800 cfs. Current releases from Lewiston Dam do not subside to this level until late June or early July which is after spring chinook have already begun migrating to the upper Trinity basin. Ideally, we should commence trapping in mid to late May.
3. Continue to trap five (instead of four) nights-per-week with mid-day weir openings at the weirs. Preliminary data indicates that our trapping efficiency has increased using the five-day schedule, while reducing numbers of fish "stacking up" downstream of the weir.
4. Conduct snorkel surveys upstream of the weirs for several miles to recover any tagging mortalities.

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Appendix 1. List of Julian weeks and their calendar date equivalents.

Julian Week	Inclusive dates		Julian Week	Inclusive dates	
1	1-Jan	-	7-Jan	27	2-Jul - 8-Jul
2	8-Jan	-	14-Jan	28	9-Jul - 15-Jul
3	15-Jan	-	21-Jan	29	16-Jul - 22-Jul
4	22-Jan	-	28-Jan	30	23-Jul - 29-Jul
5	29-Jan	-	4-Feb	31	30-Jul - 5-Aug
6	5-Feb	-	11-Feb	32	6-Aug - 12-Aug
7	12-Feb	-	18-Feb	33	13-Aug - 19-Aug
8	19-Feb	-	25-Feb	34	20-Aug - 26-Aug
9/a	26-Feb	-	4-Mar	35	27-Aug - 2-Sep
10	5-Mar	-	11-Mar	36	3-Sep - 9-Sep
11	12-Mar	-	18-Mar	37	10-Sep - 16-Sep
12	19-Mar	-	25-Mar	38	17-Sep - 23-Sep
13	26-Mar	-	1-Apr	39	24-Sep - 30-Sep
14	2-Apr	-	8-Apr	40	1-Oct - 7-Oct
15	9-Apr	-	15-Apr	41	8-Oct - 14-Oct
16	16-Apr	-	22-Apr	42	15-Oct - 21-Oct
17	23-Apr	-	29-Apr	43	22-Oct - 28-Oct
18	30-Apr	-	6-May	44	29-Oct - 4-Nov
19	7-May	-	13-May	45	5-Nov - 11-Nov
20	14-May	-	20-May	46	12-Nov - 18-Nov
21	21-May	-	27-May	47	19-Nov - 25-Nov
22	28-May	-	3-Jun	48	26-Nov - 2-Dec
23	4-Jun	-	10-Jun	49	3-Dec - 9-Dec
24	11-Jun	-	17-Jun	50	10-Dec - 16-Dec
25	18-Jun	-	24-Jun	51	17-Dec - 23-Dec
26	25-Jun	-	1-Jul	52 b/	24-Dec - 31-Dec

a/ Eight day week in each leap year.

b/ Eight day week every year.

Appendix 2. Fork length (FL) distribution of coded-wire-tagged, Trinity River Hatchery produced, spring-run chinook salmon recovered at TRH during the 2002-2003 season. a/

FL (cm)	Brood Year																Total		
	1997		1998				1999				2000								
	65238-f	65240-y	65247-f	65248-f	65249-f	65250-y	65251-f	65252-f	65253-f	65258-y	65260-f	65261-f	65262-f	65263-f	65264-f	65269-f		65270-f	65279-y
38											1							1	1
39											0							1	1
40											0							2	2
41											0							1	1
42											0							4	4
43											1							1	3
44											1			2	1		1	1	10
45											1		1	0	1	1	1	1	6
46											1		2	0	1	2	3	3	10
47											0		2	0	2	1	3	3	11
48											0		3	0	0	2	2	0	10
49											3		0	0	2	2	0	0	10
50											2		0	1	2	3	1	0	10
51											2		1	0	1	6	2	1	14
52											2		1	1	0	4	2		10
53											2		1	0	1	2	1		9
54											0		1	1	1	1	2		6
55											0		0	1	1	2	0		10
56											0		0	1	0	0	0		4
57											1		0	0	2	0	0		13
58											1		1	0	0	0	1		11
59											3		1	1	0	0			22
60											1		1	1	0	1			28
61											9		5	0	0	0			47
62											10		2	1	1	2			39
63											9		9	7	3	4			59
64											16		7	3	3	4			62
65											14		15	12	4	0			81
66											16		20	15	5	2			105
67											17		14	15	4	7			94
68											27		19	6	6	3			93
69											28		23	23	3	3			110
70											36		25	20	2	5			109
71											16		22	14	1	1			75
72											29		19	9	1	1			82
73											30		24	11	1	1			99
74											17		22	9	1	1			83
75											15		18	16	1	1			76
76											18		19	10	1	1			84
77											18		20	11	1	1			77
78											14		21	5	1	1			77
79											14		8	8	1	1			66
80											8		8	10	1	1			71
81											6		6	6	1	1			45
82											10		6	3	2	2			57
83											7		1	2	1	1			46
84											5		3	1	1	1			40
85											1		4	1	1	1			45
86											2		3	1	1	1			33
87											0		3	1	1	1			16
88											3		3	2	1	1			19
89											1		0	0	1	1			13
90											1		1	1	1	1			16
91											0		0	0	0	0			9
92											0		2	7	1	1			9
93											0		1	9	1	1			10
94											0		1	5	1	1			6
95											0		0	5	1	1			6
96											1		1	4	1	1			6
97											0		0	3	1	1			3
98											0		0	0	0	0			0
99											1		1	1	1	1			1
100											0		0	0	0	0			0
101											0		0	0	0	0			0
102											0		0	0	0	0			0
103											0		0	0	0	0			0
104											0		0	0	0	0			0
105											0		0	0	0	0			0
106											0		0	0	0	0			0
107											1		1	1	1	1			1
Totals:	2	1	25	30	26	470	399	348	225	524	11	17	5	15	13	29	18	18	2,176
Mean	101.0	85.0	80.0	80.9	84.0	81.6	71.5	72.4	72.0	66.1	47.9	48.1	52.8	48.9	51.5	50.2	49.8	43.9	71.7

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian Week 36-11)
 b/ Age at release: f = fingerlings, y = yearlings.

Appendix 3. Fork length (FL) distribution of coded-wire-tagged, Trinity River Hatchery produced, fall-run chinook salmon recovered at TRH during the 2002-2003 season. a/

FL (cm)	Brood Year														Total
	1997			1998						1999					
	65236-f	65239-f	65241-f	62641-y	65242-f	65243-f	65244-f	65245-f	65642-f	65254-f	65255-f	65256-f	65257-f	65259-y	
54										1	1				2
55										0	0			1	1
56										0	0			2	2
57										0	0			2	2
58										0	0			1	1
59										0	1			4	5
60										0	0			4	4
61										0	0	1		6	7
62										0	0	0		8	8
63										0	0	0		8	8
64										0	0	0	1	21	22
65										0	0	0	1	24	25
66				1						1	0	0	2	16	20
67				0		1				4	0	1	0	26	32
68				0		0				1	3	1	1	26	32
69				1		0				0	2	1	2	30	36
70				0		0				2	2	0	1	27	32
71				1		0				7	3	2	2	22	37
72				1		0				4	0	0	2	14	21
73				2		0				5	1	1	1	18	28
74				3		0				3	4	0	1	22	33
75				5		0				3	2	1	1	3	15
76				5		0		1		2	1	2	1	8	20
77			1	6	1	0	1	0		0	1	2	0	3	15
78			0	15	0	0	0	0		4	2	1	2	2	26
79			0	14	0	0	0	0		3	1	2	1	1	22
80			0	14	1	0	0	0	1	1	0	0	0	1	18
81			1	15	0	0	0	1	1	2	0	0	0	1	21
82			1	17	0	0	0	0	0	0	0	0	0	0	18
83			0	14	0	0	0	0	1	0	2	0	0	0	17
84			3	16	2	0	0	0	0	0	1	1	1	2	26
85		1	0	17	1	0	0	0	2	1	0	0	0	0	22
86			0	9	1	0	1	0	0	0	0	0	1	12	12
87			1	13	0	0	0	1	2					18	18
88	1		0	10	0	0	1	1	1					13	13
89			2	5	0	0	0	0	0					7	7
90			2	8	0	0	0	0	0					10	10
91			0	3	0	0	0	1	1					4	4
92			1	4	0	2	1	0	0					8	8
93			0	3	0	0	0	0	0					3	3
94			0	5	0	0	0	1	1					6	6
95			2	0	0	0	0	0	0					2	2
96				1	0	0	0	0	0					1	1
97				3	1	0	0	0	0					4	4
98				3	0	0	0	0	0					3	3
99				1	0	0	0	0	0					1	1
Totals:	1	1	14	215	7	3	4	3	10	44	27	17	20	304	670
Mean	88.0	85.0	87.1	83.4	84.7	83.7	85.8	81.3	86.1	73.2	72.8	74.6	72.0	68.5	75.2

FL (cm)	Brood Year													Total		
	2000															
	65265-f	65266-f	65267-f	65268-f	65271-f	65272-f	65273-f	65274-f	65275-f	65276-f	65277-f	65278-f	65280-f	65643-y		
40															1	1
41															3	3
42															2	2
43															5	5
44												2			1	3
45					1		1					0	5		7	7
46				1	2		0					0	2		5	5
47		1		1	1	1	0				1	0	9		14	14
48		1		0	2	1	1			2	1	0	4		12	12
49	3	2	1	0	1	1	0		1	0	0	0	3	1	13	13
50	0	0	1	2	2	1	0	1	1	1	1	1	8	0	19	19
51	0	0	2	1	3	1	1	3	0	1	0	0	3	0	15	15
52	1	1	0	1	2	0	2	1	1	1	0	1	6	0	17	17
53	2	2	1		11	1	2	1	3	1	2	3	3	0	32	32
54	0	2	0		4	0	2	0	8	1		2	0	0	19	19
55	4	2	1		1	2	4	1	2	0		0	0	1	18	18
56	2	1	1		4	1	2	0	1	0		0	0	1	13	13
57	2	1	1		5	3	3	5	2	1		0	0	0	23	23
58	0	2			4	1	0	0	2	0		0	0	0	9	9
59	1	2			1	1	2	1	2	1		1		0	12	12
60	0	1			2	1	1	1		1				0	7	7
61	1				1	2				1				0	5	5
62	1					0								0	1	1
63	0					0								0	0	0
64	1					1								0	2	2
Totals:	18	18	8	6	47	18	21	14	23	11	5	10	55	3	257	257
Mean	55.4	54.2	52.8	49.3	53.6	55.4	54.4	54.8	54.6	53.9	50.2	51.6	47.4	53.3	52.5	52.5

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian Week 36-11)
 b/ Age at release: f = fingerlings, y = yearlings.

Grand total: 927
 Grand mean: 68.9

Appendix 4. Fork length (FL) distribution of spring-run chinook salmon trapped and tagged in the Trinity River at Junction City Weir during the 2002-03 season. a/

FL (cm)	Total Trapped	Ad-clips b/	Effective Tags c/	TRH Recoveries
42	4	1	4	3
43	3	0	3	2
44	4	0	3	0
45	5	0	5	1
46	5	0	5	1
47	12	2	12	3
48	10	3	10	3
49	9	2	9	1
50	15	2	15	3
51	10	3	10	0
52	8	1	7	1
53	9	0	9	1
54	14	2	12	4
55	7	2	7	2
56	5	0	4	0
57	5	0	3	2
58	5	1	5	3
59	11	1	11	5
60	16	4	16	6
61	25	9	24	8
62	36	7	36	15
63	32	5	31	11
64	45	4	43	9
65	49	9	48	17
66	66	18	64	19
67	77	15	72	23
68	86	9	85	25
69	99	19	96	22
70	88	7	84	25
71	92	14	84	30
72	74	6	72	18
73	62	7	59	11
74	56	9	55	17
75	72	10	70	33
76	70	8	69	19
77	57	11	54	18
78	52	6	49	15
79	57	8	56	16
80	39	8	37	13
81	47	11	46	11
82	49	6	47	10
83	32	3	32	11
84	38	9	38	10
85	23	3	22	7
86	29	3	28	5
87	22	1	22	8
88	29	5	28	5
89	16	2	15	3
90	10	1	9	2
91	9	2	9	3
92	5	0	5	1
93	6	0	6	2
94	5	1	5	1
95	3	1	3	0
96	3	0	3	0
97	5	1	5	1
98	3	1	3	1
99	2		2	1
100	3		3	
101	0		0	
102	1		1	
103	0		0	
104	1		1	
105	0		0	
106	1		1	
Totals d/:	1,734	263	1,673	487
Mean FL:	72.2	71.5	72.2	71.9
Total grilse e/:	115	18	111	25
Total adults:	1,618	245	1,561	462

a/ Trapping at Junction City took place from Julian Week 25 through Julian Week 38. All chinook were considered spring-run this year at JCW.

b/ Ad-clip = Adipose fin clipped fish.

c/ Number of effectively tagged fish excludes fish that were not tagged, tagging mortalities, and fish that had their tags removed (caught and released)

d/ Totals include one fish tagged and not measured at JCW.

e/ Spring-run chinook salmon less than or equal to 55 cm FL were considered grilse.

Appendix 5. Fork length (FL) distribution of fall-run chinook salmon trapped and tagged at the Willow Creek Weir during the 2002-03 season. a/

FL (cm)	Total Trapped	Ad-clips b/	Effective Tags c/	TRH Recoveries
41	3	1	3	
42	1	0	1	
43	1	0	1	
44	5	0	4	
45	3	2	3	
46	5	0	4	1
47	8	1	8	1
48	6	1	5	0
49	11	1	11	0
50	9	1	9	3
51	10	3	10	1
52	10	2	10	2
53	15	6	15	6
54	8	1	7	5
55	11	2	11	7
56	6	1	5	1
57	7	0	7	4
58	2	0	1	0
59	7	2	7	3
60	7	2	6	4
61	5	1	5	2
62	11	1	11	2
63	9	0	9	1
64	12	0	12	1
65	9	3	9	4
66	20	3	19	8
67	11	2	10	5
68	17	3	17	6
69	16	1	16	4
70	22	1	22	10
71	29	3	28	10
72	29	2	26	6
73	19	1	18	5
74	15	0	13	4
75	26	1	25	3
76	16	1	14	2
77	22	3	21	6
78	15	3	14	1
79	18	3	17	4
80	21	3	19	2
81	17	2	16	2
82	12	1	11	2
83	15	2	15	1
84	17	5	14	6
85	16	1	16	7
86	11	0	11	1
87	14	1	13	1
88	10	2	9	3
89	5	1	5	0
90	14	3	12	2
91	5	0	4	0
92	5	0	2	0
93	5	1	4	1
94	4	0	4	0
95	5	1	5	2
96	2		2	
97	2		2	
98	2		2	
99	1		1	
100	0		0	
101	1		1	
102	1		1	
103	0		0	
104	1		1	
105	0		0	
106	1		1	
Totals:	643	81	605	152
Mean FL:	71.5	69.1	71.3	69.5
Total grilse d/:	135	26	128	38
Total adults:	508	55	477	114

a/ Trapping at Willow Creek took place from Julian Week 36 through Julian Week 50. All chinook were considered fall-run this year at WCW.

b/ Ad-clip = Adipose fin clipped fish.

c/ Number of effectively tagged fish excludes fish that were not tagged, tagging mortalities, and fish that had their tags removed (caught and released)

d/ Fall-run chinook salmon less than or equal to 60 cm FL were considered grilse.

Appendix 6. Fork length (FL) distribution of coho salmon trapped and tagged at the Willow Creek Weir during the 2002-03 season. a/

FL (cm)	Total Trapped	RM-clips b/	Effective Tags c/	TRH Recoveries
32	1	1		
33	0	0		
34	0	0		
35	0	0		
36	0	0		
37	2	2	1	
38	1	1	0	
39	1	0	1	
40	3	3	3	
41	4	4	3	1
42	2	2	2	2
43	8	7	8	1
44	9	9	8	4
45	10	9	7	3
46	9	8	8	1
47	9	9	8	3
48	6	6	6	1
49	7	7	6	3
50	7	6	6	2
51	5	4	5	3
52	7	7	7	5
53	3	2	2	0
54	0	0	0	0
55	1	1	1	1
56	2	2	2	1
57	1	1	1	0
58	2	2	1	1
59	0	0	0	0
60	1	1	1	0
61	2	2	2	1
62	3	3	3	1
63	2	2	2	1
64	7	7	5	4
65	8	8	7	4
66	5	5	4	3
67	11	11	11	6
68	6	6	6	2
69	13	13	11	8
70	14	14	12	8
71	17	16	15	6
72	10	9	9	2
73	8	8	8	2
74	7	7	7	4
75	3	3	3	2
76	3	2	3	2
77	1	1	1	
78	0			
79	1			
Totals d/:	223	211	197	88
Mean FL:	59.1	59.3	59.5	61.4
Total grilse e/:	98	91	85	31
Total adults:	124	120	111	57

a/ Trapping at Willow Creek took place from Julian Week 36 through Julian Week 50.

b/ RM-clip = Right maxillary clipped fish.

c/ Number of effectively tagged fish excludes fish that were not tagged, tagging mortalities, and fish that had their tags removed (caught and released).

d/ Totals include one fish tagged but not measured.

e/ Coho salmon less than or equal to 57 cm FL were considered grilse.

Appendix 7. Fork length (FL) distribution of fall-run steelhead trapped and tagged in the Trinity River at the Willow Creek and Junction City weirs, and recovered at Trinity River Hatchery (TRH).

FL (cm)	Willow Creek Weir a/			Junction City Weir a/		
	Total Trapped	Ad-clips b/	Effective Tags c/	TRH Recoveries	Total Trapped	Ad-clips b/
33					1	
34					0	
35					0	
36	1	1			0	
37	4	3			0	
38	5	5			0	
39	2	1			1	1
40	2	2			2	1
41	4	3	1		1	1
42	3	3	0		0	0
43	0	0	0		1	1
44	1	1	1		0	0
45	2	1	2		1	0
46	4	1	2	1	0	0
47	5	0	4	0	1	0
48	12	2	11	0	0	0
49	20	2	19	1	0	0
50	17	1	16	1	0	0
51	20	6	19	4	2	1
52	16	2	13	1	1	0
53	21	3	19	1	1	0
54	29	14	26	3	2	1
55	45	27	42	7	1	1
56	49	35	42	12	5	5
57	64	45	55	14	2	2
58	74	49	66	21	7	3
59	89	66	83	25	6	4
60	105	86	94	29	4	3
61	145	119	132	45	7	5
62	152	129	129	45	7	6
63	144	126	129	41	7	6
64	130	116	120	46	5	4
65	101	84	88	36	2	2
66	84	71	77	36	2	0
67	79	65	72	25	3	3
68	53	43	49	17	4	1
69	34	30	26	9	4	3
70	37	29	30	13	2	0
71	21	19	20	6	1	0
72	15	13	14	5	0	0
73	6	6	4	3	1	1
74	3	2	3	0	2	1
75	3	2	3	1		
76	2	1	2			
77	2	2	2			
78	0	0	0			
79	2	1	1			
Totals d/:	1,608	1,217	1,417	448	86	56
Mean FL:	61.3	62.3	61.6	62.8	60.0	60.2
Total 1/2 pounders e	18	15	1	0	5	3
Total adults:	1,589	1,202	1,415	448	81	53

a/ Trapping at Willow Creek took place from Julian Weeks 36 - 50 and at Junction City from Julian Weeks 25 - 38. Steelhead were not tagged at Junction City Weir.

b/ Ad clipped fish.

c/ Number of effectively tagged fish excludes fish that were not tagged, tagging mortalities, and fish that had their tags removed (caught and released).

d/ Totals include one fish tagged but not measured at the Willow Creek Weir.

e/ Steelhead less than or equal to 41 cm FL were considered half pounders; larger fish were adults.

Appendix 8. Fork Length (FL) distribution of Ad-clipped and non-clipped fall-run steelhead trapped in the Trinity River at Willow Creek and Junction City weirs and that entered Trinity River Hatchery during the 2002-2003 season.

FL (cm)	Recovery Site					
	Willow Creek Weir a/		Junction City Weir b/		Trinity River Hatchery c/	
	Unmk	AD	Unmk	AD	Unmk	AD
32						5
33			1			0
34			0			2
35			0			3
36		1	0			5
37	1	3	0			3
38	0	5	0			9
39	1	1	0	1		14
40	0	2	1	1		39
41	1	3	0	1	1	46
42	0	3	0	0	0	50
43	0	0	0	1	0	38
44	0	1	0	0	0	25
45	1	1	1	0	1	31
46	3	1	0	0	2	23
47	5	0	1	0	0	13
48	10	2	0	0	0	24
49	17	2	0	0	0	14
50	16	1	0	0	1	17
51	14	6	1	1	0	20
52	14	2	1	0	0	25
53	18	3	1	0	3	26
54	15	14	1	1	2	43
55	18	27	0	1	3	55
56	14	35	0	5	3	86
57	19	45	0	2	1	134
58	25	49	4	3	1	206
59	23	66	2	4	3	278
60	19	86	1	3	3	380
61	26	119	2	5	2	439
62	23	129	1	6	3	496
63	18	126	1	6	1	512
64	14	116	1	4	2	519
65	17	84	0	2	2	450
66	13	71	2	0	3	441
67	14	65	0	3	2	368
68	10	43	3	1	2	303
69	4	30	1	3	0	266
70	8	29	2	0	0	219
71	2	19	1	0	1	152
72	2	13	0	0	0	125
73	0	6	0	1	0	76
74	1	2	1	1	0	62
75	1	2			0	28
76	1	1			1	20
77	0	2				14
78	0	0				7
79	1	1				5
80						3
81						1
82						0
83						1
84						0
85						0
86						0
87						1
Totals e/	389	1,217	30	56	43	6,122
Mean FL:	58.4	62.3	59.5	60.2	59.2	62.8
Total subadults f/:	3	15	2	3	1	126
Total adults:	386	1,202	28	53	42	5,996

a/ Trapping Willow Creek took place from September 5(Julian Week 36) through December 11 (Julian Week 50) of 2002.

b/ Trapping Junction City took place from 5 June (Julian Week 25) through September 23 (Julian week 50) of 2002.

c/ The fish ladder was open from September 10, 2002 through March 12,2003 (Julian Week 36-11)

d/ Unmk = unmarked steelhead; AD = Adipose clip. All steelhead reared at Trinity River Hatchery have been adipose fin-clipped since 1998 (brood year 1997).

e/ Totals do not include one fish that was not measured at Willow Creek Weir.

f/ Subadults were steelhead less than or equal to 41 cm FL; larger fish were adults.

Appendix 9 . Fork Length (FL) distribution of spring-run chinook salmon tagged at Junction City Weir and subsequently recovered during the 2002-2003 season. a/

Fork length (cm)	Total tagged	Recoveries						Total recoveries	% recoveries
		Tag morts b/	Carcass c/ recoveries	TRH d/ recoveries	Angler released e/	Angler harvest f/	Angler found tags g/		
42	4			3				3	75.0%
43	3			2				2	66.7%
44	3			0				0	0.0%
45	5			1				1	20.0%
46	5			1				1	20.0%
47	12			3		1		4	33.3%
48	10		2	3		0		5	50.0%
49	9		0	1		0	1	2	22.2%
50	15		0	3		0	0	3	20.0%
51	10		0	0		0	0	0	0.0%
52	8		0	1	1	0	0	2	25.0%
53	9		0	1	0	0	0	1	11.1%
54	13		1	4	1	0	0	6	46.2%
55	7		0	2	0	1	0	3	42.9%
56	4		0	0	0	0	0	0	0.0%
57	4	1	0	2	0	0	0	3	75.0%
58	5	0	0	3	0	0	0	3	60.0%
59	11	0	1	5	0	0	0	6	54.5%
60	16	0	1	6	0	0	0	7	43.8%
61	25	1	1	8	0	1	0	11	44.0%
62	36	0	0	15	0	3	0	18	50.0%
63	31	0	0	11	0	2	0	13	41.9%
64	44	0	4	9	1	1	0	15	34.1%
65	48	0	2	17	0	4	1	24	50.0%
66	65	0	4	19	1	1	0	25	38.5%
67	75	1	3	23	2	3	1	33	44.0%
68	86	1	4	25	0	2	0	32	37.2%
69	98	0	6	22	2	1	0	31	31.6%
70	88	0	3	25	4	6	1	39	44.3%
71	88	2	2	30	2	2	0	38	43.2%
72	73	0	2	18	1	4	0	25	34.2%
73	62	2	2	11	1	1	2	19	30.6%
74	56	0	2	17	1	3	1	24	42.9%
75	71	0	2	33	1	2	1	39	54.9%
76	69	0	3	19	0	2	0	24	34.8%
77	55	0	1	18	1	0	0	20	36.4%
78	50	0	1	15	1	4	0	21	42.0%
79	57	0	4	16	1	1	0	22	38.6%
80	39	1	1	13	1	1	1	18	46.2%
81	47	1	4	11	0	3	1	20	42.6%
82	48	0	2	10	1	4	0	17	35.4%
83	32	0	2	11	0	1	0	14	43.8%
84	38	0	1	10	0	0	1	12	31.6%
85	23	1	0	7	0	0	0	8	34.8%
86	29	0	1	5	1	2	1	10	34.5%
87	22	0	1	8	0	0	0	9	40.9%
88	28	0	2	5	0	0	0	7	25.0%
89	15	0	0	3	0	0	0	3	20.0%
90	10	1	0	2	0	0	0	3	30.0%
91	9		1	3		2		6	66.7%
92	5			1				1	20.0%
93	6			2				2	33.3%
94	5			1				1	20.0%
95	3			0				0	0.0%
96	3			0				0	0.0%
97	5			1			1	2	40.0%
98	3			1				1	33.3%
99	2			1				1	50.0%
100	3							0	0.0%
101	0							0	
102	1							0	0.0%
103	0							0	
104	1							0	0.0%
105	0							0	
106	1							0	0.0%
Grilse: h/	113	0	3	25	2	2	1	33	29.2%
Adults:	1,595	12	63	462	22	56	12	627	39.3%
Total: i/	1,708	12	66	487	24	58	13	660	38.6%

a/ Trapping Junction City took place from 5 June (Julian Week 25) through September 23 (Julian week 50) of 2002.

b/ Tagged fish found dead and unspawned within 30 days of tagging.

c/ Fish recovered in upper Trinity River spawner surveys.

d/ TRH = Trinity River Hatchery

e/ Fish reported as caught and released by anglers.

f/ Fish reported as harvested by anglers.

g/ Tags found on dead fish or found unattached.

h/ Grilse were considered fish less than or equal to 55 cm.

i/ Total I does not includes one fish that was trapped but not measured.

Appendix 10 . Fork Length (FL) distribution of fall-run chinook salmon tagged at Willow Creek Weir and subsequently recovered during the 2002-03 season.

Fork length (cm)	Total tagged	Recoveries					Total recoveries	% recoveries
		Tag morts b/	Carcass c/ recoveries	TRH d/ recoveries	Angler released e/	Angler harvest f/		
41	3					1	1	33.3%
42	1					0	0	0.0%
43	1					0	0	0.0%
44	4					0	0	0.0%
45	3					1	1	33.3%
46	4			1		0	1	25.0%
47	8			1		0	1	12.5%
48	5			0		0	0	0.0%
49	11			0		1	1	9.1%
50	9			3		0	3	33.3%
51	10			1		1	2	20.0%
52	10			2		0	2	20.0%
53	15			6		0	6	40.0%
54	7			5		0	5	71.4%
55	11			7		0	7	63.6%
56	6			1	1	0	2	33.3%
57	7			4	0	0	4	57.1%
58	1			0	0	0	0	0.0%
59	7			3	0	1	4	57.1%
60	7			4	1	0	5	71.4%
61	5			2	0	1	3	60.0%
62	11			2	0	0	2	18.2%
63	9		1	1	0	1	3	33.3%
64	12		1	1	0	0	2	16.7%
65	9		1	4	0	0	5	55.6%
66	20		1	8	1	0	10	50.0%
67	10		1	5	0	0	6	60.0%
68	17		1	6	0	0	7	41.2%
69	16		1	4	0	0	6	37.5%
70	22		0	10	0	0	10	45.5%
71	28		1	10	0	0	11	39.3%
72	26		0	6	0	1	7	26.9%
73	18		1	5	0	3	9	50.0%
74	13		1	4	0	1	7	53.8%
75	25		1	3	0	2	6	24.0%
76	14		1	2	0	1	4	28.6%
77	21		3	6	0	0	9	42.9%
78	14		2	1	0	0	3	21.4%
79	17		1	4	0	0	5	29.4%
80	19		3	2	0	0	5	26.3%
81	17		1	2	1	0	4	23.5%
82	11		1	2	0	0	3	27.3%
83	15		2	1	0	0	3	20.0%
84	15	1	0	6	0	0	7	46.7%
85	16		1	7	0	1	9	56.3%
86	11		1	1	0	1	3	27.3%
87	13		1	1	0	0	2	15.4%
88	9			3	0	0	3	33.3%
89	5			0	0	0	0	0.0%
90	13			2	1	0	3	23.1%
91	5	1		0	0	0	1	20.0%
92	2			0			0	0.0%
93	4			1			1	25.0%
94	4			0			0	0.0%
95	5			2			2	40.0%
96	2						0	0.0%
97	2						0	0.0%
98	2						0	0.0%
99	1						0	0.0%
100	0						0	
101	1						0	0.0%
102	1						0	0.0%
103	0						0	
104	1						0	0.0%
105	0						0	
106	1						0	0.0%
Grilse: h/	130	0	0	38	2	5	45	34.6%
Adults:	482	2	28	114	3	12	161	33.4%
Total:	612	2	28	152	5	17	206	33.7%

a/ Trapping Willow Creek took place from Julian Week 36 through 50.
b/ Tagged fish found dead and unspawned within 30 days of tagging.
c/ Fish recovered in upper Trinity River spawner surveys.
d/ TRH = Trinity River Hatchery
e/ Fish reported as caught and released by anglers.
f/ Fish reported as harvested by anglers.
g/ Tags found on dead fish or found unattached.
h/ Grilse were considered fish less than or equal to 60 cm.

Appendix 11 . Fork Length (FL) distribution of coho salmon tagged at Willow Creek Weir and subsequently recovered during the 2002-03 season.

Fork length (cm)	Total tagged	Recoveries						Total recoveries	% recoveries
		Tag morts b/	Carcass c/ recoveries	TRH d/ recoveries	Angler released e/	Angler harvest f/	Angler found tags g/		
37	1						0	0.0%	
38	0						0		
39	1						0	0.0%	
40	3						0	0.0%	
41	3			1			1	33.3%	
42	2			2			2	100.0%	
43	8			1			1	12.5%	
44	8			4			4	50.0%	
45	7			3			3	42.9%	
46	8			1			1	12.5%	
47	8		1	3			4	50.0%	
48	6			1			1	16.7%	
49	6			3			3	50.0%	
50	6			2			2	33.3%	
51	5			3			3	60.0%	
52	7			5			5	71.4%	
53	2			0			0	0.0%	
54	0			0			0		
55	1			1			1	100.0%	
56	2			1			1	50.0%	
57	1			0			0	0.0%	
58	2			1	1		2	100.0%	
59	0			0			0		
60	1			0			0	0.0%	
61	2			1			1	50.0%	
62	3			1			1	33.3%	
63	2			1			1	50.0%	
64	5			4			4	80.0%	
65	7			4			4	57.1%	
66	4			3			3	75.0%	
67	11			6			6	54.5%	
68	6			2			2	33.3%	
69	11			8			8	72.7%	
70	12			8			8	66.7%	
71	15			6			6	40.0%	
72	9			2			2	22.2%	
73	8			2			2	25.0%	
74	7			4			4	57.1%	
75	3			2			2	66.7%	
76	3			2			2	66.7%	
77	1						0	0.0%	
Grilse: h/	85	0	1	31	0	0	32	37.6%	
Adults:	112	0	0	57	1	0	58	51.8%	
Total: i/	198	0	1	88	1	0	90	45.5%	

- a/ Trapping Willow Creek took place from Julian Week 36 through 50.
- b/ Tagged fish found dead and unspawned within 30 days of tagging.
- c/ Fish recovered in upper Trinity River spawner surveys.
- d/ TRH = Trinity River Hatchery
- e/ Fish reported as caught and released by anglers.
- f/ Fish reported as harvested by anglers.
- g/ Tags found on dead fish or found unattached.
- h/ Grilse were considered fish less than or equal to 57 cm.
- i/ Total includes one fish that was trapped but not measured.

Appendix 12 . Fork Length (FL) distribution of fall-run steelhead salmon tagged at Willow Creek Weir and subsequently recovered during the 2002-03 season. a/

Fork length (cm)	Total tagged	Recoveries						Total recoveries	% recoveries
		Tag morts b/	Carcass recoveries c/	TRH d/ recoveries	Angler released e/	Angler harvest f/	Angler found tags g/		
42	1				1			1	100.0%
43	0				0			0	
44	1				0			0	0.0%
45	2				0			0	0.0%
46	4			1	2			3	75.0%
47	4			0	0	1		1	25.0%
48	12			0	1	0		1	8.3%
49	19			1	0	1		2	10.5%
50	17			1	1	0		2	11.8%
51	20			4	1	0		5	25.0%
52	16			1	3	0		4	25.0%
53	20			1	1	0		2	10.0%
54	29			3	3	3		9	31.0%
55	44			7	2	2		11	25.0%
56	48			12	6	1		19	39.6%
57	64		1	14	9	0		24	37.5%
58	72			21	6	0		27	37.5%
59	87			25	4	3		32	36.8%
60	105			29	10	2		41	39.0%
61	144			44	12	0		56	38.9%
62	148			45	19	7		71	48.0%
63	142			41	12	7		60	42.3%
64	127			47	7	6		60	47.2%
65	98			36	10	2		48	49.0%
66	84			36	7	1		44	52.4%
67	78			25	5	5		35	44.9%
68	51			17	2	2		21	41.2%
69	34			9	7	0	1	17	50.0%
70	36			13	6	0		19	52.8%
71	20			6	0	0		6	30.0%
72	15			5	1	1		7	46.7%
73	5			3	1	0		4	80.0%
74	3			0		0	1	1	33.3%
75	3			1		0		1	33.3%
76	2					0		0	0.0%
77	2					0		0	0.0%
78	0					0		0	
79	1					1		1	100.0%
Adults:	1,558	0	1	448	139	45	2	635	40.8%

a/ Trapping Willow Creek took place from Julian Week 36 through 50.

b/ Tagged fish found dead and unspawned within 30 days of tagging.

c/ Fish recovered in upper Trinity River spawner surveys.

d/ TRH = Trinity River Hatchery

e/ Fish reported as caught and released by anglers.

f/ Fish reported as harvested by anglers.

g/ Tags found on dead fish or found unattached.

Appendix 13. Summary of California Fish and Game Commission regulations that affected salmonid harvest in the Trinity River during the 2002-2003 season. ^{a/}

Body of Water	Open Season and Special Regulations.	Daily Bag and Possession Limit
(6) Trinity River		
Lewiston Dam to 250 feet downstream from Lewiston Dam.	Closed to all fishing all year.	
a. From 250 feet below Lewiston Dam to Old Lewiston bridge.	Last Saturday in April through September 15. Only artificial flies with barbless hooks may be used.	0 trout, 0 salmon
b. From Old Lewiston bridge to Highway 299 West bridge at Cedar Flat.	Fourth Saturday in May through March 31.	1 hatchery trout or 1 hatchery steelhead. 3 King salmon but not more than 2 over 22 inches. No more than 6 King salmon over 24 inches in any 7 consecutive days. No more than 12 salmon may be possessed, of which no more than 6 may be over 24 inches total length.
d. From the Highway 299 West bridge at Cedar Flat downstream to the Hawkins Bar Bridge (Road to Denny).	Fourth Saturday in May through August 31 and Dec 1 through March 31.	
e. From Hawkins Bar Bridge (Road to Denny) to the confluence with the Klamath River.	Fourth Saturday in May- March 31.	
f. South Fork of the Trinity River downstream from the mouth of Grouse Creek.	Fourth Saturday in May- March 31.	1 hatchery trout or steelhead. 0 king salmon.
g. South Fork Trinity River main stem above the South Fork Trinity River bridge near Hyampom.	November 1 through March 31.	1 hatchery trout or steelhead. 0 salmon.
h. Hayfork Creek mainstem, from hwy 3 bridge in Hayfork down-stream to the mouth.	Fourth Saturday in May through March 31. Only artificial lures with barbless hooks may be used.	0 trout, 0 salmon 0 bag limit
North Fork Trinity River main stem.	Closed to all fishing all year.	
New River main stem.	Closed to all fishing all year.	
All tributaries of the Trinity River not listed above.	Last Saturday in Apr. through Nov. 15; Maximum size limit: 14 inches total length.	2 trout, 0 salmon
Anglers may only use barbless hooks and may not remove any adult king salmon from the water by any means, such as by dragging or pushing the fish on shore or using a net of any type.		

^{a/} From State of California, Fish and Game Commission, California Code of Regulations for 2002, Title 14. Natural Resources, Division 1. Fish and Game Commission-Department of Fish and Game, Supplemental sportfishing regulations, Section 7.50(b)(91.1).

Appendix 14. Fork length (FL) distribution of coho salmon recovered at Trinity River Hatchery during the 2002-03 season. a/

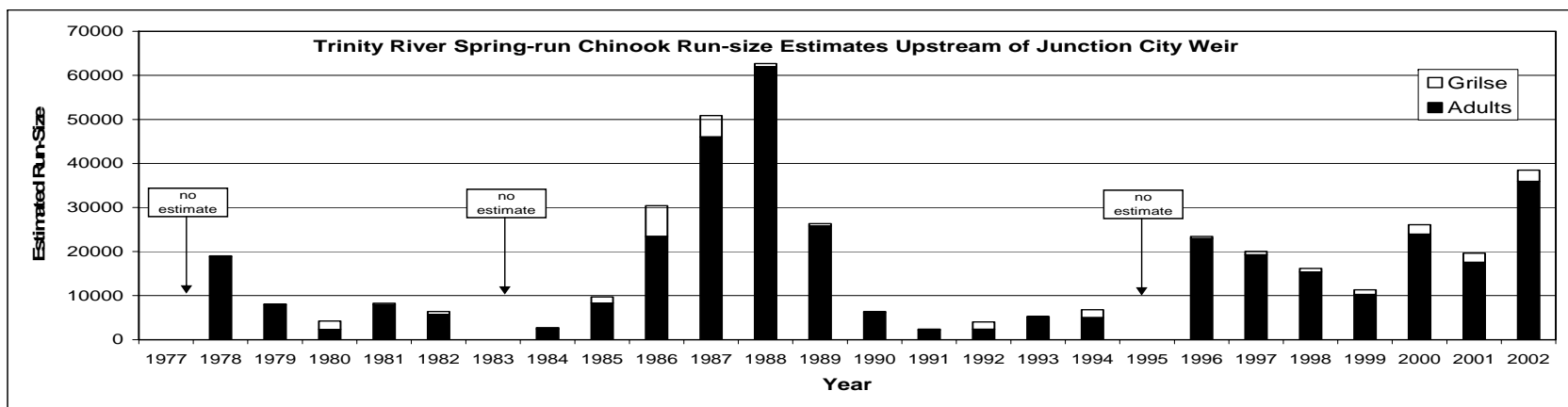
FL (cm)	Unmarked	Right maxillary clip b/	Total
35		1	1
36		0	0
37		2	2
38		2	2
39	1	7	8
40	0	18	18
41	0	22	22
42	2	24	26
43	1	36	37
44	1	43	44
45	1	67	68
46	3	46	49
47	0	71	71
48	1	69	70
49	0	52	52
50	1	40	41
51	0	61	61
52	1	39	40
53	3	37	40
54	0	23	23
55	0	10	10
56	0	11	11
57	0	7	7
58	0	10	10
59	0	8	8
60	0	17	17
61	1	30	31
62	0	44	44
63	0	56	56
64	1	112	113
65	1	145	146
66	5	220	225
67	5	383	388
68	6	467	473
69	5	542	547
70	6	691	697
71	14	758	772
72	7	718	725
73	9	621	630
74	8	567	575
75	5	386	391
76	5	274	279
77	2	152	154
78	2	95	97
79	2	63	65
80	1	27	28
81	0	18	18
82	0	4	4
83	0	1	1
84	1		1
Totals:	101	7,097	7,198
Mean FL:	68	68.8	68.7

a/ The fish ladder was open from September 10, 2002 through March 12, 2003 (Julian week 36 -11).

b/ Beginning with the 1994 brood, all coho salmon reared at Trinity River Hatchery received a right maxillary clip prior to release as yearlings.

Appendix 15. Spring-run chinook salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Junction City Creek Weir from 1977 through 2002.

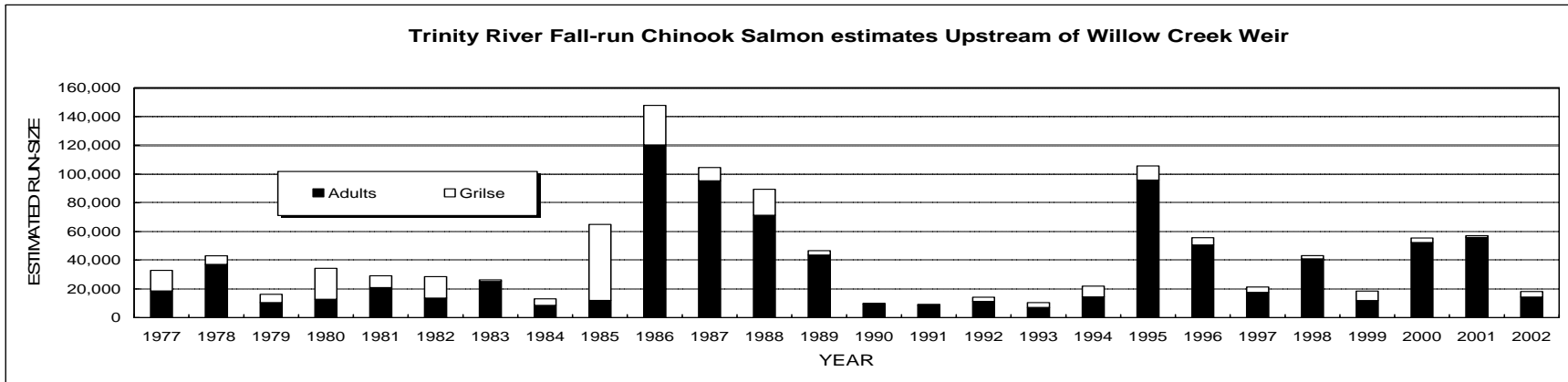
Year	Run-size estimate					Spawner escapements					Angler harvest			
	Grilse		Adults		Total	Natural		Total	Trinity River Hatchery			Grilse	Adults	Total
	Number	Percent	Number	Percent		Grilse	Adults		Grilse	Adults	Total			
1977			no estimates				no estimates		385	1,124	1,509	no estimates		
1978	190	1.0%	18,816	99.0%	19,006	29	14,384	14,413	153	3,680	3,833	8	752	a/ 760
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		385	930	1,315	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		385	8,722	9,107	no estimates		
1996	489	2.1%	22,927	97.9%	23,416	370	16,283	16,653	119	5,131	5,250	0	1,513	b/ 1,513
1997	768	3.8%	19,271	96.2%	20,039	543	13,049	13,592	225	4,892	5,117	0	1,330	b/ 1,330
1998	802	5.0%	15,365	95.0%	16,167	567	9,057	9,624	184	4,679	4,863	51	1,629	b/ 1,680
1999	1,028	9.1%	10,265	90.9%	11,293	440	5,968	6,408	547	3,671	4,218	41	626	b/ 667
2000	2,159	8.3%	23,923	91.7%	26,082	1,264	10,846	12,110	571	11,594	12,165	324	1,483	b/ 1,807
2001	2,065	10.5%	17,556	89.5%	19,621	1,178	10,284	11,462	629	6,366	6,995	258	906	1,164
2002	2,575	6.7%	35,910	93.3%	38,485	1,883	23,674	25,557	617	10,440	11,057	75	1,796	1,871



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 1985, 5 November 1992, 9 October 1994,. The Trinity River was subject to seasonal closures during the 1995-00 seasons, commencing 9 September in the lower river. Various periods of opening and closures (seasons) were instituted along the river through November 30.

Appendix 16. Fall-run chinook salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 2002.

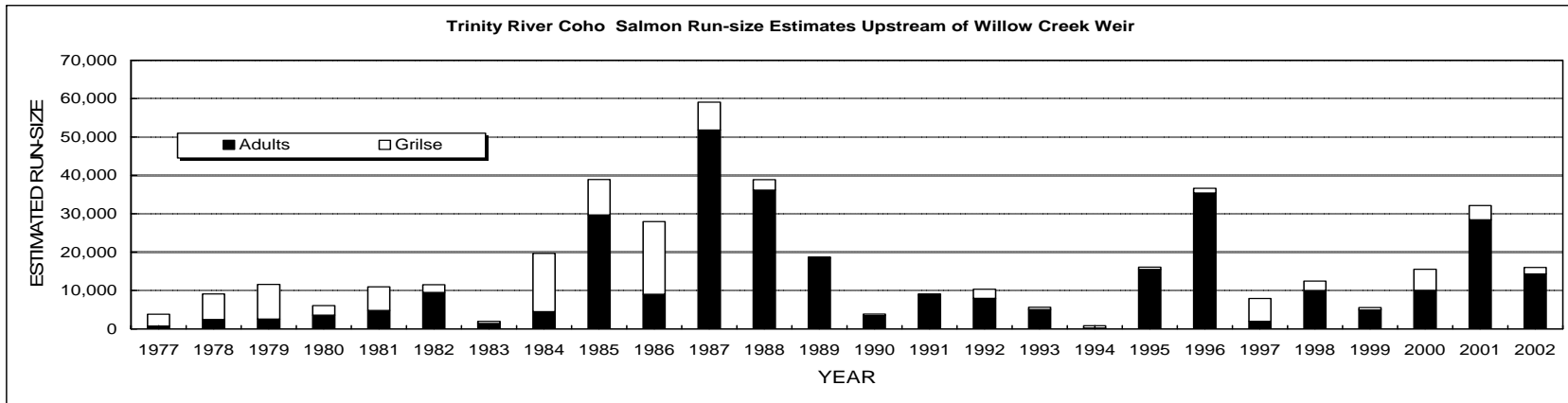
Year	Run-size estimate					Spawner escapements						Angler harvest		
	Grilse		Adults		Total	Grilse	Natural Adults	Total	Trinity River Hatchery			Grilse	Adults	Total
	Number	Percent	Number	Percent					Grilse	Adults	Total			
1977	14,318	43.5%	18,596	56.5%	32,914	9,737	13,501	23,238	2,177	2,035	4,212	2,404	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
1996	5,072	9.1%	50,574	90.9%	55,646	4,478	42,646	47,124	249	6,411	6,660	345	1,517 b/	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 b/	788
1998	2,307	5.3%	40,882	94.7%	43,189	1,974	24,460	26,434	192	14,296	14,488	141	2,126 b/	2,267
1999	6,583	35.6%	11,933	64.4%	18,516	4,154	6,753	10,907	2,027	5,037	7,064	402	143 c/	545
2000	3,163	5.7%	52,310	94.3%	55,473	1,964	24,880	26,844	1,028	26,018	27,046	171	1,412 d/	1,583
2001	1,214	2.1%	55,895	97.9%	57,109	914	36,152	37,066	204	17,971	18,175	96	1,772 d/	1,868
2002	3,812	21.0%	14,344	79.0%	18,156	2,566	10,310	12,876	1,078	3,475	4,553	168	559 d/	727



- 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 22 September 1985, 5 November 1992, 9 October 1993, and 3 October 1994. The Trinity River was subject to seasonal closures during the 1995-'98 seasons, commencing 9 September in the lower river. Various periods of openings and closures (seasons) were instituted along the river through November 30.
- c/ The 1999 sport harvest of Trinity River fall-run chinook was managed with a quota system. In 1999, the quota was 957 adult fall-run chinook.
- d/ The 2001 and 2002 sport harvest of Trinity River fall-run chinook was managed with a quota system. The quota for adult fall-run chinook salmon was 9,834 in 2001 and 6,926 in 2002.

Appendix 17. Coho salmon run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 2002.

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	573	10.2%	5,048	89.8%	5,621	416	3,024	3,440	93	2,024	2,117	64	0	64
1994	613	71.9%	239	28.1%	852	453	105	558	160	134	294	0	0	0
1995	634	3.9%	15,477	96.1%	16,111	370	10,680	11,050	264	4,503	4,767	0	294	294
1996	1,269	3.5%	35,391	96.5%	36,660	1,149	25,308	26,457	120	9,835	9,955	0	248	248 c/
1997	5,951	75.0%	1,984	25.0%	7,935	5,038	1,097	6,135	871	887	1,758	42	0	42 c/
1998	2,471	19.8%	10,009	80.2%	12,480	1,494	5,995	7,489	977	4,014	4,991	0	0	0 c/
1999	623	11.3%	4,912	88.7%	5,535	234	1,696	1,930	389	3,118	3,507	0	98	98 c/
2000	5,486	35.3%	10,046	64.7%	15,532	4,560	6,585	11,145	926	3,461	4,387	0	0	0 c/
2001	3,670	11.4%	28,470	88.6%	32,140	2,644	18,715	21,359	1,026	9,755	10,781	0	0	0 c/
2002	1,709	10.7%	14,307	89.3%	16,016	1,006	7,812	8,818	703	6,495	7,198	0	0	0 c/



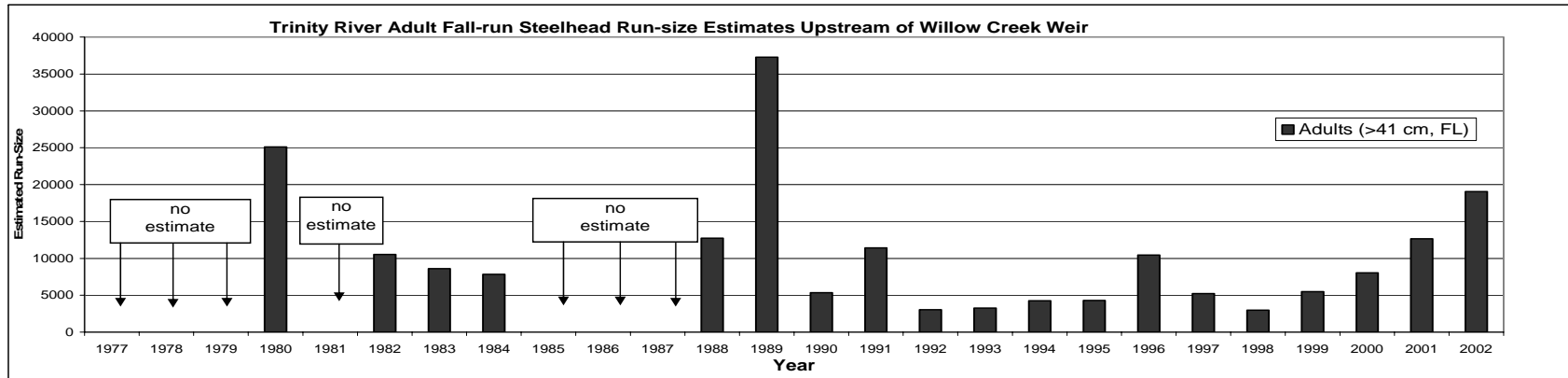
a/ The 1978 sport harvest of coho was essentially eliminated by a salmon fishing closure beginning 25 August 1978.

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.

c/ The 1996-'02 sport fishery was closed to the take of coho salmon.

Appendix 18. Fall-run adult steelhead run-size, spawner escapement and angler harvest estimates for the Trinity River upstream of Willow Creek Weir from 1977 through 2002.

Year	Run-size estimate					Spawner escapement						Angler harvest		
	Hatchery b/		Wild c/		Total	Hatchery	Natural		Trinity River Hatchery			Hatchery	Wild	Total
	Number	Percent	Number	Percent			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			1,345
1984	"				7,833			6,430			142			1,261
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 d/			817		"	
1989	"				37,276			28,933			4,765			3,578
1990	"				5,348			3,188			930			1,230
1991	"				11,417			8,631			446			2,340
1992	1,315	43.2%	1,731	56.8%	3,046	759	1,540	2,299	430	25	455	126	166	292
1993	1,894	58.4%	1,349	41.6%	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	1,424	1,867	3,291	24	681	705	147	145	292
1996	8,598	82.4%	1,837	17.6%	10,435	4,127	1,703	5,830	3,964	48	4,012	507	86	593
1997	No estimates for hatchery/wild components				5,212		No estimates	4,267		No estimates	429		No estimates	516
1998	"				2,972		"	2,463		"	441		"	68 e/
1999	"				5,470		"	3,817		"	1,571		"	82 e/
2000	"				8,042		"	7,097		"	768		"	177 e/
2001	"				12,638		"	9,938		"	2,333		"	367 e/
2002	14,408	75.6%	4,650	24.4%	19,058	7,715	4,551	12,266	5,966	42	6,038	697	57	754 e/



- a/ Adult 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.
- e/ Harvest was limited to hatchery produced fish only. Hatchery fish are those with an adipose fin-clip.

ANNUAL REPORT
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT
2002-03 SEASON

TASK 2
SURVIVAL AND CONTRIBUTIONS TO THE FISHERIES AND SPAWNER
ESCAPEMENTS MADE BY CHINOOK SALMON PRODUCED AT
TRINITY RIVER HATCHERY

by

Wade Sinnen

ABSTRACT

Recovery of marked spring-run (spring) and fall-run (fall) chinook salmon (*Oncorhynchus tshawytscha*) at Trinity River Hatchery (TRH) was conducted between 9 September, 2002 and 11 March, 2003. Of the 15,610 chinook salmon that entered TRH, we recovered 3,280 adipose fin-clipped (AD) chinook salmon, 21.0% of the total. Of these, coded-wire tags (CWT) were recovered from 2,176 spring chinook and 927 fall chinook salmon.

We estimated that 5,488 marked (AD+CWT) spring chinook returned to the Trinity River upstream of the Junction City Weir and 2,198 marked fall chinook returned to the Trinity River upstream of the Willow Creek weir during the 2002-03 season.

Run-size, in-river angler harvest, and spawner escapements of marked spring- and fall-run chinook salmon of the 1997 through 2000 brood years are presented. Complete returns are only available for both runs of fish from the 1997 brood year, returning as two- through five-year-olds. TRH-produced spring chinook from this brood year returned at estimated rates of 0.88% and 3.03% for fingerling and yearling releases respectively. Similarly, fall chinook returned at rates of 0.79% and 3.65%.

Based on estimated total spring chinook run-size above Junction City Weir and fall chinook run-size above Willow Creek Weir, we estimate that the hatchery produced portion of these two runs were 67.2% and 52.2% respectively.

Approximately 33,000 fall Chinook died in the lower Klamath River this season. The kill affected returns of Trinity River bound Chinook. Since most Trinity River Chinook return as three and four year old fish, the effects of this kill will be most noticeable when compiling the cohort tables for brood years 1998 and 1999.

TASK OBJECTIVES

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

INTRODUCTION

During the period of 9 September, 2002 through 11 March, 2003, the California Department of Fish and Game's (CDFG) Trinity River Project recaptured chinook salmon returning to Trinity River Hatchery (TRH) from previously marked brood years (BY). Marked chinook (AD+CWT) were identified by an adipose fin-clip (AD). These fish were implanted with a binary coded-wire tag (CWT) prior to their release from TRH as either smolts or yearlings. Both spring-run (spring) and fall-run (fall) chinook were representatively marked. Prior to 1995, the CDFG was responsible for the coded-wire tagging program at TRH. Beginning in 1995, the coded-wire tagging program at TRH has been conducted by the Hoopa Valley Tribal 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 and analyzing the information derived from their recovery. This study is a continuation of previous studies conducted by the CDFG and is reliant on data presented in Sinnen 2000, 2002, 2004.

METHODS

We examined all salmon entering TRH for fin-clips and Project tags (also part of TASK 1). 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) total run-size, 2) angler harvest rate, 3) proportion of the run comprised of marked fish, and 4) proportion of CWT groups recovered at TRH. Independent estimates of spring and fall chinook run-size and angler harvest rates for each race of chinook are required. Methods to determine total run-size and angler harvest rate estimates were presented in "TASK 1" of this report.

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 $N_{run-size\ estimate}$ = 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:

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

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

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

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

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

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

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

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

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

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

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

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

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 basin run-size estimate. In evaluating the return of CWTed hatchery chinook, we normally report on the individual year's return along with a summary of each CWT group throughout their five-year life cycle.

Run size estimates for spring and fall chinook are calculated for the Trinity River upstream of the JCW (river km [RKM] 137.1) and the WCW (RKM 36.4), respectively.

In this report, we present estimated contribution rates of TRH-produced chinook salmon to total spring and fall chinook run-sizes. This is accomplished by expanding each of the individual CWT estimated run-sizes, by its corresponding hatchery expansion factor (total releases represented by each CWT release group/CWT'ed fish released). In doing this, we assume that marked fish are representative of their unmarked counterparts.

RESULTS

Coded-wire tag recovery

We recovered 3,280 AD-clipped chinook at TRH this season, of which we recovered CWT's from 2,176 spring chinook and 927 fall chinook. The remaining 177 AD-clipped fish had either shed their CWT or the CWT was lost or unreadable. Chinook without CWT's were classified as either spring- or fall-run based on their date of entry into TRH. Fish which entered the hatchery prior to 11 October were considered spring chinook, while chinook entering after 23 October were considered fall fish. Recovered spring chinook CWT's were composed of 18 release groups from the 1997 through 2000 BY's. Recovered fall chinook with CWT's were from 28 groups representing the 1997 through 2000 BY's (Table 1).

Table 1. Release and recovery data for adipose fin-clipped chinook recovered at Trinity River Hatchery (TRH) during the 2002-03 season.

CWT a/ code	Egg source	Brood year	Release data				Recovery data				Total No.
			Date	Number	Size (No./lb)	Site	Males		Females		
							No.	FL b/	No.	FL b/	
Spring-run chinook salmon											
065238	TRH	1997	06/15/98	104,578	49	TRH	2	101.0	0	---	2
065240	TRH	1997	10/1-7/98	147,507	13	TRH	1	85.0	0	---	1
065247	TRH	1998	06/1-7/99	54,378	55	TRH	11	84.5	14	76.4	25
065248	TRH	1998	06/1-7/99	61,516	64	TRH	9	83.4	21	79.8	30
065249	TRH	1998	06/1-7/99	61,074	67	TRH	11	88.4	15	80.7	26
065250	TRH	1998	10/4-13/99	137,602	11.25	TRH	215	85.3	255	78.5	470
065251	TRH	1999	06/1-07/00	49,421	40.8	TRH	215	74.0	184	68.5	399
065252	TRH	1999	06/1-07/00	51,993	40.8	TRH	175	75.5	173	69.4	348
065253	TRH	1999	06/1-07/00	46,966	50.6	TRH	122	74.4	103	69.1	225
065258	TRH	1999	10/03-06/00	129,919	10.3	TRH	332	67.1	192	64.5	524
065260	TRH	2000	06/6-06/13/01	33,049	33.3	TRH	11	47.9	0	---	11
065261	TRH	2000	06/6-06/13/01	32,621	33.3	TRH	17	48.1	0	---	17
065262	TRH	2000	06/6-06/13/01	24,480	33.3	TRH	5	52.8	0	---	5
065263	TRH	2000	06/6-06/13/01	34,385	33.3	TRH	15	48.9	0	---	15
065264	TRH	2000	06/6-06/13/01	31,587	42.0	TRH	13	51.5	0	---	13
065269	TRH	2000	06/6-06/13/01	52,491	33.3	TRH	29	50.2	0	---	29
065270	TRH	2000	06/6-06/13/01	52,580	42.0	TRH	18	49.3	0	---	18
065279	TRH	2000	10/1-10/10/01	99,304	7.9	TRH	18	43.9	0	---	18
100000 c/ d/							83	72.2	56	70.5	139
Spring-run chinook salmon totals:							1,302		1,013		2,315
Fall-run chinook salmon											
065236	TRH	1997	06/15/98	48,382	88	TRH	0	---	1	88.0	1
065239	TRH	1997	06/15/98	18,304	160	TRH	0	---	1	85.0	1
065241	TRH	1997	10/1-7/98	313,080	23.2	TRH	4	92.3	10	85.0	14
062641	TRH	1998	10/4-13/99	334,726	19.05	TRH	69	86.7	146	81.9	215
065242	TRH	1998	06/1-7/99	46,399	106	TRH	3	86.7	4	83.3	7
065642	TRH	1998	10/4-13/99	16,673	19.05	TRH	4	88.8	6	84.3	10
065243	TRH	1998	06/1-7/99	42,659	118	TRH	2	92.0	1	67.0	3
065244	TRH	1998	06/1-7/99	49,332	135	TRH	2	90.0	2	81.5	4
065245	TRH	1998	06/1-7/99	46,391	141	TRH	1	81.0	2	81.5	3
065254	TRH	1999	06/1-07/00	44,654	79.4	TRH	32	74.2	12	70.6	44
065255	TRH	1999	06/1-07/00	42,549	79.4	TRH	17	72.9	10	72.5	27
065256	TRH	1999	06/1-07/00	43,565	90.5	TRH	10	77.0	7	71.1	17
065257	TRH	1999	06/1-07/00	50,533	90.5	TRH	15	73.2	5	68.4	20
065259	TRH	1999	10/03-06/00	296,892	14.7	TRH	240	68.7	64	68.0	304
065265	TRH	2000	06/6-06/13/01	32,795	56.5	TRH	18	55.4	0	---	18
065266	TRH	2000	06/6-06/13/01	33,806	56.5	TRH	18	54.2	0	---	18
065367	TRH	2000	06/6-06/13/01	34,852	56.5	TRH	8	52.8	0	---	8
065268	TRH	2000	06/6-06/13/01	33,240	86.0	TRH	6	49.3	0	---	6
065271	TRH	2000	06/6-06/13/01	54,867	56.5	TRH	47	53.6	0	---	47
065272	TRH	2000	06/6-06/13/01	36,035	56.5	TRH	18	55.4	0	---	18
065273	TRH	2000	06/6-06/13/01	57,444	56.5	TRH	21	54.4	0	---	21
065274	TRH	2000	06/6-06/13/01	32,096	56.5	TRH	14	54.8	0	---	14
065275	TRH	2000	06/6-06/13/01	64,250	56.5	TRH	23	54.6	0	---	23
065276	TRH	2000	06/6-06/13/01	27,159	56.5	TRH	11	53.9	0	---	11
065277	TRH	2000	06/6-06/13/01	56,582	86.0	TRH	5	50.2	0	---	5
065278	TRH	2000	06/6-06/13/01	34,183	86.0	TRH	10	51.6	0	---	10
065643	TRH	2000	06/6-06/13/01	25,007	86.0	TRH	3	53.3	0	---	3
065280	TRH	2000	10/1-10/10/01	216,593	12.3	TRH	55	47.4	0	---	55
100000 c/ e/							28	62.2	10	77.3	38
Fall-run chinook salmon totals:							684		281		965

a/ CWT = Coded-wire tag.

b/ FL = Average fork length in cm.

c/ 100000 = No CWT found or it was lost during recovery.

d/ Assigned as spring-run chinook based on their entry dates into Trinity River Hatchery.

e/ Assigned as fall-run chinook based on their entry dates into Trinity River Hatchery.

Run-size, angler harvest, and escapement of coded-wire tagged salmon

Spring-run chinook salmon

Based on estimated total chinook run-size above JCW, the AD-clip rate of spring chinook at JCW, the estimated angler harvest rate, and recovery of spring-run CWT fish at TRH, we estimated that 5,488 CWT'ed spring chinook salmon returned to the Trinity River above JCW during the 2002-03 season. An estimated 268 of these fish were harvested by anglers during the season. Escapement of CWT'ed spring chinook was divided between 2,176 fish recovered at the TRH and 3,045 estimated to have spawned in natural areas (Table 2).

1997 brood year

Three spring chinook CWT groups from the 1997 BY completed their life cycle this season, having reached the age of five. CWT groups 065237 and 065238 (smolt releases) had percent return rates (number released from TRH/estimated returns above Junction City Weir X 100) of 0.895% and 0.859% respectively. The yearling-released group, 065240, returned at a rate of 3.03%, approximately 3.4 times that of their smolt-released counterparts. All three release groups experienced their largest returns at age three (Table 3).

1998 brood year

Spring chinook yearlings (CWT 065250) from the 1998 BY have returned at a rate approximately 3 times that of their smolt (CWT 065247, 065248 and 065249) released counterparts thus far. Tagged fish from this BY can be expected to return as five-year-olds in 2003 (Table 3).

1999 brood year

Three smolt release groups, 065251, 065252 and 065253 (smolt releases) and 065258 (yearling release), have returned as age two and three-year-old fish thus far. Estimated returns of fingerling releases, through age three are approaching 2%, which is almost double that of the yearling release group (Table 3). Spring chinook from these groups will be returning as four- and five-year-olds during 2003 and 2004 respectively.

2000 brood year

Eight release groups (7 fingerling and 1 yearling) from the 1999 BY returned as two-year-olds this season. The one yearling release group, 065279, has returned at approximately half the rate as that of the seven smolt groups (Table 3). Spring chinook from this BY are expected to return as three through five-year-olds during the next three years.

Table 2. Run-size, angler harvest, and spawner escapement estimates for Trinity River Hatchery produced, coded-wire tagged, spring and fall chinook salmon returning to the Trinity River during the 2002-03 season.

Run-size estimates a/		Angler harvest rates b/		% TRH Ads With CWTs c/	% Weir Ads d/	Ad+CWT Run-size estimates e/
		Grilse	Adults			
Spring Chinook (JCW)	38,485	2.9%	5.0%	94.00%	15.17%	5,488
Fall Chinook (WCW)	18,156	4.4%	3.9%	96.06%	12.60%	2,198

CWT code	BY	Age	TRH Total No.	% of		Angler harvest	Spawning escapement		
				Total	Run-size		TRH	Natural	Total
Spring-run chinook salmon									
065238	97	5	2	0.1%	5	0	2	3	5
065240	97	5	1	0.0%	3	0	1	2	3
065247	98	4	25	1.1%	63	3	25	35	60
065248	98	4	30	1.4%	76	4	30	42	72
065249	98	4	26	1.2%	66	3	26	37	63
065250	98	4	470	21.6%	1,185	59	470	656	1,126
065251	99	3	399	18.3%	1,006	50	399	557	956
065252	99	3	348	16.0%	878	44	348	486	834
065253	99	3	225	10.3%	567	28	225	314	539
065258	99	3	524	24.1%	1,322	66	524	732	1,256
065260	00	2	11	0.5%	28	1	11	16	27
065261	00	2	17	0.8%	43	1	17	25	42
065262	00	2	5	0.2%	13	0	5	8	13
065263	00	2	15	0.7%	38	1	15	22	37
065264	00	2	13	0.6%	33	1	13	19	32
065269	00	2	29	1.3%	73	2	29	42	71
065270	00	2	18	0.8%	45	1	18	26	44
065279	00	2	18	0.8%	45	1	18	26	44
			2,176	100%	5,489	268	2,176	3,045	5,221

Fall-run chinook salmon

065236	97	5	1	0.1%	2	0	1	1	2
065239	97	5	1	0.1%	2	0	1	1	2
065241	97	5	14	1.5%	33	1	14	18	32
062641	98	4	215	23.2%	510	20	215	275	490
065242	98	4	7	0.8%	17	1	7	9	16
065243	98	4	3	0.3%	7	0	3	4	7
065244	98	4	4	0.4%	9	0	4	5	9
065245	98	4	3	0.3%	7	0	3	4	7
065642	98	4	10	1.1%	24	1	10	13	23
065254	99	3	44	4.7%	104	4	44	56	100
065255	99	3	27	2.9%	64	2	27	35	62
065256	99	3	17	1.8%	40	2	17	21	38
065257	99	3	20	2.2%	47	2	20	25	45
065259	99	3	304	32.8%	721	28	304	389	693
065265	00	2	18	1.9%	43	2	18	23	41
065266	00	2	18	1.9%	43	2	18	23	41
065267	00	2	8	0.9%	19	1	8	10	18
065268	00	2	6	0.6%	14	1	6	7	13
065271	00	2	47	5.1%	111	5	47	59	106
065272	00	2	18	1.9%	43	2	18	23	41
065273	00	2	21	2.3%	50	2	21	27	48
065274	00	2	14	1.5%	33	1	14	18	32
065275	00	2	23	2.5%	55	2	23	30	53
065276	00	2	11	1.2%	26	1	11	14	25
065277	00	2	5	0.5%	12	1	5	6	11
065278	00	2	10	1.1%	24	1	10	13	23
065643	00	2	3	0.3%	7	0	3	4	7
065280	00	2	55	5.9%	130	6	55	69	124
			927	100%	2,197	89	927	1,181	2,108

a/ Run-size estimates are upstream of either Willow Creek weir (WCW) or Junction City weir (JCW) and are inclusive of the entire run (hatchery produced and naturally produced).

b/ In-river angler harvest rates are based on the return of reward tags.

c/ A portion of all chinook released from Trinity River Hatchery (TRH) are coded-wire tagged and identified with an adipose (Ad) fin-clip. The fraction shown are those fish with an adipose fin-clip that also contained a coded-wire tag (CWT).

d/ The observed percentage of Ad-clipped fish at respective weir sites.

e/ The estimated run of chinook that were coded-wire tagged.

Table 3. 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 1999 through 2002.

Release data					Estimated returns						
CWT a/ code	Brood year	Date b/ Date	Number	Site	Age	Run- size	% of release	River harvest	Spawning escapement		
									TRH c/ %	Natural	Total
065237	1997	06/15/98	104,577	TRH	2	41	0.039	2	21	18	39
					3	805	0.770	50	441	314	755
					4	90	0.086	5	45	40	85
					5	0	0.000	0	0	0	0
					Totals: d/ Total adults: e/	936	0.895	57	507	372	879
					895	0.856	55	486	354	840	
065238	1997	06/15/98	104,578	TRH	2	61	0.058	2	31	27	58
					3	718	0.687	44	393	281	674
					4	114	0.109	6	57	51	108
					5	5	0.005	0	2	3	5
					Totals: d/ Total adults: e/	898	0.859	52	483	362	845
					837	0.800	50	452	335	787	
065240	1997	10/1-7/98	147,507	TRH	2	223	0.151	9	114	99	213
					3	2,708	1.836	167	1,483	1,058	2,541
					4	1,537	1.042	80	765	692	1,457
					5	3	0.002	0	1	2	3
					Totals: d/ Total adults: e/	4,471	3.03	256	2,363	1,851	4,214
					4,248	2.88	247	2,249	1,752	4,001	
065247	1998	06/1-7/99	54,378	TRH	2	35	0.064	5	19	11	30
					3	187	0.344	10	93	84	177
					4	63	0.116	3	25	35	60
065248	1998	06/1-7/99	61,516	TRH	2	27	0.0439	4	15	8	23
					3	191	0.3105	10	95	86	181
					4	76	0.1235	4	30	41	71
065249	1998	06/1-7/99	61,074	TRH	2	29	0.0475	4	16	9	25
					3	171	0.28	9	85	77	162
					4	66	0.1081	3	26	36	62
065250	1998	10/4-13/99	137,602	TRH	2	144	0.1046	22	79	43	122
					3	842	0.6119	44	419	379	798
					4	1,185	0.8612	59	470	652	1122
065251	1999	06/1-7/00	49,421	TRH	2	56	0.1133	7	28	21	49
					3	1,006	2.0356	50	399	554	953
065252	1999	06/1-7/00	51,993	TRH	2	50	0.0962	6	25	19	44
					3	878	1.6887	44	348	483	831
065253	1999	06/1-7/00	46,966	TRH	2	18	0.0383	2	9	7	16
					3	567	1.2073	28	225	312	537
065258	1999	10/3-6/00	129,919	TRH	2	114	0.0877	14	57	43	100
					3	1,322	1.0176	66	524	727	1251
065260	2000	06/6-13/01	33,049	TRH	2	28	0.0847	1	11	16	27
065261	2000	06/6-13/01	32,621	TRH	2	43	0.1318	1	17	25	42
065262	2000	06/6-13/01	24,480	TRH	2	13	0.0531	0	5	8	13
065263	2000	06/6-13/01	34,385	TRH	2	38	0.1105	1	15	22	37
065264	2000	06/6-13/01	31,587	TRH	2	33	0.1045	1	13	19	32
065269	2000	06/6-13/01	52,491	TRH	2	73	0.1391	2	29	42	71
065270	2000	06/6-13/01	52,580	TRH	2	45	0.0856	1	18	26	44
065279	2000	10/1-10/01	99,304	TRH	2	45	0.0453	1	18	26	44

a/ CWT = coded-wire tag.

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

c/ TRH = Trinity River Hatchery.

d/ Totals are presented only for brood year 1997. These fish have reached five years of age and are considered to have completed their life cycle.

e/ The term "adults" includes chinook aged three through five.

Fall-run chinook salmon

Based on estimated total chinook run-size above WCW, the ad-clip rate of fall chinook at WCW, the estimated angler harvest rate, and recovery of fall-run CWT fish at TRH, we estimated that 2,198 CWT'ed fall chinook salmon returned to the Trinity River above WCW during the 2002-03 season. We estimated that anglers harvested 89 CWT'ed fall chinook. Escapement of CWT'ed fall chinook was divided between 927 fish recovered at TRH and 1,181 estimated to have spawned naturally (Table 2).

1997 brood year

Six fall chinook CWT groups composed of five fingerling releases and one yearling release from the 1997 BY completed their life cycle this season, having reached the age of five. Estimated returns of five year old Chinook from fingerling released Chinook were minimal, only four fish from two fingerling release groups, 065236 and 065239, returned this year. The one yearling group, 065241, experienced an estimated return of 33 five-year-old fish. The total return rate of fish released as yearlings was estimated at 3.65%, more than three times the rate of any of the fingerling released counterparts. All Chinook from the 1997 BY experienced their highest returns as three-year-old fish (Table 4).

1998 brood year

The 1998 BY is represented by six CWT groups, of which two are yearling groups and four are fingerling groups (Table 4). Through age four returns, the two yearling groups, 062641 and 065642 have returned at rates of 2.07% and 1.67% respectively. The fingerling groups have returned at a much reduced rate, the best return to date is only 0.24%, eight times less than the best yearling group. Returns of both release types were greatest in 2001 as age three fish. Fish released from this BY are expected to return as five-year-olds during the 2003 season.

1999 brood year

Returns of 1999 BY fall chinook are complete through age 3 only. Five release groups have returned (4 fingerling and 1 yearling) to date as two and three-year-old fish (Table 4). The fingerling group, 065254, has experienced the best returns to date. Fish from both release groups should return as four and five-year-old fish in 2003 and 2004, respectively.

2000 brood year

Fourteen CWT groups (13 fingerling and 1 yearling) from the 2000 BY returned as two-year-olds during the 2002 season (Table 4). Age 2 return rates were less than 0.1% for all release groups. Chinook from BY 2000 are expected to return as adults (age three through five) during the next three seasons.

Table 4. 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 1999 through 2002.

Release data					Estimated returns						
CWT a/ code	Brood year	Date b/ Date	Number	Site	Age	Run- size	% of release	River harvest	Spawning escapement		
									TRH c/ TRH	Natural	Total
065233	1997	06/15/98	50,947	TRH	2	29	0.057	0	15	14	29
					3	277	0.544	7	177	93	270
					4	67	0.132	2	32	33	65
					5	0	0.000	0	0	0	0
					Totals: /d	373	0.73	9	224	140	364
Total adults: /e						344	0.68	9	209	126	335
065234	1997	06/15/98	49,353	TRH	2	72	0.146	1	37	34	71
					3	322	0.652	9	206	107	313
					4	83	0.168	3	40	40	80
					5	0	0.000	0	0	0	0
					Totals: /d	477	0.97	13	283	181	464
Total adults: /e						405	0.82	12	246	147	393
065235	1997	06/15/98	49,786	TRH	2	37	0.074	0	19	18	37
					3	233	0.468	6	149	78	227
					4	60	0.121	2	29	29	58
					5	0	0.000	0	0	0	0
					Totals: /d	330	0.66	8	197	125	322
Total adults: /e						293	0.59	8	178	107	285
065236	1997	06/15/98	48,382	TRH	2	64	0.132	4	33	27	60
					3	263	0.544	7	168	88	256
					4	35	0.072	1	17	17	34
					5	2	0.004	0	1	1	2
					Totals: /d	364	0.75	12	219	133	352
Total adults: /e						300	0.62	8	186	106	292
065239	1997	06/15/98	18,304	TRH	2	17	0.093	1	9	7	16
					3	95	0.519	3	61	31	92
					4	52	0.284	2	25	25	50
					5	2	0.011	0	1	1	2
					Totals: /d	166	0.907	6	96	64	160
Total adults: /e						149	0.814	5	87	57	144
065241	1997	10/1-7/98	313,080	TRH	2	422	0.135	26	218	178	396
					3	7,182	2.294	194	4,591	2,397	6,988
					4	3,781	1.208	121	1,814	1,846	3,660
					5	33	0.011	1	14	18	32
					Totals: /d	11,418	3.65	342	6,637	4,439	11,076
Total adults: /e						10,996	3.51	316	6,419	4,261	10,680
062641	1998	10/4-13/99	334,726	TRH	2	366	0.109	20	234	112	346
					3	6,057	1.810	194	2,906	2,957	5,863
					4	510	0.152	20	215	274	489
065242	1998	06/1-7/99	46,399	TRH	2	22	0.047	1	14	7	21
					3	73	0.157	2	35	36	71
					4	17	0.037	1	7	9	16
065243	1998	06/1-7/99	42,659	TRH	2	11	0.026	1	7	3	10
					3	50	0.117	2	24	24	48
					4	7	0.016	0	3	4	7

a/ CWT = coded-wire tag.

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

c/ TRH = Trinity River Hatchery.

d/ Totals are presented only for brood year 1997. These fish have reached five years of age and are considered to have completed their life cycle.

e/ The term "adults" includes chinook aged three through five.

Table 4. (continued) 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 1999 through 2002.

CWT a/ code	Brood year	Release data			Estimated returns							
		Date b/ Date	Number	Site	Age	Run- size	% of release	River harvest	Spawning escapement			
								TRH c/	Natural	Total		
065244	1998	06/1-7/99	49,332	TRH	2	0	0.000	0	0	0	0	0
					3	42	0.085	1	20	21	41	
					4	9	0.018	0	4	5	9	
065245	1998	06/1-7/99	46,391	TRH	2	5	0.011	0	3	2	5	
					3	50	0.108	2	24	24	48	
					4	7	0.015	0	3	4	7	
065642	1998	10/4-13/99	16,673	TRH	2	5	0.030	0	3	2	5	
					3	248	1.487	8	119	121	240	
					4	24	0.144	1	10	13	23	
065254	1999	06/1-7/00	44,654	TRH	2	17	0.038	1	8	8	16	
					3	104	0.233	4	44	56	100	
065255	1999	06/1-7/00	42,549	TRH	2	4	0.009	0	2	2	4	
					3	64	0.150	2	27	35	62	
065256	1999	06/1-7/00	43,565	TRH	2	2	0.005	0	1	1	2	
					3	40	0.092	2	17	21	38	
065257	1999	06/1-7/00	50,533	TRH	2	10	0.020	1	5	4	9	
					3	47	0.093	2	20	25	45	
065259	1999	10/3-6/00	296,892	TRH	2	27	0.009	2	13	12	25	
					3	721	0.243	28	304	388	692	
065265	2000	06/06-13/01	32,795	TRH	2	43	0.131	2	18	23	41	
065266	2000	06/06-13/01	33,806	TRH	2	43	0.127	2	18	23	41	
065267	2000	06/06-13/01	34,852	TRH	2	19	0.055	1	8	10	18	
065268	2000	06/06-13/01	33,240	TRH	2	14	0.042	1	6	7	13	
065271	2000	06/06-13/01	54,867	TRH	2	111	0.202	5	47	59	106	
065272	2000	06/06-13/01	36,035	TRH	2	43	0.119	2	18	23	41	
065273	2000	06/06-13/01	57,444	TRH	2	50	0.087	2	21	27	48	
065274	2000	06/06-13/01	32,096	TRH	2	33	0.103	1	14	18	32	
065275	2000	06/06-13/01	64,250	TRH	2	55	0.086	2	23	29	52	
065276	2000	06/06-13/01	27,159	TRH	2	26	0.096	1	11	14	25	
065277	2000	06/06-13/01	56,582	TRH	2	12	0.021	1	5	6	11	
065278	2000	06/06-13/01	34,183	TRH	2	24	0.070	1	13	13	26	
065643	2000	06/06-13/01	25,007	TRH	2	7	0.028	0	3	4	7	
065280	2000	10/01-10/01	216,593	TRH	2	130	0.060	6	55	69	124	

a/ CWT = coded-wire tag.

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

c/ TRH = Trinity River Hatchery.

d/ Totals are presented only for brood year 1997. These fish have reached five years of age and are considered to have completed their life cycle.

e/ The term "adults" includes chinook aged three through five.

The contribution of hatchery produced chinook to total estimated run-size

The contribution of hatchery-produced spring and fall chinook to the overall Trinity River basin run-size estimates for the two races of chinook are presented in Table 5. We estimate that the 2002-03 run of spring chinook was composed of the 25,850 chinook of TRH origin. This represents 67.2% (25,850/38,485) of the total estimated run upstream of JCW. The fall run, upstream of WCW, was estimated to be composed of 9,475 TRH-produced chinook, which represents 52.2% (9,475/18,156) of the total estimated run.

DISCUSSION

Since CWT estimates are based, in part, on the overall run-size estimates for each race of chinook, CWT estimates are subject to the precision and potential biases associated with the mark-recapture estimates performed under Task 1 of this report. The potential impact of this would be most relevant in regard to the number of fish estimated to have spawned in “natural” areas. This is due to the fact that hatchery recoveries are actual counts, while CWT’d fish estimated to have spawned naturally are the remaining estimated number of fish after hatchery CWT’s and angler harvest are subtracted from the overall CWT estimate.

Two other potential biases that could distort our CWT run-size estimates are vulnerability of capture and run-timing. Assumptions of our CWT estimates include equal probability of capture for hatchery and wild fish and capture of chinook throughout the entire run. The second assumption, due to trapping constraints at JCW which preclude operating our weir there until June, may affect our spring-run chinook CWT estimates.

Hatchery-produced spring chinook returns to the Trinity River this season were composed of 68.7% age three, 25.3% age four, 5.8% age two and less than 1% age five fish. Hatchery produced fall Chinook were dominated by age three fish which composed 51.2% of the run. Age two fish were the second most abundant comprising 26.4% of the run. Age four returns composed 21% and age five 1.5% of the run. The fall-run of Chinook, based on CWT analysis, was heavily impacted by the large fish kill that occurred this year in the lower Klamath River (CDFG, 2003).

Return rates for TRH-produced yearling spring and fall Chinook from the completed 1997 BY were 3 to 4 times greater than their fingerling counterparts. This is typical for the Trinity River, however, the 1996 cohort, which completed returns last season, experienced relatively equal return rates for fingerling and yearling release types.

The estimated hatchery contribution rates to overall spring and fall chinook run-sizes are relatively high. As mentioned previously, run-size estimates may have potential bias (see TASK I), which under most scenarios would tend to be positive. However, this bias should not affect hatchery contribution rates since total CWT run-size is based on AD clip rates observed at either

Table 5. Estimated run-size, angler harvest, and spawner escapement estimates for Trinity River Hatchery-produced, spring and fall chinook salmon expanded for unmarked releases (hatchery multiplier) returning to the Trinity River during the 2002-03 season. a/

CWT code b/	BY c/	Age	TRH expansion factor d/	Run size	Expanded run-size e/	Angler harvest	Expanded angler harvest	Spawning escapement						
								TRH f/	Expanded TRH	Natural	Expanded natural	Total	Expanded total	
Spring-run chinook salmon														
065238	97	5	6.2	5	31	0	0	2	12	3	19	5	31	
065240	97	5	2.9	3	9	0	0	1	3	2	6	3	9	
065247	98	4	6.9	63	437	3	21	25	173	35	243	60	416	
065248	98	4	6.3	76	477	4	25	30	188	42	264	72	452	
065249	98	4	6.3	66	416	3	19	26	164	37	233	63	397	
065250	98	4	2.9	1,185	3,437	59	171	470	1,363	656	1,902	1,126	3,265	
065251	99	3	6.7	1,006	6,710	50	334	399	2,661	557	3,715	956	6,377	
065252	99	3	6.4	878	5,619	44	282	348	2,227	486	3,110	834	5,338	
065253	99	3	6.2	567	3,504	28	173	225	1,391	314	1,941	539	3,331	
065258	99	3	2.9	1,322	3,873	66	193	524	1,535	732	2,145	1,256	3,680	
065260	00	2	4.2	28	118	1	4	11	46	16	67	27	114	
065261	00	2	4.2	43	181	1	4	17	72	25	105	42	177	
065262	00	2	4.2	13	55	0	0	5	21	8	34	13	55	
065263	00	2	4.1	38	154	1	4	15	61	22	89	37	150	
065264	00	2	4.5	33	149	1	5	13	59	19	86	32	144	
065269	00	2	4.1	73	296	2	8	29	117	42	170	71	288	
065270	00	2	4.5	45	203	1	5	18	81	26	117	44	198	
065279	00	2	4.1	45	182	1	4	18	73	26	105	44	178	
				5,489	25,850	265	1,251	2,176	10,248	3,048	14,351	5,224	24,599	
Fall-run chinook salmon														
065236	97	5	11.5	2	23	0	0	1	12	1	12	2	23	
065239	97	5	11.0	2	22	0	0	1	11	1	11	2	22	
065241	97	5	2.9	33	96	1	3	14	41	18	52	32	93	
062641	98	4	2.9	510	1,474	20	58	215	621	275	795	490	1,416	
065242	98	4	11.2	17	190	1	11	7	78	9	101	16	179	
065243	98	4	11.2	7	78	0	0	3	34	4	45	7	78	
065244	98	4	10.7	9	96	0	0	4	43	5	54	9	96	
065245	98	4	11.3	7	79	0	0	3	34	4	45	7	79	
065642	98	4	3.0	24	71	1	3	10	30	13	38	23	68	
065254	99	3	10.8	104	1,125	4	43	44	476	56	606	100	1,082	
065255	99	3	10.8	64	691	2	22	27	292	35	378	62	670	
065256	99	3	10.8	40	433	2	22	17	184	21	227	38	411	
065257	99	3	11.0	47	515	2	22	20	219	25	274	45	493	
065259	99	3	2.9	721	2,084	28	81	304	879	389	1,124	693	2,003	
065265	00	2	4.2	43	179	2	8	18	75	23	96	41	171	
065266	00	2	4.1	43	175	2	8	18	73	23	93	41	166	
065267	00	2	4.1	19	77	1	4	8	32	10	41	18	73	
065268	00	2	4.1	14	58	1	4	6	25	7	29	13	54	
065271	00	2	4.2	111	462	5	21	47	196	59	245	106	441	
065272	00	2	4.2	43	179	2	8	18	75	23	96	41	171	
065273	00	2	4.1	50	203	2	8	21	85	27	109	48	194	
065274	00	2	4.0	33	133	1	4	14	57	18	73	32	129	
065275	00	2	4.1	55	223	2	8	23	93	30	122	53	215	
065276	00	2	4.1	26	106	1	4	11	45	14	57	25	102	
065277	00	2	4.1	12	49	1	4	5	21	6	25	11	45	
065278	00	2	4.1	24	99	1	4	10	41	13	54	23	95	
065643	00	2	4.5	7	31	0	0	3	13	4	18	7	31	
065280	00	2	4.0	130	524	6	24	55	222	69	278	124	500	
				2,197	9,475	88	273	927	3,027	879	3,857	1,567	6,884	

a/ Estimates are upstream of Junction City and Willow Creek weirs for spring and fall estimates respectively.

b/ CWT=coded-wire tag code. Fish are of the same race and release type (smolt or yearling).

c/ BY=brood year.

d/ Expansion factor used to account for untagged releases of the same BY and release type for each CWT group.

e/ Run-size times TRH expansion factor.

f/ TRH=Trinity River Hatchery.

JCW or WCW, times total estimated runs above these sites. Thus, even if total run-size was adjusted lower, the AD clip rate would remain the same, resulting in the same hatchery contribution rates. If, however, hatchery produced fish are more vulnerable to capture than their wild counterparts at the weirs, the estimated contribution of hatchery fish would be positively biased.

Another rough method to validate hatchery-produced chinook contribution rates is to examine AD clip rates at TRH and the weirs. If it is assumed that the AD clip rate at TRH is representative of the hatchery population, then the AD clip rates observed at the weirs would theoretically represent a fraction of the TRH population. Therefore, simple division of the AD clip rates observed at both weir sites by the AD rate at TRH would produce a hatchery contribution rate. The AD clip rates observed at the weirs and TRH during the 2002-03 season are the following: spring chinook (JCW) 15.2%; fall chinook (WCW) 12.6%; TRH springs 20.9%; TRH falls 21.2%. Performing the calculations results in a contribution rate of 72.6% for spring chinook and 59.4% for fall chinook. These are slightly higher than our reported rates, but within 8%.

RECOMMENDATIONS

1. Coded-wire tagging and release of smolt and yearling chinook salmon, and the monitoring of adult salmon returns at Trinity River Hatchery should be continued in 2003-04.
2. Monitor the annual TRH-produced chinook salmon contribution rates to the overall runs to determine the relative status of naturally produced chinook salmon in the Trinity basin.
3. Continue spawner carcass surveys (Task IV) in the upper Trinity River to evaluate straying of TRH produced fish.

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ANNUAL REPORT
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT
2002-2003 SEASON

TASK 3
SURVIVAL AND SPAWNER ESCAPEMENTS MADE BY COHO
SALMON PRODUCED AT TRINITY RIVER HATCHERY

by

Wade Sinnen

ABSTRACT

Project personnel marked 416,201 coho salmon (*Oncorhynchus kisutch*) from the 2001 brood year with a right maxillary clip prior to their release from Trinity River Hatchery (TRH) in March of 2003. These fish are expected to return as two and three-year-old fish during the 2003-04 and 2004-05 seasons respectively.

An estimated 16,016 coho returned to the Trinity River, upstream of the Willow Creek weir (RK 48), during the 2002-03 season. We estimated the TRH-produced component of this run to be 15,420 fish (96.3%). There was no angler harvest reported this season. Spawning escapement of TRH-produced coho was divided between 7,097 fish which entered TRH and 8,323 fish estimated to have spawned outside of the hatchery facility.

TRH-produced coho from the 1999 brood year are considered to have completed their life cycle this year. An estimated 17,222 coho from the 1999 brood year returned to the Trinity River basin, upstream of Willow Creek weir, the past two seasons. This represents 3.36% of the 512,986 marked coho yearlings released from TRH in March of 2001. Estimated TRH-produced coho returns from the 2000 brood year are complete for age two returns only. An estimated 1,571 coho have returned thus far, representing 0.30% of the number released.

TASK OBJECTIVES

To determine the relative return rates and contributions to spawning escapement and the fisheries made by naturally and hatchery-produced coho in the Trinity River basin.

INTRODUCTION

Coho salmon are propagated at Trinity River Hatchery (TRH) by the California Department of Fish and Game (CDFG) as mitigation for lost habitat/coho production upstream of Lewiston Dam. The Trinity River Project, an element of CDFG, is responsible for the marking of coho prior to their release from the hatchery facility and the estimation of the naturally- and hatchery-produced components of coho salmon returning to the Trinity River basin, upstream of Willow Creek weir (WCW). Beginning with the 1994 brood year, all coho salmon reared at TRH have received a right maxillary (RM) clip prior to release. Prior to the 1994 brood year, a portion of the coho production was coded-wire tagged similar to the Chinook marking program at TRH. With the advent of coho becoming listed as a threatened species pursuant to the Endangered Species Act (ESA) in 1994, the CDFG began a program to mark 100% of the hatchery production so that a more thorough analysis of hatchery and natural stocks could be accomplished.

METHODS

There are two phases involved in this task; marking all coho produced at TRH and estimating coho run-size, harvest, and escapement of TRH- and naturally-produced coho salmon returning to the Trinity basin. The latter phase is partially accomplished under TASK 1 of this report. In this section we present release and recovery data that is used to estimate the hatchery- and naturally-produced component of the 2002-03 coho run above WCW. Data compilation and analysis is reliant upon previously reported data in Sinnen and Null, 2002, Sinnen and Moore, 2000, and Sinnen, 2004.

Marking at Trinity River Hatchery

All fish to be marked are anaesthetized with carbon dioxide; and their right maxillaries removed with a pair of sharp scissors. Marked fish are tallied with a manual counter and returned to hatchery ponds.

To determine overall marking accuracy, we examine a sample of the marked coho just prior to their release into the river. These fish are anaesthetized with carbon dioxide, measured to the

nearest millimeter (mm) fork length (FL), and checked for quality of the maxillary clip. If more than 3/4 of the bone was excised it is considered a good clip; less than that is considered a poor clip. We estimate the total number of coho effectively marked by multiplying the percent of fish with good clips by the total number marked.

TRH-produced coho escapement and in-river harvest

To estimate the contribution of TRH-produced coho to escapement and in-river angler harvest, the following information is required:

1. Marking and enumeration of the coho production released from TRH.
2. Recovery totals of marked and unmarked coho returning to TRH.
3. Total coho run-size above Willow Creek Weir (WCW).
4. The percentage of marked coho salmon observed at WCW.
5. Coho in-river angler harvest rates.
6. Specific age class determinations.

The assumptions underlying the validity of run-size estimates are discussed under TASK 1 of this report. Additionally, we assume that coho right-maxillary-marks do not regenerate and that the mark is recognizable.

To estimate the TRH-produced component of the run above WCW, we used the equation:

$$N_{RM} = \frac{NW_{RM}}{NW} \times N_{Cohorun}$$

where N_{RM} = The estimated number of coho salmon above Willow Creek weir with a right maxillary clip; NW_{RM} = The number of coho salmon observed at Willow creek weir that were right-maxillary clipped; NW = The total number of coho salmon observed at Willow creek weir; $N_{Cohorun}$ = Total estimated run of coho salmon above Willow Creek weir. To estimate the number of un-marked coho salmon above the weir we used the equation:

$$N_N = N_{Cohorun} - N_{RM}$$

where, N_N = The estimated number of naturally produced coho above Willow Creek weir.

The size separating grilse and adult coho is determined using length frequency analysis. The total number of grilse and adults in the coho run was determined by multiplying the proportion of each observed at WCW and TRH combined times the total estimated run-size. We combined WCW and TRH totals due to the small sample size at WCW, the preponderance of marked fish in the run and the large disparity between WCW and TRH grilse and adult numbers. The number of right maxillary-clipped coho for each age strata is estimated by multiplying the ratio of

marked to unmarked coho observed at Willow Creek weir times the total age stratified run-size estimate. The remaining coho are considered naturally produced. Coho harvest rate estimates are developed using angler tag return data presented in Task 1. Harvest rates are multiplied times the age stratified coho run to produce a harvest estimate. The estimate is apportioned to both maxillary clipped and naturally produced fish. Coho escapement is determined by the following equation:

$$N_{\text{escapement}} = N_{\text{Cohorun}} - H_{\text{coho}}$$

where, H_{coho} = The estimated number of coho salmon harvested by anglers upstream of Willow Creek weir. Escapement is divided into Trinity River Hatchery escapement and natural escapement. Hatchery escapement is a direct count of marked and unmarked coho that entered TRH, while natural escapement is estimated by the following equation:

$$N_{\text{Naturalescapement}} = N_{\text{escapement}} - N_{\text{TRHescapement}}$$

where $N_{\text{Naturalescapement}}$ = The estimated number of coho salmon above Willow Creek weir estimated to have spawned in natural areas; $N_{\text{TRHescapement}}$ = the number of coho salmon that entered TRH. All estimates are stratified by grilse and adults and by marked and unmarked coho salmon.

RESULTS

Marking

Staff personnel marked (right maxillary-clip) approximately 418,891 BY 2001 coho, representing the entire brood year at Trinity River Hatchery. We began marking on December 17, 2002 and finished on February 21, 2003.

We performed a quality control check of each raceway on February 24-25, 2003. We measured and examined approximately 2% of the coho in each raceway. The percentage of coho with proper clips ranged from 97.7% to 100% and averaged 98.7% for the 8,464 fish examined. We also recorded 290 post clip mortalities. Therefore we estimate that 416,201 coho were effectively clipped and released (Table 1). These fish ranged in size from 97 to 299 mm fork length (FL), with a range of mean lengths from 148 to 176 mm, FL. All BY 2001 coho were volitionally released from TRH March 17-19, 2003.

Table 1. Quality control analysis of right maxillary clip and fork length (FL) measurements of BY 2001 yearling coho salmon, prior to release from Trinity River Hatchery, March 2003.

Pond	Number counted/ clipped	Number examined post clip	Number without clip	Percent unclipped	Post clip morts	Number effectively clipped	FL range (mm)	FL mean (mm)
F1&2	66,770	1,085	2	0.18	52	66,595	105 – 243	160
F3&4	40,054	1,067	1	0.09	41	39,975	119 – 299	176
G1&2	42,114	914	0	0	27	42,087	113 – 291	155
K1&2	67,343	1,336	31	2.32	21	65,760	103 – 282	152
K3&4	67,617	1,395	13	0.93	34	66,953	97 – 286	148
L1&2	72,569	1,345	0	0	97	72,472	100 – 274	155
L3&4	62,424	1,322	1	0.08	18	62,359	109 – 264	151
Totals:	418,891	8,464	48	0.57	413	416,201	97 - 299	157

Contribution of TRH-produced coho salmon to escapement and in-river sport fisheries

Total (natural and TRH-produced) coho run-size for the 2002-03 season, above WCW, was estimated at 16,016 fish (TASK 1), of which 1,709 were grilse (age 2) and 14,307 were adults (age 3). Age classes were determined using length frequency analysis. The size separating grilse and adults was 57 cm, FL (TASK 1). Therefore all coho \leq 57 cm, FL were considered grilse and larger fish adults.

The percentage of right maxillary-clipped (RM) coho observed at WCW was 91.9% (91/99) for grilse salmon and 96.8% (120/124) for adults. The overall marked coho total observed at WCW for the 2002-03 season was 94.6% (211/223). Therefore, we estimate that the 2002-03 coho run was composed of 596 naturally-produced fish and 15,420 TRH-produced fish (Table 2.).

Since none of the project tags applied to coho salmon at WCW were returned by anglers, we estimated that anglers did not harvest any coho during the 2002-03 season. The sport take of coho, a federally threatened species, has been prohibited since 1995; however, some fish are occasionally harvested by unknowledgeable anglers due to mistaken identity or a lack of knowledge concerning the closure.

Table 2. Run-size, in-river sport catch, and spawner escapement estimates for naturally- and TRH-produced coho salmon upstream of Willow Creek Weir for the 2002-03 return year.

Strata	BY a/	Age b/	Run-size	Angler harvest	Spawning escapement	
					TRH c/	Natural
Naturally	00	2	138	0	15	123
Produced	99	3	458	0	86	372
		Totals:	596	0	101	495
TRH	00	2	1,571	0	688	883
Produced	99	3	13,849	0	6,409	7,440
		Totals:	15,420	0	7,097	8,323
		Grand totals:	16,016	0	7,198	8,818

a/ BY=Brood year

b/ Age classes are determined using fork length frequency analysis.

c/ TRH=Trinity River Hatchery

Based on coho run-size estimates presented in Table 2, the percent return of 1999 brood year, TRH-produced coho salmon, was approximately 3.4% (Table 3). These fish have reached three years of age and are considered to have completed their life cycle. The estimated return of two-year-old 2000 brood year coho is approximately 0.3%. These fish will return during the 2003-04 season as three-year-olds.

Spawning escapement of 1999 brood year, TRH-produced coho, consisted of 7,433 (43.2%) fish that entered TRH and 9,789 (56.8%) fish estimated to have spawned in natural areas (Table 3).

Estimated escapement of TRH-produced, two-year-old coho, from the 1999 brood year was composed of 688 (43.8%) hatchery spawners and 883 (56.2%) natural spawners (Table 3).

Table 3. Run-size, percent return, in-river angler harvest and spawner escapement estimates for Trinity River Hatchery-produced coho salmon returning to the Trinity River upstream of the Willow Creek Weir during the period 2001 through 2002.

Release Data						Estimated Returns					
Clip a/	Brood Year	Date	Number	Site	Age b/	Run-size	% of release	River harvest	Spawning Escapement		
									TRH c/	Natural	Total
RM	99	3/15-22/00	512,986	TRH	2	3,373	0.66	0	1,024	2,349	3,373
					3	13,849	2.70	0	6,409	7,440	13,849
					Totals:	17,222	3.36	0	7,433	9,789	17,222
RM	00		524,238	TRH	2	1,571	0.30	0	688	883	1,571

a/ Identifying clip. Beginning with the 1994 brood year, all coho salmon released from Trinity River Hatchery received right maxillary (RM) clips.

b/ Age classes are determined using length frequency analysis.

c/ TRH= Trinity River Hatchery.

DISCUSSION

Since estimation of TRH-produced contribution rates to overall coho run-size, escapement and harvest are directly related to the total coho run-size estimates produced under Task 1 of this report, it must be noted that the information presented under Task 3 is not rigorous, statistically speaking. The total coho run-size estimate of 16,016 fish, produced under task 1 of this report, was based on only 197 effectively tagged fish. Confidence intervals (1-p=0.95) for this estimate are in the 18- 24% range. Additionally, the Willow Creek weir, although fished until December 11th this season, was non-operational November 8 through November 16, 2002 due to high flows. We undoubtedly missed a portion of the run during this period. If run timing of coho salmon to the upper Trinity River occurs after mid December, or naturally produced coho return later than their hatchery produced cohorts, we may be missing a portion of the run at the weir, which could bias our estimates. However, since our efforts represent the only work to quantify the hatchery vs. wild runs and survival and contribution rates of returning adult coho, we feel it is important to present the best information we have available.

Return rates of 99 BY coho, estimated at 3.4%, is relatively high, although not extraordinarily so. Estimated returns of 98 BY coho were approximately 6%. Additionally, yearling chinook released from TRH have approached or exceeded 3% returns (See Task 2). Given the fact that coho are raised to slightly larger than yearling size (spawned in late November through early January and released in March of the following year) it would seem reasonable that survival

rates could potentially be high. Return rates of coho to the Trinity basin, unlike chinook salmon, are in theory minimally affected by ocean and in-river commercial and sport harvest, since the take of coho has been prohibited in these fisheries since 1994. The Native American gill-net fisheries may harvest substantial numbers of coho, but it is doubtful that this harvest rate approaches historical harvest rates for all combined fisheries (ocean, commercial, in-river and gill-net). Return rates of TRH-produced coho have ranged from 1.30% to 6.22% for brood years 1994 through 1999 (appendix 1).

The reported number of hatchery-produced coho estimated to have spawned in natural areas surpassed those that were counted at TRH, indicating that TRH-produced coho stray at a very high rate, the run-size estimate was positively biased this year, or a combination of the two. Results of a mainstem Trinity River carcass survey (TASK 4 of this report) indicate that straying may have been substantial this year. Of the 177 coho salmon carcasses recovered, 161 (91.0%) were RM-clipped. It must be noted that the surveys were only performed in the mainstem and were discontinued after December 16th, which would preclude full recovery of coho carcasses.

Despite the potential bias, coho trends, based on trapping data at Willow Creek weir, indicate that coho runs returning to the upper Trinity basin are heavily supported by TRH production. The past six seasons of trapping data (years in which all TRH-produced coho have been 100% marked) have consistently shown that the marked percentage of coho observed at the weir has remained fairly constant, near 90% of the total observed (appendix 2).

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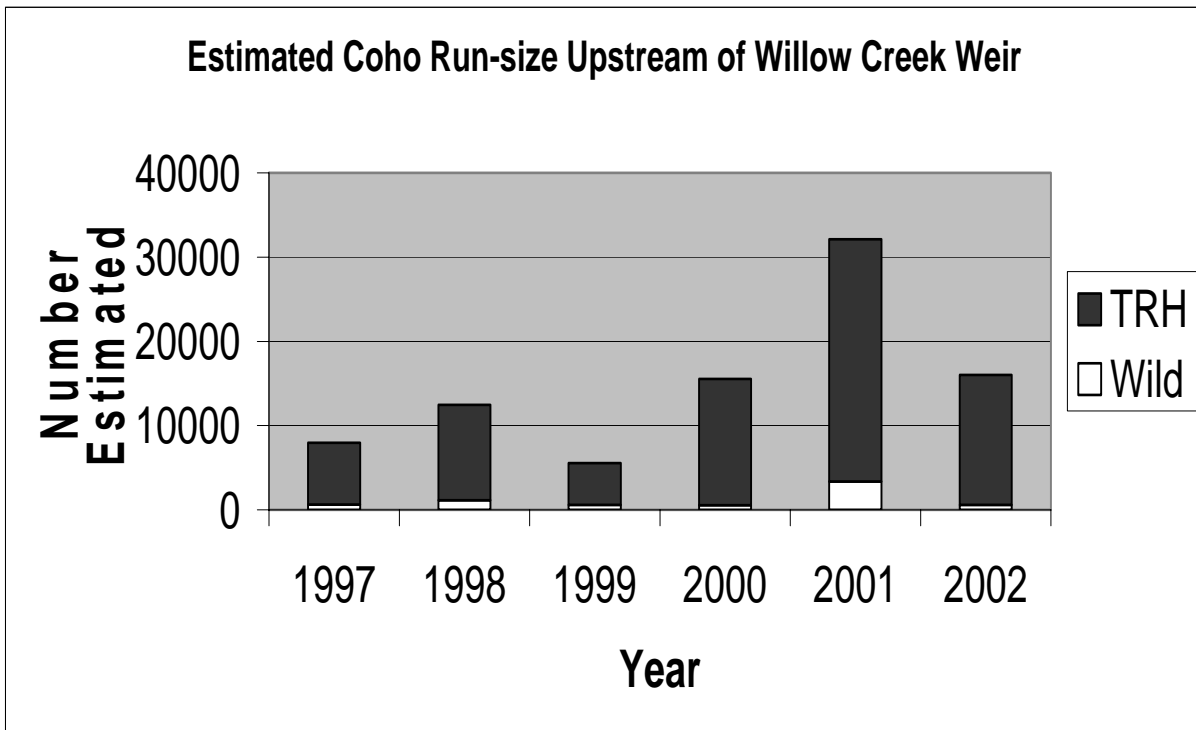
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Appendix 1. Run-size, harvest and spawner escapement estimates for right maxillary clipped, Trinity River Hatchery-produced coho salmon returning to the Trinity River, upstream of Willow Creek weir, brood years 1994-1999.

Release data				Return data						
Brood year	Date	Effective Number	Site	Age	Run-size	% of release	In-river harvest	Spawner Escapement		
								TRH	Natural	Total
1994	3/17-21/96	72,311	TRH	2	970	1.34%	0	105	865	970
			TRH	3	1,732	2.40%	0	867	865	1,732
			Totals:		2,702	3.74%	0	972	1,730	2,702
1995	3/17-21/97	580,880	TRH	2	5,552	0.96%	39	858	4,655	5,513
			TRH	3	9,008	1.55%	0	3,899	5,109	9,008
			Totals:		14,560	2.51%	39	4,757	9,764	14,521
1996	3/16-20/98	513,663	TRH	2	2,340	0.46%	0	969	1,371	2,340
			TRH	3	4,357	0.85%	86	3,015	1,256	4,271
			Totals:		6,697	1.30%	86	3,984	2,627	6,611
1997	3/15-22/99	517,196	TRH	2	592	0.11%	0	381	211	592
			TRH	3	9,704	1.88%	0	3,407	6,297	9,704
			Totals:		10,296	1.99%	0	3,788	6,508	10,296
1998	3/15-20/00	493,233	TRH	2	5,289	1.07%	0	916	4,373	5,289
			TRH	3	25,395	5.15%	0	9,625	15,770	25,395
			Totals:		30,684	6.22%	0	10,541	20,143	30,684
1999	3/15-22/01	512,986	TRH	2	3,373	0.66%	0	1,024	2,349	3,373
			TRH	3	13,849	2.70%	0	6,409	7,440	13,849
			Totals:		17,222	3.36%	0	7,433	9,789	17,222

Appendix 2. Naturally and Trinity River Hatchery-produced coho salmon run-size, in-river angler harvest and spawner escapement estimates for the Trinity River upstream of Willow Creek Weir for 1997-2002.

Year	Strata	Run-size Estimate			Spawner Escapement						Angler harvest		
		Grilse	Adults	Total	Natural			Trinity River Hatchery			Grilse	Adults	Total
					Grilse	Adults	Total	Grilse	Adults	Total			
1997	Natural	399	252	651	383	232	615	13	20	33	3	0	3
	TRH	5,552	1,732	7,284	4655	865	5520	858	867	1725	39	0	39
1998	Natural	131	1,001	1,132	123	886	1,009	8	115	223	0	0	0
	TRH	2,340	9,008	11,348	1,371	5,109	6,480	969	3,899	4,868	0	0	0
1999	Natural	31	555	586	23	440	463	8	103	111	0	12	12
	TRH	592	4,357	4,949	211	1,266	1,477	381	3,015	3,396	0	86	86
2000	Natural	197	342	539	187	288	475	10	54	64	0	0	0
	TRH	5,289	9,704	14,993	4,373	6,297	10,670	916	3,407	4,323	0	0	0
2001	Natural	298	3,075	3,373	296	2,945	3,241	2	130	132	0	0	0
	TRH	3,373	25,395	28,768	2,349	15,770	18,119	1,024	9,625	10,649	0	0	0
2002	Natural	138	458	596	123	372	495	15	86	101	0	0	0
	TRH	1,571	13,849	15,420	883	7,440	8,323	688	6,409	7,097	0	0	0



ANNUAL REPORT
TRINITY RIVER BASIN SALMON AND STEELHEAD MONITORING PROJECT
2002-03 SEASON

TASK 4
SALMON SPAWNER SURVEYS IN THE UPPER TRINITY RIVER

by

Wade Sinnen and Monty Currier

ABSTRACT

Employees of the California Department of Fish and Game's (CDFG) Trinity River Project (TRP), in cooperation with the Yurok Tribe, the U.S. Fish and Wildlife Service (USFWS), and U.S. Forest Service (USFS) conducted a salmon spawner survey of the Upper Trinity River from 16 September through 18 December, 2002. The survey focused on the mainstem Trinity River from the upper most available anadromous spawning area at Lewiston Dam (river section #1) and continued down stream to the Cedar Flat recreation area (river section #10), a total of 101.6 rkms. The survey did not include any tributaries that may have been used for spawning by anadromous fish species. We examined 4,215 chinook salmon (*Oncorhynchus tshawytscha*) and 177 coho salmon (*O. kisutch*) carcasses during our survey. Carcass density was the most numerous in the uppermost reach. Carcass numbers generally decreased as we surveyed downstream.

Spring-run and Fall-run Chinook salmon carcasses were both recovered during the spawning season. Recovery of spring-run Chinook carcasses outnumbered Fall-Run Chinook salmon until the week of October 22nd. After this time the Fall-Run Chinook carcasses became the dominate run found during the survey. Coho salmon were recovered starting on November 6th and peaked the week of December 10th.

Chinook fork lengths averaged 75.9cm (range: 43-110cm) for spring-run and 76.5 cm (range: 39-110cm) for fall-run. Adult Chinook made up 94.8% of the spring and 90.1 % of the fall chinook. Coho salmon fork lengths averaged 70.6cm (range: 42-82 cm). Coho adults composed 97.7 % of all coho recovered during our surveys.

Recovered spring chinook salmon had a male: female sex ratio of approximately 0.6: 1, while fall Chinook salmon had a sex ratio relationship of male: female; 0.69: 1 respectively. Coho salmon had a male: female sex ratio of approximately 1:1

We estimated female pre-spawn mortality of spring and fall chinook at 5.6% and 1.7%, respectively. Coho female pre-spawn mortality was estimated to be 13.3%.

Based on the recovery of adipose-fin-clipped chinook salmon carcasses, we estimated that 24.6% of the spring-run and 13.5% of the fall-run salmon spawners observed in the mainstem survey were of hatchery origin. Based on the recovery of right-maxillary clipped coho, we estimate that 91.1 % of the mainstem spawners were of hatchery origin.

OBJECTIVES

1. To determine the size, sex composition, and hatchery component among the naturally spawning populations in the mainstem Trinity River.
2. To determine the incidence of pre-spawning mortality among naturally spawning chinook and coho salmon in the mainstem Trinity River.
3. To determine the distribution of the naturally spawning populations of chinook and coho salmon within the mainstem Trinity River.

INTRODUCTION

The California Department of Fish & Game's (CDFG) Trinity River Project (TRP) funded by the United States Bureau of Reclamation contract # 02FG200027, in cooperation with the Yurok Tribe (YT) and the U.S. Fish and Wildlife Service (USFWS), conducted a carcass and redd survey in the mainstem Trinity River. The U.S. Forest Service (USFS) also participated in the survey using internal funding. Their participation was limited to enumerating redds in the uppermost reach (Lewiston Dam area). Redd survey information will be summarized by the Yurok Tribe and USFWS and presented in a separate report.

Spawner surveys have been conducted intermittently on the Trinity River since 1955. Spawning surveys prior to 1964 included river sections located above river mile (RKM 180.1), the site of present day Lewiston dam.

This survey improves our understanding of the pre- and post- treatment effectiveness of increasing adult spawning habitat within the basin. Spawning, in-river flows and habitat improvements are part of the ongoing Trinity River Restoration Program.

METHODS

The study area included the main stem Trinity River from its upstream limit to anadromous fish migration at Lewiston Dam to Cedar Flat Recreational Area. The study area was divided into 10

sections (Table 1, Figure 1). Sections were surveyed between September 16 and December 18, 2002. CDFG and YT crews attempted to survey sections 1-5 on a consecutive basis with each section surveyed at least once a week, however manpower and logistical constraints caused some sections to be excluded on occasion. USFWS surveyed sections 6-10. Sections 6 and 7 were surveyed once a week, while sections 8-10 were only surveyed on a bi-weekly basis. The reason for this was a result of limited staff available and limited spawning activities in these sections.

Table 1. Description and Lengths of river zones used in the 2002 mainstem Trinity River carcass and redd survey.

River Zone	Length (km)	Zone Description
1	3.2	Lewiston Dam - Old Lewiston Bridge
2	7.9	Old Lewiston Bridge - Browns Mountain Bridge
3	10.2	Browns Mountain Bridge - Steel Bridge
4	10.4	Steel Bridge - Douglas City Camp
5	15.7	Douglas City Camp - Sky Ranch Road
6	7.2	Sky Ranch Road - Junction City Campground
7	8.8	Junction City Campground - Mouth of North Fork Trinity River
8	9.7	Mouth of N. Fork Trinity River - Big Flat Public Boat Launch
9	14.8	Big Flat Public Boat Launch - Del Loma
10	13.7	Del Loma - Cedar Flat Recreation Area

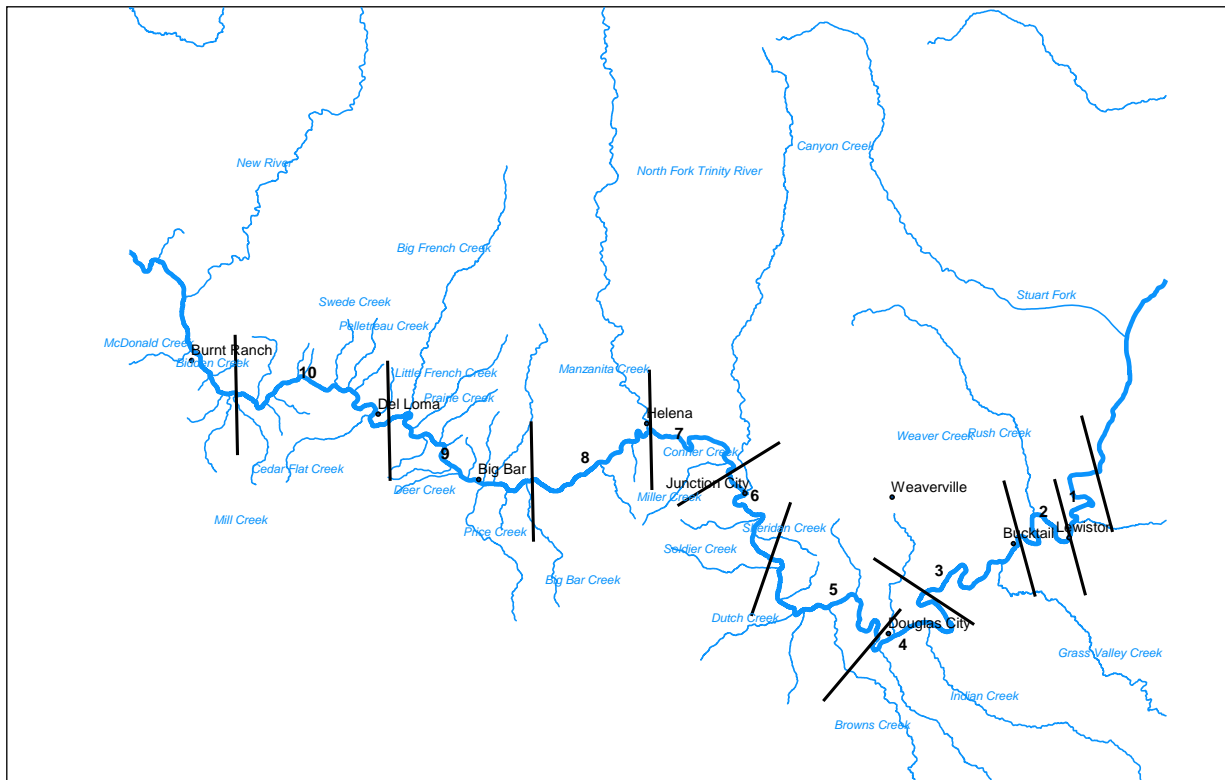


Figure1. Survey sections for 2002 Trinity River main stem spawner survey.

Surveys were conducted using 12-ft Avon™ and Otter™ inflatable rafts equipped with rowing frames. Each raft was staffed by two crew members, one rower-recorder and one person responsible for recovering carcasses. Two rafts in tandem cover either side of the river as the crews proceeded down stream. Carcasses were recovered from all accessible areas in the river and on the bank. Fish in deeper areas were recovered using telescoping poles with gigs attached to the handles.

In the Trinity River, there is a temporal and spatial overlap in the spring and fall Chinook runs. Since there is variation in the run timing each year, a date separating the two races was determined based on two factors. First, some of the Chinook carcasses recovered during the survey contained Coded Wire Tags (CWT's), which are implanted in their snouts prior to release from Trinity River Hatchery (TRH). CWT's are currently implanted in approximately 25% of all TRH Chinook salmon as juveniles. The code on each tag indicated whether each fish was of spring or fall-run salmon origin. Expansions are made based on the ratio of tagged and untagged Chinook salmon at the time of release. Second, a portion of the carcasses recovered were marked with spaghetti tags placed on fish at CDFG fish trapping weirs located near the towns of Junction City and Willow Creek. Run timing was assigned to each fish tagged based on the times they were captured and marked at the weirs. We separate the two runs of Chinook when the percent recovery of fall Chinook became greater than that of the spring Chinook during the survey week.

Carcasses were given a condition rating in order to classify the stage or degree of decomposition at any given period of time. During the survey, carcasses were separated into three categories as follows: one clear eye (condition 1), both eyes cloudy (condition 2), and skeletal remains (condition 3).

Carcasses that were recovered during the survey were identified to species, gender, and examined for hatchery clips and/or program tags (spaghetti tags). We measured each fish to the nearest cm fork length (FL). Hatchery clips included adipose-fin clips (Ad) on salmon and steelhead and right maxillary clips (RM) on coho salmon. Ad-clips on Chinook salmon indicated the presence of a coded-wire tag (CWT). All Trinity River Hatchery (TRH) produced steelhead are clipped prior to release, however no CWT's are implanted. Similar to steelhead, all TRH coho are marked, except that coho are marked with a right maxillary (RM) clip.. Heads of all recovered Ad-clipped chinook were removed and retained for later CWT tag recovery. The CWT tags are extracted and decoded by TRP staff. Spaghetti tags, applied at the two main stem weirs to complete Task 1 of this report, were removed and the unique number associated with each was recorded.

Spawning condition in all female salmon was determined by direct observation of the ovaries. Fish were classified as either spawned or un-spawned based on their egg retention. Females retaining over 50 percent of their eggs were classified as un-spawned. We made the assumption that all females were adult fish. Male spawning condition was not assessed as its determination was considered to be too subjective. All carcasses were cut in half, using a machete, to prevent processing of the same carcass in the future.

RESULTS

Spring / fall chinook separation

Overlap of spring and fall chinook occurred primarily during Julian weeks 43 - 46. Spring chinook carcass recoveries were predominant through Julian week 43 (Oct. 22-Oct 28), after which, fall chinook recoveries were most numerous. All chinook recoveries prior to Julian week 44 were classified as spring chinook and all subsequent carcass recoveries were classified as fall chinook (Figure2).

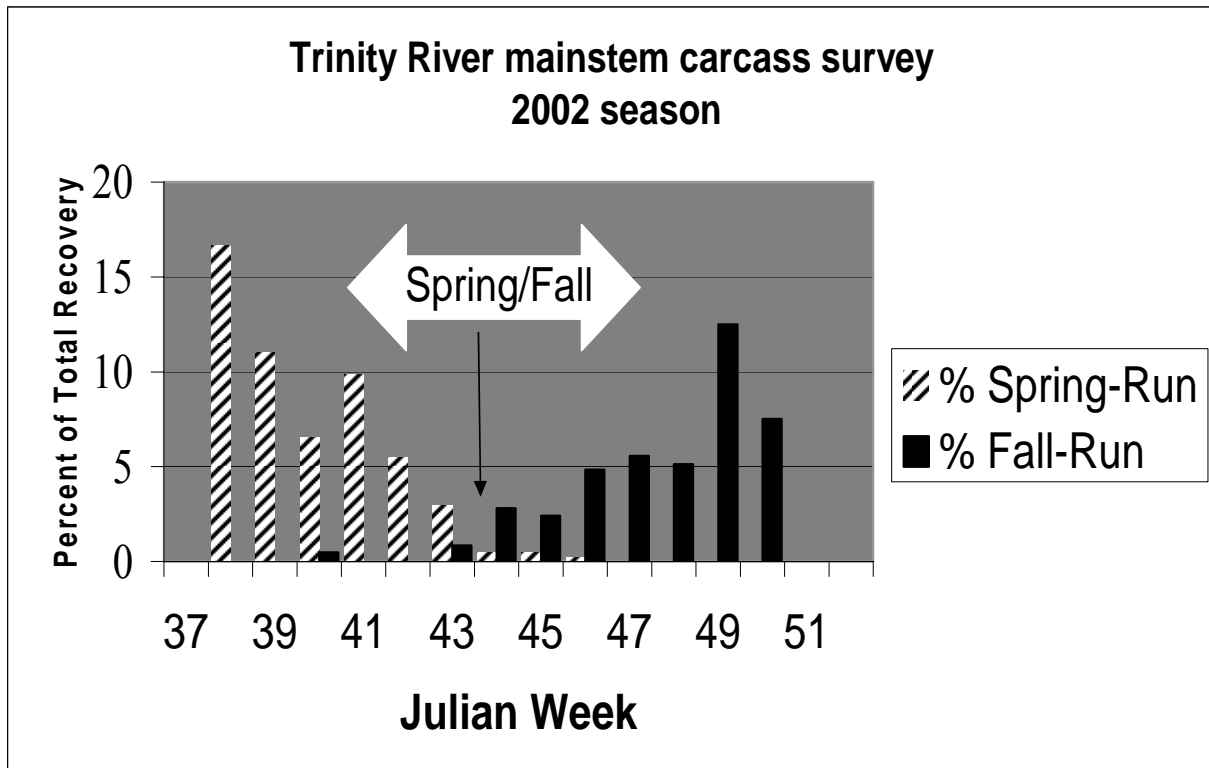


Figure 2. Weekly proportions of coded-wire tagged and Program-marked spring and fall-run chinook observed in the 2002 main stem Trinity River spawner survey. The arrow denotes the designated separation between the spring and fall runs.

Carcass distribution

We recovered 4,215 chinook carcasses during a 15 week period in our 10 survey sections (Table 2). The majority of the chinook carcasses (2,623) were recovered in sections 1- 2. Recovery of Chinook was greatest during Julian week 41 (Oct. 8 -14) when crews recovered 1,005 Chinook.

Similar to carcass recovery, Chinook redds were encountered most frequently in section 1 (Table 3). A total of 2,410 redds were enumerated in section 1, approximately half of the total (2,410/5,232) for all sections combined. The fewest redds (73) were observed in section 10. The peak period for redd enumeration was Julian weeks 40-43 when 3,216 redds were counted. This represents 61% of the total for the season and corresponds with spring Chinook spawning.

Table 2. Recovery of all chinook salmon by Julian week and section in the main stem Trinity River spawner survey during the 2002-2003 season.

Section	Number of Surveys	Julian week of Chinook recovery															Section totals:
		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	
		Week ending															
		Sept. 16	Sept. 23	Sept. 30	Oct. 7	Oct. 14	Oct. 21	Oct. 28	Nov. 4	Nov. 11	Nov. 18	Nov. 25	Dec. 2	Dec. 9	Dec. 16	Dec. 23	
1	11	NS	18	77	NS	588	157	111	144	NS	279	61	54	20	11	NS	1,520
2	14	3	NS	38	78	196	146	180	94	127	86	64	51	19	18	3	1,103
3	12	NS	2	NS	65	84	72	88	42	NS	25	10	8	1	3	0	400
4	12	NS	3	NS	17	59	55	80	56	7	14	10	NS	8	4	1	314
5	9	NS	1	NS	15	48	55	50	10	26	NS	6	NS	4	NS	NS	215
6	10	NS	0	2	30	NS	129	84	40	NS	20	4	1	NS	1	NS	311
7	12	NS	0	0	8	24	40	52	43	17	10	10	3	1	NS	NS	208
8	6	NS	NS	1	NS	3	NS	16	NS	18	NS	6	NS	1	NS	NS	45
9	6	NS	NS	0	NS	2	NS	44	NS	11	NS	19	NS	2	NS	NS	78
10	6	NS	NS	0	NS	1	NS	7	NS	2	NS	8	NS	NS	3	NS	21
	Weekly Totals:	3	24	118	213	1,005	654	712	429	208	434	198	117	56	40	4	4,215

a/ NS indicates that a survey was not performed that week.

Table 3. Summary of weekly Chinook redd enumeration, mainstem Trinity River carcass/redd survey, 2002-03 season. a/

Section	Section Start/End	Julian week of redd enumeration														Total Redd Count
		38	39	40	41	42	43	44	45	46	47	48	49	50	51	
1	Lewiston Dam- Old Lewiston Bridge	106	164	301	319	179	216	97	83	7	183	199	232	193	27	2,306
2	Old Lewiston Bridge- Browns Mt. Bridge	2	26	80	104	80	102	53	20	19	7	6	6	25	1	531
3	Browns Mt. Bridge Steel Bridge	6	24	73	83	57	116	40	NS	34	26	4	6	3	0	472
4	Steel Bridge- Douglas City Campground	1	7	42	112	79	48	9	1	3	NS	3	9	4	0	318
5	Douglas City Campground- Sky Ranch road (Jct. City)	NS	NS	88	136	112	77	30	14	NS	11	NS	4	NS	NS	472
6	Sky Ranch road (Jct. City) Jct. City Campground	NS	8	37	61	102	81	17	11	4	7	1	1	4	NS	334
7	Jct. City Campground- N.F. Trinity River	2	2	40	93	78	34	19	7	9	7	0	3	0	NS	294
8	N.F. Trinity River- Big Flat	NS	0	NS	22	NS	52	NS	13	NS	1	NS	6	NS	NS	94
9	Big Flat- Del Loma	NS	0	NS	40	NS	117	NS	15	NS	18	NS	6	NS	NS	196
10	Del Loma- Cedar Flat Rec. area	NS	0	NS	20	NS	35	NS	0	NS	13	NS	5	NS	NS	73
Weekly totals:		117	231	661	990	687	878	265	164	76	273	213	278	229	28	5,090

a/ Data provided by U.S. Fish and Wildlife Service.

Spring chinook salmon

There were 2,729 chinook classified as spring-run examined during the survey (Table 4), of those, 1,482 (54.3 %) Chinook were classified as condition-one. The largest number (951) and greatest density (297.2 fish/km) of spring Chinook carcasses were recovered in section 1, followed by section 2. Recovery densities in Section 2 remained high at 81.1 fish/km. Sections 3 and 6 had a density greater than 30, (30.5 and 34.0 fish/ km). In contrast, sections 8-10 had

densities less than 4 fish/km. Section 10 had the lowest density (0.6 fish/ km) of spring-run carcasses observed during the survey. Section 10 is located between Del Loma and the Cedar Flat Recreation Area.

Table 4. Number, density, incidence of Ad clips, project tags, and condition of spring Chinook salmon recovered during the 2002-2003 main stem Trinity River spawner survey.

Section	length (km)	Number observed a/	Density (fish/km)	Cond 1 b/	Cond 2 c/	Ad-clips d/		Project tags e/	
						Total	C-1	Total	C-1
1	3.2	951	297.2	538	413	90	34	33	6
2	7.9	641	81.1	310	331	40	15	9	2
3	10.2	311	30.5	167	144	16	5	10	2
4	10.4	214	20.6	123	91	4	1	9	3
5	15.7	169	10.8	109	60	3	2	4	
6	7.2	245	34.0	122	123	5	4	1	
7	8.8	124	14.1	73	51	2	1		
8	9.7	20	2.1	12	8	0			
9	14.8	46	3.1	22	24	1			
10	13.7	8	0.6	6	2	0			
Totals:	101.6	2,729	26.9	1,482	1,247	161	62	66	13

a/ For the purpose of analysis we considered all Chinook recovered prior to Julian week 44 (Oct 29) as spring Chinook.

b/ Condition-1 fish are those with at least one clear eye and considered to have died within one week.

c/ Condition-2 fish are those with both eyes cloudy and considered to have died more than a week previous to recovery.

d/ Adipose fin clipped chinook salmon. Total and condition-1(C-1) recoveries shown.

e/ Spaghetti tags applied at Willow Creek and Junction City weirs. Total and condition-1 (C-1) recoveries shown.

Fall Chinook

There were 1,486 chinook classified as fall-run examined during the survey (Table 5), of which, 788 (53.0%) were classified as condition-one. The largest number (569) and the greatest density (177.8 fish/ km) of all fall carcasses were recovered in section 1, followed by section 2, (462, 58.5 fish/ km). Sections 3- 4 and 6-7 had considerable lower densities of approximatey 9.5 fish/ km. The remaining sections (5,8-9) had much lower carcass concentrations, less than 3 fish/km. Comparably to spring chinook, the lowest density of fall chinook carcasses occurred in section 10 at a density of (0.9 fish/ km).

Table 5. Number, density, incidence of Ad clips, project tags, and condition of fall Chinook salmon recovered during 2002-03 mainstem Trinity River spawner survey.

Section	length (km)	Number observed a/	Density (fish/km)	Cond 1 b/	Cond 2 c/	Ad-clips d/		Project tags e/	
						Total	C-1	Total	C-1
1	3.2	569	177.8	340	229	42	34	12	9
2	7.9	462	58.5	212	250	14	11	8	3
3	10.2	89	8.7	51	38	0	0	3	2
4	10.4	100	9.6	62	38	2	2	0	0
5	15.7	46	2.9	24	22	1	0	1	1
6	7.2	66	9.2	38	28	1	1	3	2
7	8.8	84	9.5	31	53	1	0	1	0
8	9.7	25	2.6	12	13	1	1	0	0
9	14.8	32	2.2	14	18	0	0	0	0
10	13.7	13	0.9	4	9	0	0	0	0
Totals:	101.6	1,486	14.6	788	698	62	49	28	17

a/ For the purpose of analysis we considered all Chinook observed after Julian week 43 (Oct. 28) as fall Chinook.

b/ Condition-1 fish are those with at least one clear eye and considered to have died within one week.

c/ Condition-2 fish are those with both eyes cloudy and considered to have died more than a week previous to recovery.

d/ Adipose fin clipped chinook salmon. Total and condition-1(C-1) recoveries shown.

e/ Spaghetti tags applied at Willow Creek weir. Total and condition-1 (C-1) recoveries shown

Coho Salmon

Coho salmon carcasses were recovered starting in mid-November and peaked in mid-December.

A total of 177 coho were recovered during the survey, of which 130 were classified as condition-1 and 47 as condition-2 (Table 6). The highest density of coho salmon were recovered in section 1 (39.1 fish/km). Carcass recovery of coho salmon remained low in the remaining sections.

Table 6. Number, density, incidence of Rm clips, project tags, and condition of Coho salmon recovered during the 2002-03 mainstem Trinity River spawner survey.

Section	Length (km)	Number observed	Density (fish/km)	Cond 1 c/	Cond 2 d/	RM-clips		Project tags b/	
						Total	C-1	Total	C-1
1	3.2	125	39.1	86	39	116	79		
2	7.9	29	3.7	25	4	26	23	1	1
3	10.2	8	0.8	7	1	7	6		
4	10.4	7	0.7	5	2	7	5		
5	15.7	4	0.3	4	0	2	2		
6	7.2	1	0.1	1	0	1	1		
7	8.8	0	0.0	0	0	0	0		
8	9.7	1	0.1	1	0	0	0		
9	14.8	1	0.1	0	1	1	0		
10	13.7	1	0.1	1	0	1	1		
Totals:	101.6	177	1.7	130	47	161	117	1	1

a/ Right-maxillary clipped coho salmon. Total and condition-1(C-1) recoveries shown.

b/ Spaghetti tags applied at Willow Creek and Junction City weirs. Total and condition-1 (C-1) recoveries shown.

c/ Condition-1 fish are those with at least one clear eye and considered to have died within one week.

d/ Condition-2 fish are those with both eyes cloudy and considered to have died more than a week

Size Composition

Only condition-1 fish that were measured are included in our analysis. Condition-2 fish were not included due to potential inaccuracies in measuring fish in various decomposed states. The size separating grilse and adults was determined using length frequency analysis (Task 1 of this report).

Spring chinook

Fork lengths of 1,477 of condition-1 spring salmon averaged 76.0 cm and ranged between 39-110 cm (Figure 3). Five condition-1 fish were not measured and were excluded from fork length analysis. Grilse accounted for 5.2 % (77/1,482) of condition-1 spring chinook. Grilse were considered fish ≤ 55 cm, FL.

Fall chinook

Fork lengths of 785 of condition-1 fall chinook averaged 77.2 cm and ranged between 43-110cm (Figure 3). Three condition-1 fish were not measured and excluded from length analysis. Grilse accounted for 9.9 % (78/785) of condition-1 fall chinook. Grilse were considered fish ≤ 60 cm, FL.

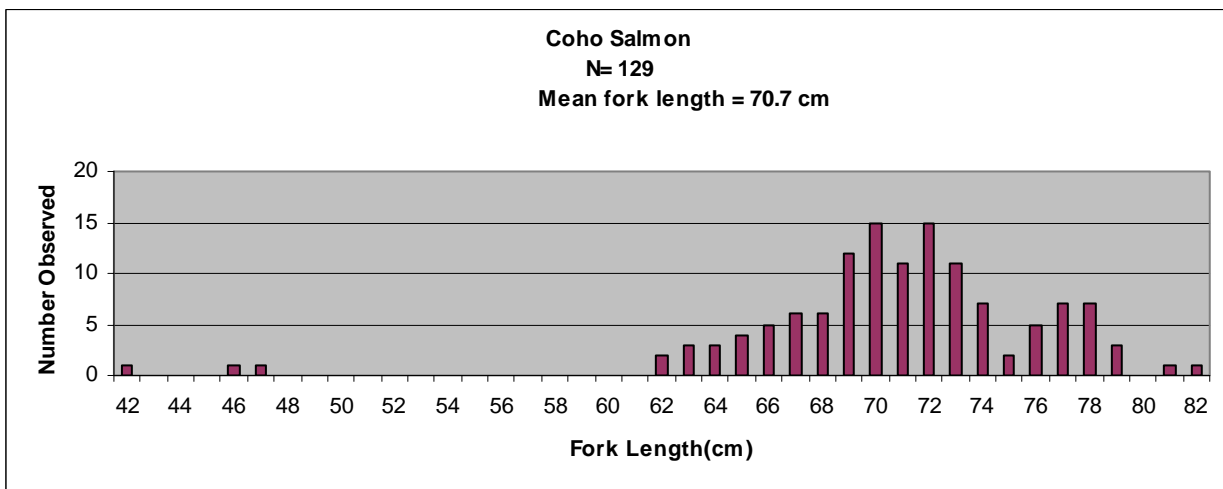
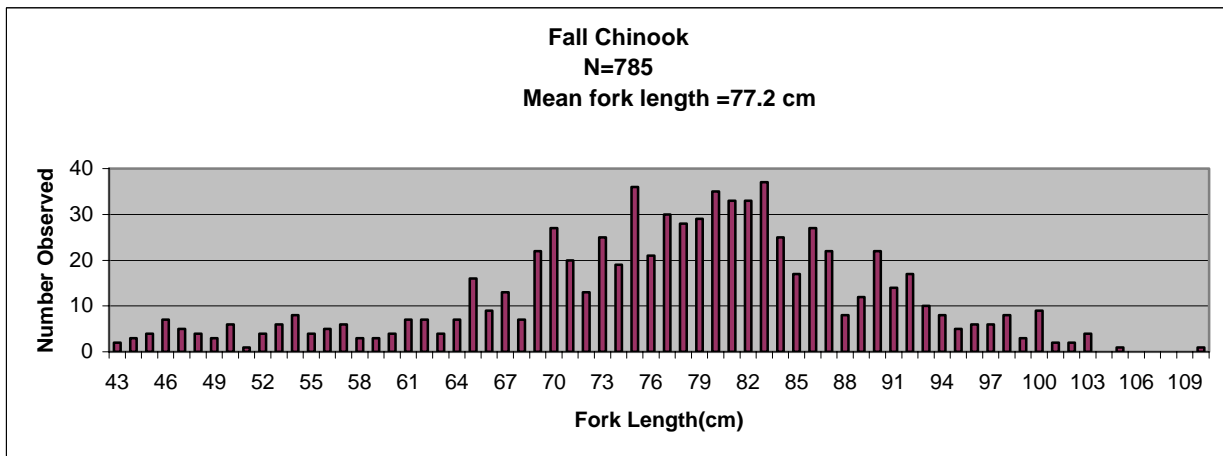
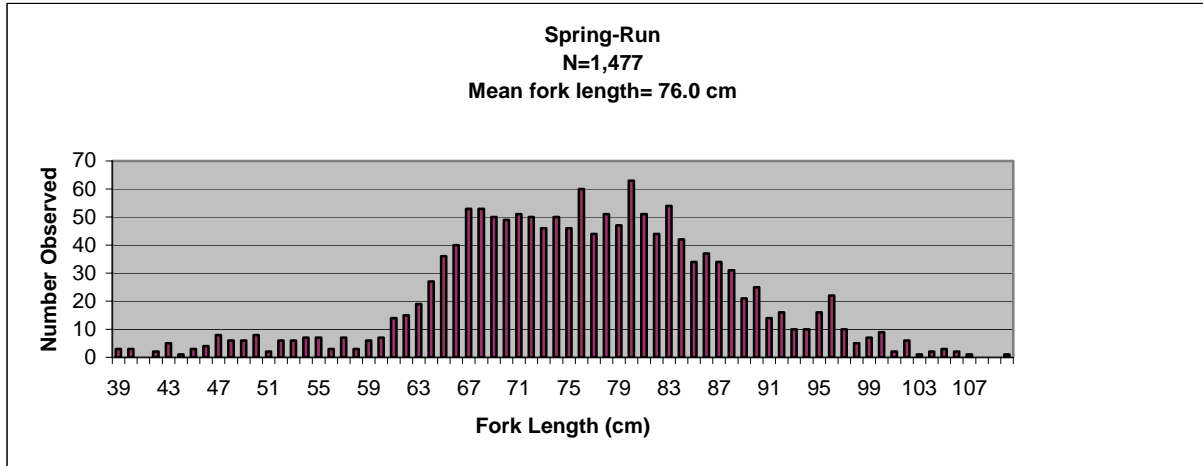


Figure 3.Length frequency histograms for Condition-1 Chinook and Coho salmon measured during the 2002-03 mainstem Trinity River spawner survey.

Coho

Fork lengths of 129 coho salmon were examined (Figure 3). The average size of coho examined was 70.7 cm and the range was from 42-82 cm. Grilse accounted for 2.3% (3/129) of condition-1 fish. Grilse were considered fish ≤ 57 cm, FL.

Adult sex composition and female pre-spawn mortality

All identifiable, measured chinook and coho salmon carcasses recovered during this survey were examined for sexual identity. Adult female ovaries were examined for spawning completeness to determine a pre-spawn mortality rate. Fish were considered pre-spawn mortalities if they retained over 50 percent of their eggs.

Spring chinook

Of the 2,006 adult spring chinook recovered that were measured and sexed, 716 were sexed as males and 1,190 as females, a male to female ratio of 0.6:1. Of all “springers” measured 5 adult fish could not be reliably sexed.

During the survey we examined 1,186 adult female spring-chinook salmon, of which two were unclassified and 67 were classified as pre-spawn mortalities, a rate of 5.6 %.

Fall chinook

Of the 1,076 adult fall chinook that were measured and sexed, 439 were sexed as males and 637 were as females, a male: female ratio of 0.69:1. The gender of 1 adult chinook could not be reliably determined.

Of the 637 adult female fall chinook carcasses examined, one was unclassified and 11 were classified as un-spawned, a rate of 1.7 %.

Coho salmon

We measured 171 adult coho during the survey, of which 87 were males and 84 were females. All coho were able to be classified by gender. The male: female ratio was approximately 1:1.

A total of 84 female coho carcasses were examined for spawning success, of which one was unclassified and 11 were classified as un-spawned, a rate of 13.3%.

Incidence of Program marked salmon

Spring Chinook

A total of 66 project spaghetti tags were recovered from spring Chinook, of which, 13 were recovered from condition-1 fish (Table 4). Three of the tags were applied at the Willow Creek weir and 63 at Junction City weir. Slightly over half (50.7%) of all project tags were recovered in section 1. Project tags were observed on 2.4% (66/2,729) of the spring Chinook we examined.

Fall Chinook

A total of 28 project spaghetti tags were recovered from fall Chinook, of which, 17 were recovered from condition-1 fish (Table 5). Two of the tags recovered were applied at the Junction City weir and the remaining 26 tags originated from the Willow Creek weir. Of the project tags recovered, 42.9% were recovered in section 1. Project tags were observed on 1.9% (28/1,486) of the fall Chinook we examined.

Coho salmon

A single project spaghetti tag was recovered in a coho salmon during this survey in section 2 (Table 6). The project tagged coho was classified as a condition-1 fish. The incidence of project tagged fish was 0.6% (1/177).

Incidence of hatchery produced chinook and coho salmon

Spring Chinook

Sixty-two (7.2%) of the condition-one and 161 (5.9%) of all spring chinook bore Ad-clips. The majority (130/161) of the Ad-clipped chinook were recovered in sections 1 and 2 (Table 4). Coded-wire tags (CWT's) were recovered from 133 of the total Chinook recovered during the spring Chinook recovery period (Table 7), of which four CWT codes were from fall Chinook and 129 indicated fish were of spring Chinook origin. Based on expansion of all CWT codes recovered during the spring period (Table 7), we estimated that 671 (24.6%) of the total 2,729 fish recovered during the spring period were of TRH origin.

Based on expansions of all spring CWT groups, we estimate that the age structure of TRH spring Chinook recovered in the mainstem Trinity carcass survey at 4.52% age 2, 68.6% age 3, 26.44% age 4, and 0.44% age 5.

Fall Chinook

Forty-nine (2.8%) of the condition-one and 62 (4.2%) of all fall chinook bore Ad-clips. The majority (42/62) of the Ad-clipped fish were found in section-1 (Table 5). CWT's were recovered from 42 the 62 Ad-clipped fish (Table 7), of which one was a spring Chinook and 41 were fall chinook. Based on expansion of all CWT codes recovered during the fall period (Table

7), we estimate that 200 (13.5%) of the total 1,486 Chinook recovered during the fall period were of TRH origin.

Based on the expansion of all fall Chinook CWT codes, we estimate that the age structure of TRH fall Chinook recovered in the mainstem Trinity carcass survey at 22.6% age 2, 26.7% age 3, 43.0% age 4, and 7.7% age 5.

Coho Salmon

The occurrence of right maxillary clips (RM) was found on 161 of the 177 (91.1%) coho examined (Table 6). We combined condition-1 and -2 fish in this analysis because RM clips, unlike adipose fin-clips, remain recognizable long after the fish has died and are therefore subject to less observer error. Since all TRH produced coho salmon are marked prior to release we estimate that 91.1% of coho recovered during the survey were of TRH origin.

Table 7. Release and recovery data for coded-wire tagged, Trinity River Hatchery-produced Chinook salmon, recovered during the mainstem Trinity River carcass survey, 2002-03 season. a/

CWT code	Release data				Recovery data				
	Brood year	Age	Release type b/	Production multiplier c/	Recovery period d/		Total	% of sub-total	Expanded total
					Spring	Fall			
Spring Chinook									
065240	1997	5	Sy	2.85	1		1	0.6%	2.85
065247	1998	4	Sf	6.93	2		2	1.3%	13.86
065248	1998	4	Sf	6.28	6		6	3.8%	37.68
065249	1998	4	Sf	6.3	5		5	3.2%	31.5
065250	1998	4	Sy	2.9	31		31	19.6%	89.9
065251	1999	3	Sf	6.67	18		18	11.4%	120.06
065252	1999	3	Sf	6.4	29		29	18.4%	185.6
065253	1999	3	Sf	6.19	15	1	16	10.1%	99.04
065258	1999	3	Sy	2.93	15		15	9.5%	43.95
065261	2000	2	Sf	4.21	2		2	1.3%	8.42
065263	2000	2	Sf	4.05	1		1	0.6%	4.05
065270	2000	2	Sf	4.51	2		2	1.3%	9.02
065279	2000	2	Sy	4.05	2		2	1.3%	8.1
No CWT recovered e/					28		28	17.7%	
Sub-totals:					157	1	158		654.03
Fall Chinook									
065235	1997	5	Ff	10.91		1	1	1.5%	10.91
065241	1997	5	Fy	2.9		2	2	3.1%	5.8
065242	1998	4	Ff	11.18		2	2	3.1%	22.36
065243	1998	4	Ff	11.18		1	1	1.5%	11.18
065244	1998	4	Ff	10.7		1	1	1.5%	10.7
062641	1998	4	Fy	2.88		15	15	23.1%	43.2
065642	1998	4	Fy	2.95		2	2	3.1%	5.9
065254	1999	3	Ff	10.83	1	1	2	3.1%	21.66
065255	1999	3	Ff	10.8		1	1	1.5%	10.8
065257	1999	3	Ff	10.96		1	1	1.5%	10.96
065259	1999	3	Fy	2.89		5	5	7.7%	14.45
065265	2000	2	Ff	4.17		2	2	3.1%	8.34
065266	2000	2	Ff	4.06		1	1	1.5%	4.06
065267	2000	2	Ff	4.05		2	2	3.1%	8.1
065272	2000	2	Ff	4.17	1		1	1.5%	4.17
065273	2000	2	Ff	4.05		2	2	3.1%	8.1
065274	2000	2	Ff	4.04		1	1	1.5%	4.04
065277	2000	2	Ff	4.11	1	1	2	3.1%	8.22
065278	2000	2	Ff	4.12	1		1	1.5%	4.12
No CWT recovered e/						20	20	30.8%	
Sub-totals:					4	61	65		217.07
Grand totals:					161	62	223		871.1

a/ Survey was conducted from Lewiston Dam downstream to Cedar Flat between September 16 through December 16, 2002.

b/ Release types: Sf-Spring Chinook fingerling, Sy-Spring Chinook yearling; Ff-Fall Chinook fingerling, Fy-Fall Chinook yearling.

c/ Hatchery production multiplier used to account for untagged releases of the same brood year, race, and release type.

d/ Spring Chinook recovery period was September 16 through October 28. Later recoveries were considered fall Chinook.

e/ CWT was not present or was lost during recovery.

DISCUSSION

A major fish mortality event occurred in the lower Klamath River during late September in 2002. Large numbers of adult fish, primarily Chinook salmon, but also steelhead and endangered coho salmon died during the fish kill. Fish mortality was observed primarily in the lower 36 miles of river, below the confluence of the Trinity River.

Based on multi agency/tribal fish kill surveys in the lower Klamath River, the USFWS reported at the October 9-11, 2002 Klamath Fishery Management Council meeting, that their preliminary analysis indicated 34,000 fish had died in the lower Klamath River from September 20-27, 2002.

The final number of Chinook salmon reported to have died during the kill totaled 32,553 (CDFG, 2003). Department and USFWS pathologists determined the cause of death for Chinook, coho and steelhead were from the pathogens *Ichthyophthirius multifiliis* (ICH), a ciliated protozoan and *Flavobacter columnare* (columnaris) a bacterial pathogen. Amplification and spread of the pathogens were attributed to low flows, high water temperatures (20.5C°), and high population densities of fish (CDFG, 2004). The department states in our report that the kill estimate should be viewed as a minimum number of fish killed and may have significantly underestimated the actual numbers of dead fish.

We believe the large fish kill profoundly affected the numbers of returning fall Chinook to the Trinity River this season. During surveys this year nearly twice as many spring-run chinook (2,729) as fall-run chinook carcasses (1,486) were recovered. In recent years, fall-run chinook carcasses have constituted the majority of carcasses recovered during surveys of the mainstem Trinity River. Similarly, spring Chinook returns to TRH were considerably more than fall Chinook (11,057 vs 4,553). Spring Chinook returns had never surpassed fall Chinook returns at TRH until this season.

The spawner survey conducted this year included both carcass recovery and redd enumeration and mapping. Prior to 1996, CDFG conducted carcass recovery operations which entailed flagging carcasses for subsequent recapture to estimate recovery efficiency. This allowed us to estimate the total number of spawners in each surveyed section. With the addition of the redd mapping, crews did not have enough time to perform mark-recapture efficiency estimates. Therefore, sectional carcass density estimates prior to 1996 for the main stem Trinity River may not be directly comparable to current findings.

Carcass distribution

As in past years (Sinnen, 2004, Sinnen and Null, 2002), Chinook carcasses were most frequently recovered in the upper two sections this season (Appendix 1). Sixty two percent (2,623/4,215)

of all Chinook were recovered from Lewiston Dam downstream to Browns Mountain bridge, a length of approximately 11 kms. The remaining sections (3-10), a length of approximately 90 kms, yielded a combined 1,592 (37.8%) of all Chinook carcasses. The high density of Chinook carcasses in the upper two sections appears primarily to be due to “short distance straying” of hatchery- produced Chinook at TRH. Other potential reasons that Chinook heavily utilize the upper 11 kms are the availability of quality spawning habitat, suitable water temperatures, suitable holding and spawning flow regimes or natal homing (i.e. the large number of Chinook spawned in these sections perpetuate returns to the same areas).

Redd enumeration may be the best indication of spawner distribution since we are not able to generate sectional efficiency estimates and recovery of Chinook carcasses is dependent on stream characteristics such as depth, water clarity, flows, etc.

Size composition

The proportion of grilse in this year’s run of Chinook and coho observed in the carcass survey and at three fixed locations (either Willow Creek or Junction City weir and Trinity River Hatchery) in the main stem Trinity River are presented in appendix 2. The proportion of grilse this year was lowest in the carcass survey for all three species. This has been generally the case for the past several seasons and supports the hypothesis that grilse are not sampled proportionally in carcass surveys. We believe that grilse are more likely to be removed from the surveyed sections of the river by predators and drift than adults. Additionally, the smaller size of grilse make them less likely to be observed during surveys.

The proportion of grilse coho (2.3%) observed in the spawner survey was significantly different than the other two fixed sites (appendix 2), however, this may be a manifestation of the truncated recovery period for coho salmon this season. Had surveys continued into January when a majority of coho would have died, the grilse proportion may have changed. Additionally, increased river flows and poor water visibility conditions may have affected recovery of grilse. Of concern is the very high grilse rate observed at Willow Creek weir, which suggests that trapping of grilse and adults there was not in proportion to the population, trapping did not extend long enough into the season or differential capture efficiency existed.

Adult sex composition and female pre-spawn mortality

For both races of Chinook salmon, female adults outnumbered male adults. Previous studies on the Trinity presented in Aguilar (1996), suggest this is common for Chinook salmon. It is generally assumed that adult females would compose a higher percentage of adults than their male counterparts due to the fact that a percentage of males return as grilse.

Reported Trinity River Chinook salmon pre-spawn mortalities have ranged from 0 to 71% for spring Chinook and 0.7 to 43.7% for fall Chinook for the 1987-2001 period (Appendix 3). This year's pre-spawn mortality rates 5.6 % and 1.7 % for spring and fall Chinook respectively are relatively lower than past seasons. It has been noted, most recently by Zuspan (1998), that pre-spawn mortality may be density dependent in the Trinity system. In years of high Chinook abundance, pre-spawn mortality increases. Due in part to the Klamath fish kill, Trinity River fall Chinook carcass numbers in the upper three reaches of our survey were the lowest observed during the past three years (appendix 1). Conversely, recoveries of spring Chinook during this season were the highest we have observed the past three seasons. It appears, based on our data, that the lower Klamath fish kill did not adversely affect the spawning success of those fish which survived the kill and migrated to the upper Trinity River and that spring Chinook were relatively unaffected by the lower Klamath River fish kill.

Incidence of Program marked salmon

One important aspect of our surveys is to recover Program marks (spaghetti tags) from Chinook and coho salmon. These fish, tagged at Willow Creek and Junction City weirs, are used to validate population estimates reported under Task 1 of this report. It is assumed that fish tagged at the weirs are representative of both the hatchery and naturally spawning populations within the Trinity. Therefore, we expect that salmon found during carcass surveys would have approximately the same percentage of tags as fish which enter Trinity River Hatchery.

During the 2002 season, the percentage of tags found on both spring and fall Chinook and coho salmon during carcass surveys was lower than observed at the hatchery (appendix 4). Factors that may account for differences in program marked percentages between the hatchery and natural areas include: 1) Sample size. Our sample sizes are much greater at TRH versus natural areas. 2) Weir trapping schedules. If a portion of the run is not trapped as efficiently as other segments of the run we would expect that the recovery percentages of marked fish may vary. This may explain the difference between spring Chinook marked recovery percentages at TRH versus spawner surveys. Since the JCW was not operational until June 19th, we may have missed a portion of the run. If this portion of the run had a higher percentage of wild fish than latter segments, we would expect lower tag recovery percentages in natural areas, which was observed this year. 3) Tag loss. It can be reasonably expected that tags may be lost during decomposition or that anglers or other people on the river may be removing tags. It is well known that some of our tags offer 10\$ rewards.

Incidence of hatchery produced Chinook

Another important aspect of our surveys is document the magnitude and distribution of hatchery strays. Ad-clip and RM-clip rates observed at 3 fixed sites and in the carcass survey

are presented in appendix 5. Only condition-1 Chinook carcass recoveries were used for this analysis, while all coho found during carcass surveys were used. This was done because of the subjectivity of determining the presence or absence of Ad-clips on deteriorating Chinook and the more easily identified RM-clip on coho.

A rough estimate of the incidence of hatchery produced Chinook found in the main stem Trinity can be obtained by comparing the ratios of Ad-clipped salmon observed at various locations within the river. If the assumption is made that fish which enter TRH are very close to 100% hatchery origin, division of river recovery clip rates divided by TRH clip rates will produce a percentage of fish observed at off-site areas composed of hatchery produced fish

The Ad-clip rate (7.6%) of spring Chinook found in the main stem Trinity River were lower than at either JCW (15.2%) and TRH (20.9%). Using the above estimation method and assumption, we estimate that hatchery-produced spring Chinook, upstream of Junction City weir composed 72.7% ($15.2/20.9$) of the total run and 36.4% ($7.6/20.9$) of the spring Chinook observed in the main stem carcass survey. We estimated that 654 of 2,729 (24.0%) spring Chinook recovered during carcass surveys were of hatchery origin based on expansion of coded-wire tags (Table 7).

This estimate is slightly lower than the previously mentioned 36.4% using the hatchery comparison method, however it must be noted that 17% of our CWT sample from the carcass survey was lost or unreadable. Hatchery rates for lost or unreadable CWT's are generally less than 10%, therefore we would expect a slightly higher percentage of hatchery fish to be estimated from our CWT recovery sample in the carcass survey.

The Ad-clip rate (6.2%) of fall Chinook found in the mainstem spawner survey (appendix 5) was also lower than that observed at WCW (12.6%) and TRH (21.2%). Using the previous estimation methods, we estimate that 58.1% ($12.6/21.7$) of the fall Chinook, upstream of Willow Creek weir, were of hatchery origin and that 28.6% ($6.2/21.7$) of main stem spawners were of hatchery origin. We estimated that 217 of 1,486 (14.6%) spring Chinook recovered during carcass surveys were of hatchery origin based on expansion of coded-wire tags (Table 7). This estimate is about half the estimate using previously mentioned 28.6% using the hatchery comparison method. However, 31% of our CWT sample were shed tags, lost heads or unreadable. This rate is much higher than what we typically observe at TRH.

The incidence of coho RM-clips varied from a rate of 91.0% in the main stem spawner survey to 98.6% at TRH. The observed rate at WCW was intermediate at 94.6%. These high rates of hatchery produced coho in all sample sites indicate that the Trinity River coho population, upstream of Willow Creek weir, is heavily supported by hatchery produced fish. However, sampling at the weir (through mid November) and in the main stem Trinity spawner survey (through mid December) did not include the complete temporal scale of coho migration and their ultimate death. The potential exists that naturally produced coho have a later run-timing, spawn and die later, or spawn primarily in tributary streams which were not surveyed.

RECOMMENDATIONS

- 1.) Annual spawner survey activities should be continued, with current or modified objectives, in future years.
- 2.) In future years, the entire survey area, sections one through ten, should be surveyed on a consistent temporal basis (e.g. once each week) if possible.
- 3.) We should attempt to measure all identifiable fish and make all efforts to collect CWT's from Ad-clipped Chinook.
- 4.) If recovery of coho salmon becomes a high priority, the length of the surveys will need to be extended into January.

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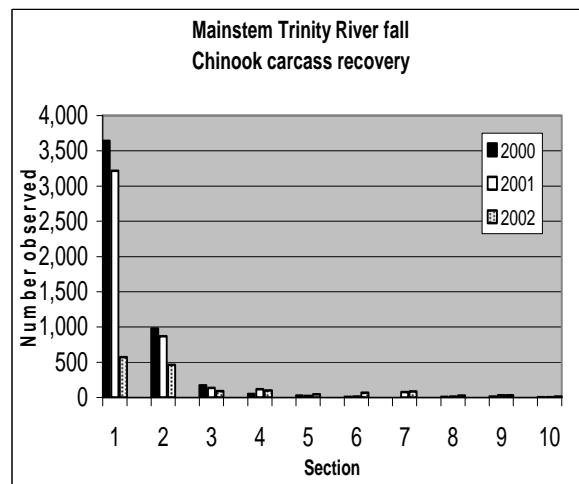
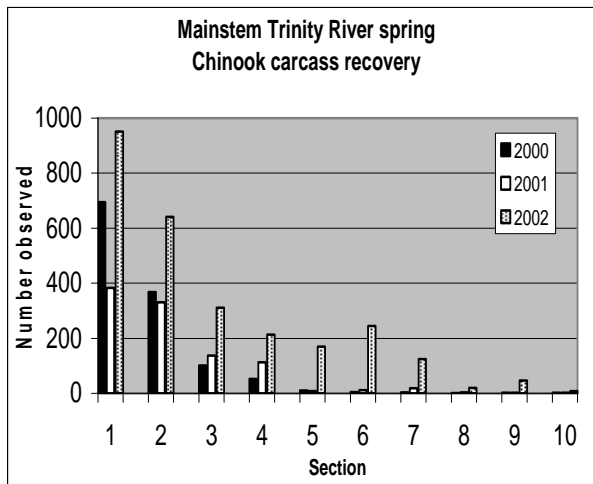
Appendix 1. Chinook carcass recovery in the mainstem Trinity River, 2000-2002. a/

Spring Chinook

Year	Recovery totals by section										Total
	1	2	3	4	5	6	7	8	9	10	
2000	695	368	101	52	11	5	4	1	2	2	1,241
2001	383	331	137	113	8	12	19	3	2	2	1,010
2002	951	641	311	214	169	245	124	20	46	8	2,729

Fall Chinook

Year	Recovery totals by section										Total
	1	2	3	4	5	6	7	8	9	10	
2000	3,644	979	174	50	25	10	1	7	13	6	4,909
2001	3,217	872	136	118	23	14	75	12	32	6	4,505
2002	569	462	89	100	46	66	84	25	32	13	1,486



a/ Survey conducted from Cedar Flat upstream to Lewiston Dam on mainstem Trinity River.

Appendix 2. Size composition of Chinook and coho salmon observed in the main stem spawner survey and at three fixed locations in the Trinity River basin during the 2002-03 season.

Spring Chinook

Size strata	Recovery site			Total
	Junction City weir	Trinity River Hatchery	Spawner survey b/	
Grilse a/	116	617	77	810
Adults	1,618	10,441	1,400	13,459
% Grilse	6.7%	5.6%	5.2%	5.7%

a/ Spring Chinook grilse were less than 56 cm, FL; larger fish were adults.

b/ Measured condition 1 fish only.

Fall Chinook

Size strata	Recovery site			Total
	Willow Creek weir	Trinity River Hatchery	Spawner survey b/	
Grilse a/	135	1,078	78	1291
Adults	508	3,474	707	4,689
% Grilse	21.0%	23.7%	9.9%	21.6%

a/ Fall Chinook grilse were less than 61 cm, FL; larger fish were adults.

b/ Measured condition 1 fish only.

Coho

Size strata	Recovery site			Total
	Willow Creek weir	Trinity River Hatchery	Spawner survey b/	
Grilse a/	99	703	3	805
Adults	124	6,495	126	6,745
% Grilse	44.4%	9.8%	2.3%	10.7%

a/ Coho grilse were less than 58 cm, FL; larger fish were adults.

b/ Measured condition 1 fish only.

Appendix 3. Female chinook salmon pre-spawning mortality rates observed during the mainstem Trinity River spawner surveys from 1955 through 2002.

Study year	Literature source	Spring-run chinook			Fall-run chinook			Total chinook		
		Spawned	Unspawned	Percent unspawned	Spawned	Unspawned	Percent unspawned	Spawned	Unspawned	Percent unspawned
1955 a/	Gibbs (1956)							2,076	32	1.5
1956 a/	Weber (1965)							3,438	219	6.0
1963 a/	LaFauce (1965)							4,953	328	6.2
1968 a/	Rogers (1970)							1,494	124	7.7
1969 a/	Smith (1975)							1,889	23	1.2
1970 a/	Rogers (1973)							632	34	5.1
1971 b/	" (1982)									
1972 a/	Miller (1972)							791	110	12.2
1973 a/ c/	" (1973)									12.0
1974 a/ c/	" (1974)									9.1
1976 a/ c/	" (1976)									8.4
1978 a/ c/	" (1978)									7.2
1979 a/ c/	" (1979)									6.0
1980 a/ c/	" (1980)									36.5
1981 a/ c/	" (1981)									2.6
1982 a/ c/	" (1982)									1.5
1984 b/	" (1984)									
1985 b/	" (1985)									
1987 c/	Stempel (1988)			49.9			18.8			30.8
1988	Zuspan (1991)	11	27	71.1	479	372	43.7	490	399	44.9
1989	Zuspan (1992a)	194	327	62.8	1,546	464	23.1	1,740	791	31.3
1990	Zuspan (1992b)	76	21	21.6	104	6	5.5	180	27	13.0
1991	Zuspan (1994)	22	0	0.0	162	2	1.2	184	2	1.1
1992	Aguilar / Zuspan (1995)	48	3	5.9	133	1	0.7	181	4	2.2
1993	Aguilar (1995)	115	5	4.2	180	12	6.3	295	17	5.4
1994	Aguilar/Davis (1995)	202	2	1.0	380	12	3.1	582	14	2.3
1995	Zuspan (1997)	2,711	517	19.0	8,502	3,188	27.3	11,213	3,705	24.8
1996	Zuspan (1997)	1,243	42	3.3	1,058	90	7.8	2,301	132	5.4
1997	Zuspan (1998)	1,263	34	2.6	491	28	5.4	1,754	62	3.4
2000	Sinnen / Null (2002)	559	17	2.9	1,940	146	7.0	2,499	163	6.1
2001	Sinnen (2004)	327	22	6.3	963	98	9.2	1,290	120	8.5
2002	Current Study	1,186	67	5.6	636	11	1.7	1,822	78	4.3

a/ Spring-run and fall-run chinook salmon were not separated during these years.

b/ Pre-spawning mortality rate was not reported during these years.

c/ Overall pre-spawning mortality rates were reported but not numbers of carcasses observed.

Appendix 4. Observed program tags on Chinook and coho salmon recovered at Trinity River Hatchery and in the mainstem Trinity River spawner survey, 2002-03 season.

Tag site a/	Spring Chinook			Fall Chinook			Coho		
	Program tags	Total observed	Program tag %	Program tags	Total observed	Program tag %	Program tags	Total observed	Program tag %
Mainstem spawner survey b/									
JCW	36	1,482	2.4%	----	----	----	----	----	----
WCW	----	----	----	15	787	1.9%	1	130	0.8%
Trinity River Hatchery									
JCW	480	11,057	4.3%	----	----	----	----	----	----
WCW	----	----	----	150	4,553	3.3%	88	7,198	1.2%

a/ JCW =Junction City Weir; WCW=Willow Creek Weir

b/ Only condition 1 Chinook salmon used for this analysis.

Appendix 5. Comparison of the proportion of adipose fin-clipped Chinook salmon and right maxillary-clipped coho salmon in the main stem Trinity River spawner survey to proportions observed at three fixed locations in the Trinity River basin during the 2002-03 season.

Site a/	Spring Chinook			Fall Chinook			Coho		
	Ad clips	Total	% Ad clips	Ad clips	Total	% Ad clips	RM clips	Total	% RM clips
JCW	263	1,734	15.2%	-----	-----	-----	-----	-----	-----
WCW	-----	-----	-----	81	643	12.6%	211	223	94.6%
TRH	2,315	11,057	20.9%	965	4,553	21.2%	7,097	7,198	98.6%
TR b/	113	1,482	7.6%	49	787	6.2%	161	177	91.0%

a/ JCW=Junction City Weir; WCW=Willow Creek Weir; TRH=Trinity River Hatchery; TR=Trinity River mainstem carcass survey.

b/ Only condition 1 Chinook used for this analysis.

ANNUAL REPORT
2002-03 SEASON

ANGLER CREEL SURVEYS IN THE LOWER KLAMATH RIVER

By
Sara Borok

ABSTRACT

During August 6th through November 4th, 2002, a creel census was conducted in the lower (Mouth to Coon Creek Falls) Klamath River to determine numbers of upstream migrating chinook salmon, coho salmon and steelhead trout harvested by sport anglers. The adult fall-run chinook lower river quota of 10,250 (20,500 for basin) was not met. A total of 7,913 (7,275 adults and 638 grilse) chinook salmon and 398 (393 adults and 5 half-pounders) steelhead harvested. We did not start counting fish toward the quota until August 20th. During the first two weeks of the creel 757 (724 adult and 33 grilse) spring-run chinook salmon were harvested. The total of fall-run chinook harvested was 7,156 (6,551 adults and 605 grilse) fish. Seasonal summaries and comparisons of angler effort and catch, catch timing, length frequencies, species composition, hatchery fin clips and tag recoveries are presented. A massive fish die off occurred starting mid September. A conservative estimate of 33,000 fish died in the lower 34 miles of the Klamath River.. The number of fish harvested could have been greater if fish had not died.

INTRODUCTION

The Klamath River system is the second largest river system in California (the Sacramento system is the largest). It drains over 40,000 sq km in northern California and southern Oregon. The Trinity River is its largest tributary and empties into the Klamath River at Weitchpec (river mile (rm) 43). Other major tributaries of the Klamath River are the Salmon River (rm 66) , Scott (rm 143) and the Shasta River (rm 177).

The upper limit of anadromous fish migration in the main Klamath River is at Iron Gate Dam (rm 98). Iron Gate Hatchery, at the base of the dam, mitigates for fish loss above the dam. The upper limit of fish migration in the Trinity River is at Lewiston Dam (rm 111). Trinity River Hatchery is located at the base of Lewiston Dam and mitigates for fish loss above the dam. Both Hatcheries are operated by California Department of Fish and Game.

The Klamath River system is one of the state=s primary producers of chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*Oncorhynchus mykiss*). These two species support popular sport fisheries throughout the Klamath River system with most of the concentrated effort and catch occurring in the lower 30 miles of the mainstem Klamath River.

Although sport angling has been popular throughout the Klamath River for many decades angler harvest data of anadromous salmonids within the Klamath River system prior to 1978 is limited. The earliest report found, that mentions angling in the Klamath River is by Snyder (1931) where he briefly describes methods, mean length and sex of a two day creel sample at the mouth of the Klamath River in August 1921. Coots (1952) reports on angler harvest of anadromous salmonids during a year long creel census from the mouth of Salmon River to Copco Dam during 1949 and 1950. Gibbs and Kimsey (1955) provide angler effort and harvest estimates for the boat fishery in the Klamath River estuary during 1951. Bailey (1952) reported on a creel census of the riffle fishery in the lower Klamath River above the Highway 101 Bridge conducted during the fall 1951 adult steelhead and chinook salmon immigration.

Other earlier creel census reports on the mainstem Klamath River conducted upstream of the Salmon River deal with angler catches during the summer trout season. Some adult steelhead and juvenile coho salmon are reported in the catches (Coots 1950, 1951, 1953, 1954; Wales 1948; Wales and Coots 1949). More harvest data was reported by Lanse (1970) in an area of the upper Klamath River and by Miller (1971) working in an area of the middle Klamath River. Steelhead comprised the majority of the sampled catches.

Creel census studies prior to 1978 consisted primarily of angler effort, species composition and catch per hour information. Some provided harvest and effort estimates within the sampled area. However, not until 1978 was an attempt made to estimate chinook harvest by anglers throughout the Klamath River basin (Boydston, 1979).

The Fishery Conservation and Management Act of 1976 declared a fishery conservation zone in ocean waters surrounding the United States from 3 to 200 miles. As a result the Pacific Fisheries Management Council (PFMC) was established in 1976. The PFMC soon recognized the need for salmon resource management and implemented the Fishery Management Plan (FMP) in 1977 for commercial and recreational salmon fisheries off the coasts of Washington, Oregon and California. The Klamath River is regarded as one of the more important producers of fall chinook to California commercial and sport fisheries; PFMC management objectives included measures to rebuild and protect depressed Klamath River fall chinook stocks (PFMC 1983). PFMC management practices focused on harvest restrictions for ocean troll and sport fisheries that were impacting Klamath River chinook stocks. The State of California, with management jurisdiction of fisheries in coastal waters from shore out 3 miles and of in-river sport fisheries, implemented chinook salmon management practices and regulations supporting PFMC objectives. Thus, the Klamath River adult fall chinook run-size data has been a critical component, since 1978, for management of fall chinook resource and its fisheries in northern California and southern Oregon.

The numbers of fall chinook salmon entering the Klamath Basin (run-size) is determined by accumulating the numbers harvested in-river, the numbers returning to the two hatcheries and the

numbers spawning naturally. Since 1978 the angler harvest of Klamath River fall chinook has been monitored by CDFG to provide data for fall chinook run size estimates. Annual reports summarizing these activities have been written through the 2001 season (Boydston 1979, 1980; Lee 1984a, 1984b, 1985, Lau 1992-1997; Pisano 1998; Borok 1999-2001).

This report covers the period July 1, 2002 through June 30, 2003. It provides data and a description of the CDFG fall chinook angler harvest monitoring program in the Mainstem Klamath River from the mouth to the falls at Coon Creek excluding the Trinity River. Trinity River fall chinook angler harvest data during the corresponding time is contained in a separate CDFG report.

The Klamath River Project (KRP) divides the Klamath River into three Areas to determine angling effort and catch for the entire river. California Department of Fish and Game (DFG) needs this information to determine when sport anglers have reached the in-river sport harvest quota of fall-run adult chinook salmon for the entire river (excluding the Trinity River).

The Klamath River chinook quota works in the following manner; One half the total in-river quota is dedicated to the lower river (Area 1 and Area 2). The other half is dedicated to the upper river (Area 3) and Trinity River. We monitor each of the areas for the fall-run chinook harvest and determine when the quota of each portion has been met. Once met, an adult chinook closure goes into effect in the river. Anglers are still permitted to fish, but must release any adult chinook salmon caught. Meanwhile, anglers in the other portions of the river are still permitted to harvest adult chinook until their individual quotas are met. Afterwards, fishing is allowed, but the entire river is closed to the harvest of any adult chinook. However, once Iron Gate Dam has received enough adult salmon for an egg take, a special fishery for adult chinook was permitted from Iron Gate Dam to where Interstate 5 crosses the Klamath River. Once the river is closed to adult chinook harvest in any area, fishing for grilse chinook and other legal species is still permitted.

The Fish and Game Commission establishes all angling regulations and quotas for the Klamath River. These regulations are enforced by the CDFG. The Commission adopts the quota recommendations made by the Pacific Fishery Management Council. Typically, the in-river sport chinook quota was 7.5% of the overall allowable harvest, or 15% of the non-tribal fisheries harvest. This year was different, a large run was forecast and it was believed the ocean commercial and recreational fishermen would not be able to catch their portion of the allocation due to fishing constraints due to ESA stocks being listed as threatened. The portion that the commercial and recreational fishermen would not be able to catch was given to the in-river sport anglers. Instead of the in-river sport getting 7.5% of the non-tribal, they received 39% of the non-tribal harvest allocation or 20,500 fish.

Starting in 1999 an "impact quota" was implemented for the Klamath and Trinity Rivers. From this impact quota a ten percent hooking mortality factor was accounted for within the quota and this number was used as the trigger quota. This trigger closure was to account for increased hook and release mortalities when the quota was met early in the season. The impact quota was

further divided among the areas in the following manner: 50% Lower Klamath River and 50% Upper Klamath and Trinity River. The Upper Klamath River and Trinity River further divided the quota with 17 % going to the Upper Klamath and 16.5% to each of the two sections on the Trinity River (upper Trinity; above Cedar Flat to Trinity Hatchery and lower Trinity; confluence with Klamath to below Cedar Flat). For the 2002 season these percentages worked out to 10,250 fish for the Lower Klamath River, 3,485 for the upper Klamath River and 3,382 for each section on the Trinity River (6,765 total for Trinity River).

During the 2002 season, fishing regulations allowed anglers to harvest three chinook salmon per day (up to two adult chinook) and one hatchery trout or one hatchery steelhead per day in the Klamath and Trinity Rivers. A total length (tip to tip) of 22 inches was used in the regulations to determine the adult/grilse cutoff. No harvest of Coho salmon was permitted. Regulations stated: one “hatchery” trout or one “hatchery” steelhead could be harvested. This eliminated cutthroat fishery in the lower river as there are no facilities raising cutthroat trout in the Klamath Trinity Basin.

During the 2002 season a large adult fish kill occurred. The initial call alerting CDFG that fish were dying in large numbers came on September 18, 2002 from a former CDFG employee who was fishing. Law enforcement and U.S. Fish and Wildlife Service (USFWS) were contacted. A multi agency investigation team consisting of CDFG, USFWS, the Yurok Tribal (YT) in the lower river, and Hoopa Valley Tribe(HVT), Karuk Tribe (KT) and the U.S. Forest Service (USFS) on the Trinity and upper Klamath River came together to assess the situation. Primary surveys were conducted on September 20, 24, 27 and Oct 1 in the lower 36 (falls at Coon Creek to the Mouth of Klamath) miles of the Klamath River to enumerate dead fish. Additional surveys were conducted to obtain biological samples and to check the extent of the Fish Kill in areas other than the lower 36 miles of river.

METHODS

Description of Fishery and Creel Sample Area

The mainstem Klamath River from the mouth to Iron Gate Dam was divided into three areas for estimating angler catch and effort. Areas 1 and 2 are included in this report. Area 3 methods and results are included in another report.

AREA 1: This area consisted of 4.5 rkm (2.8 mi) of river from the mouth of the Klamath to the Highway 101 bridge and is referred to as the estuary. Virtually all shore angling effort took place at the mouth of the river. River mouth configuration which changed between years, determined which side (north or south) afforded better angling. A creel sample of shore anglers was conducted at the mouth location. During the 2002 season fishing regulations called for a closure at the mouth when 15% of the basin quota was met. It was determined using an in-season predictor model that the quota would not be met. Since the quota would not be met, there was no reason to close the mouth. The majority of fish were caught at the mouth this season.

All boat angling effort in the estuary originated from ten resort boat docks in the estuary area. Two resort docks (Chinook RV Park and Riverside RV Park) and the public launch ramp (Old Townsite Boat Ramp) were sampled this season for angler effort and catch.

AREA 2: This area extended from the Highway 101 bridge upstream to the falls at Coon Creek (54.4 rkm, 34 rm) near the community of Johnsons (Pecwan Creek) and consisted primarily of riffle type fisheries. Shore angling effort was generally confined to two popular riffles (Lower Klamath Glen and Blakes) located in the lower 5 km of this area and were easily accessible to the shore angler. One resort boat dock (Klamath Glen) and a public boat launch (Roy Rook), also located in the lower 5 km, were the principal boat facilities in the area. Creel sampling occurred at these locations.

Shore angling access above Blakes Riffle to Johnsons was limited to about three areas: the mouth of Blue Creek (rkm 26.3, 16.4 rm), Ah Pah Creek (rkm 27.5, 17.2 rm) and Bear Riffle (rkm 29.8, 18.6 rm) were accessible by vehicle but accounted for an estimated less than one percent of angling effort in the entire sample area.

Virtually all boat angling effort that took place within Area 2 originated from one boat dock or public launching ramp, therefore, all boat angling effort was accounted for in the daily creel samples.

Angler access routes at Lower Klamath Glen and Blakes riffles were limited to specific routes in and out enabling a complete accounting of angler effort and catch during a sample day at these locations. Boat anglers were also confined to access at the launching ramp or resort boat dock enabling a complete sample of angler effort and catch for each sample day.

Waukel Riffle, located one-quarter mile upstream of the Highway 101 Bridge, has two principal access points each on opposite sides of the river. This sight has not been used by anglers in the last five years. It is checked sporadically, but no effort was recorded.

Creel Census Methods

Study methods and procedures used in the Lower Klamath Creel (Area 1 and 2) during the 2001 seasons were essentially the same as those described for the 1984-1987 seasons (Hopelain 2001). Data is presented in Standard Julian Week (JW) format throughout this report (Appendix 1).

The weekly sampling schedule in the Lower Klamath River was sampling each site three days per Julian week and in the Upper Klamath creel each site was sampled twice per Julian week. For weeks that were sampled other than above, the data is expanded accordingly. Each angling site is sampled throughout the day to account for total catch and effort for that particular site. Scientific aids interviewed anglers as they departed the fishing site and recorded the following information:

- 1) Was the angler finished fishing at this time?
- 2) Total hours spent fishing (to the nearest half hour).
- 3) The first three numbers of their Zip Code (to find their general area of residence).
- 4) The scientific aid processed any fish harvested (species, fork length, fin clips, tags, and unusual conditions were recorded, and a scale sample collected).
- 5) If the chinook (or coho) salmon had a missing adipose fin, (possessed a CWT) the scientific aid collected the head.
- 6) The number and kind of fish caught and released (actually released not lost) by the angler (recorded as juveniles, grilse or adults).

Harvest and Effort Estimating Procedures

Data was stratified for each creel census location by Julian week (Appendix 1). Angler catch and effort estimates are then calculated for each week. The catch-effort estimate formula used was:

$$\text{Estimate total} = \sum_{I=1}^n \text{Daily total (N/n)}$$

where: Estimate total = estimates of catch or effort

Daily total = Daily counts of catch or effort

N = Number of fishing days in week

n = number of sample days

Area 2: Harvest estimates for the area above Highway 101 to Coon Creek Falls is calculated by multiplying the observed catch and effort by a sampling ratio. This ratio is the weekly expansion value. This value is a simple ratio of the number of days sampled during that Julian week for the site over the number of legal fishing days within the week (7 days week / 3 days sampled = 2.33). All sites are totaled for the week to obtain the weekly harvest estimate for Area 2. This procedure applies to both boat and shore harvest. No additional expansion for the boat harvest in Area 2 is needed since total boat catch and effort were accounted for in the creel sampling.

Area 1: The procedure for the area below 101 is identical with Area 2 except for the addition of a boat expansion factor. The boat expansion factor accounts for the harvest by boat anglers we missed in sampling. Since we sample only some boat anglers, we need to account for the unsampled portion. The boat expansion formula is:

$$\frac{(\text{Boats at the non-sampled docks} + \text{Boats at sampled docks})}{\text{Boats at Sampled docks}}$$

This formula expands the catch and effort from sampled sites by a percentage determined from the number of sampled and non-sampled boats. A scientific aid obtains this percentage by counting the number of boats at all the docks (both sampled and non-sampled) below Hwy 101. This count occurs during a slow time of the day, usually, between 1100 to 1500. At this time, anglers often return to the docks. It is true that not all the boats will be at their docks at this time. However, the assumption that the percentage of boats that do not return to their docks is the same between both the unsampled and sampled docks. I also assume that the effort and catch are equal between the non-sampled boats and sampled boats.

The fish technician obtains the boat count every day we sample in Area 1. This aid does not include any boats used in the Indian gill-net fishery and any un-rented boats in their counts. An average of these daily values is used to arrive at the average boat expansion value for the week. The closer the expansion value is to one, the greater the total coverage we have in the estuary.

Daily Real Time Harvest Estimates and Projections

As in previous seasons, the Klamath River Project thought it necessary to compute harvest and effort estimates daily (real time) as we neared the quota to help prevent any over harvesting. In addition, we estimated one, two, and three day harvest projections to allow lead time to close the adult chinook fishery and to assist with management.

CREEL RESULTS

Rounding numbers to whole numbers may cause some slight addition discrepancies in these results. Spring run chinook numbers are included in totals.

The creel census for the lower Klamath River began on August 6 and ran through November 4 (JW 32 through 44) of 2002. Chinook salmon harvested in the creel fishery ranged in size from 38 to 118 cm in fork length (FL) and averaged 70.2 cm FL (Figure 1). From the fork length frequency in the creel survey sample, I found the true grilse-adult separation in length to be at 60 cm FL (Figure 1) instead of the 56cm (22 inches) separation used during the creel season. All numbers cited in this report are based on the adjusted adult -grilse separation.

This adult-grilse separation was smaller than the 62 cm FL break off observed in the 2001 season. The grilse component of the angler harvest ranged in size from 38 to 59 cm FL and averaged 51.0 cm FL. The adult chinook salmon component of the harvest ranged in size from 60 to 118 cm FL and averaged 79.8 cm FL (Figure 1). This separation is the same that was used by Trinity River Hatchery and the Willow Creek Weir. They made the separation at 60 cm FL (personnel communication Wade Sinnen). This separation in the sport fishery is smaller than Iron Gate Hatchery (Figure 2). From recovery operations at Iron Gate Hatchery we determined the grilse-adult break off at 63 cm FL.

Steelhead ranged in size from 28 to 79 cm FL and averaged 55.2 cm FL (Figure 3). I considered any fish less than 42 cm FL to be half-pounders, any steelhead larger to be an adult. Any steelhead less than 23 cm FL was considered a resident trout and not anadromous. The half-pounder steelhead ranged in size from 28 to 41 cm FL and averaged 36.9 cm FL. The adult steelhead ranged in size from 42 to 79 cm FL and averaged 59.5 cm FL. This is slightly larger than the 2001 season.

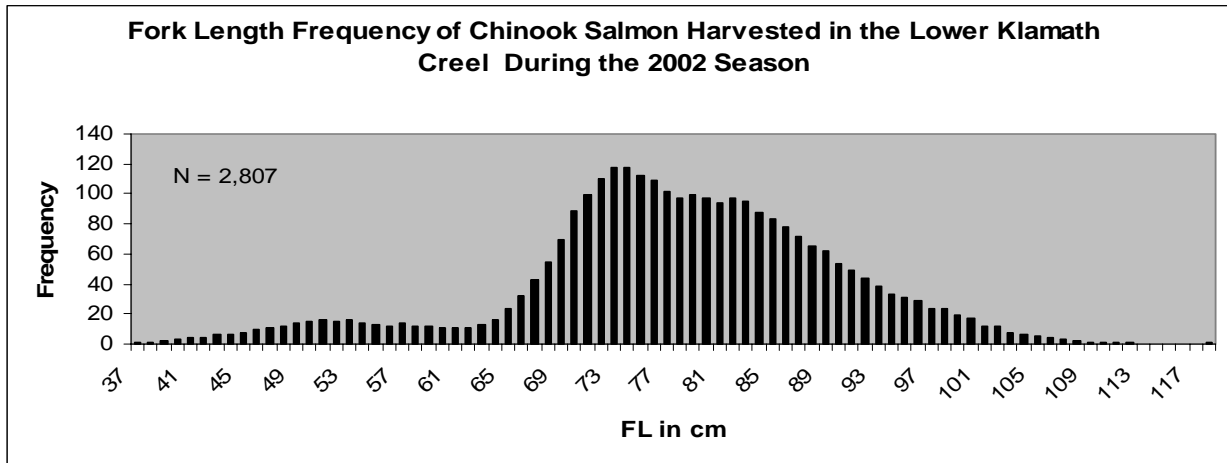


Figure 1. Fork Length Frequency of Chinook Salmon Harvested in the Lower Klamath River Creel During the 2002 Season.

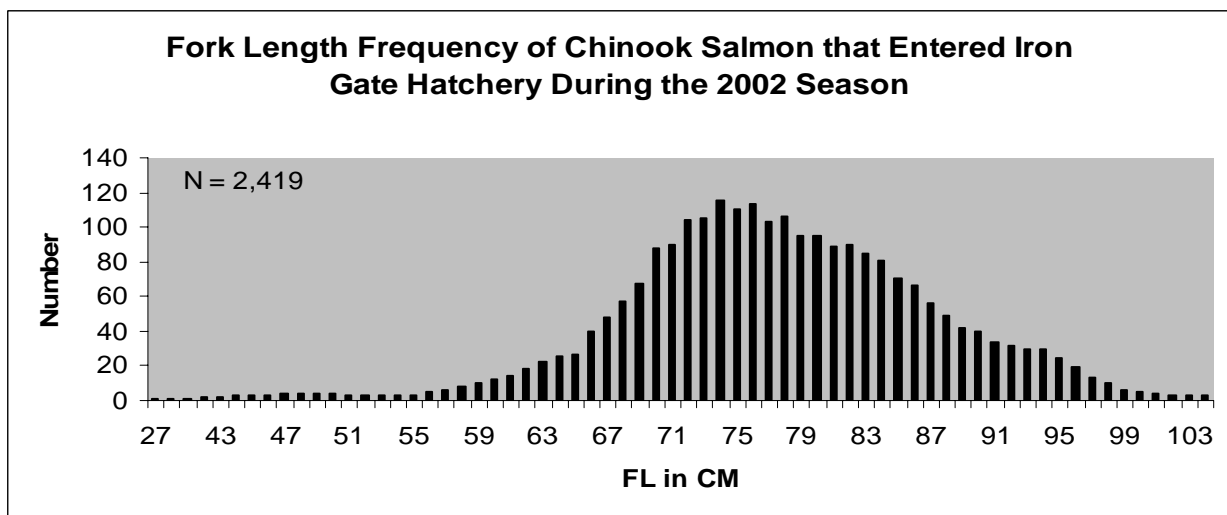


Figure 2. Fork Length Frequency of Chinook Salmon Sampled at Iron Gate Hatchery During the 2002 Season.

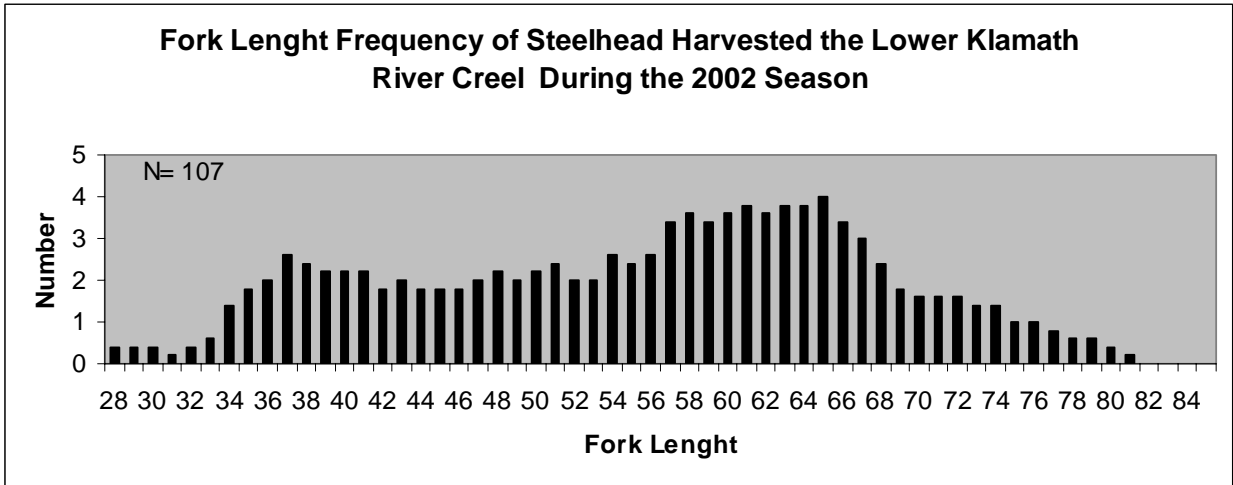


Figure 3. Length Frequency of Steelhead Caught in the Lower Klamath River Creel during the 2002 Season.

Estimated Angler Effort and Harvest

During the 2002 season, I estimate that anglers made a total of 18,376 trips in both Areas combined. Of the 18,376 trips 9,629 were in Area 1, 8,747 were in Area 2 (Table 1). These trips resulted in a total of 85,925 fishing hours. Shore anglers out fished the boat anglers. A total of 7,913 (7,275 adults and 638 grilse) chinook salmon and 398 (393 adults and 5 half-pounders) steelhead were harvested. We did not start counting fish toward the quota until August 20th. During the first two weeks of the creel 757 (724 adult and 33 grilse) spring-run chinook salmon were harvested. The total of fall-run chinook harvested was 7,156 (6,551 adults and 605 grilse) fish. Adults composed 91.5 % (6,551/7,156) of the estimated fall-run chinook harvest. Adult steelhead trout composed 98.7 % (393/398; Table 1) of the steelhead harvest.

Table 1. Summary of Estimated Angler Effort and Harvest During the 2002 Lower Klamath River Creel Census.

Site	Angler		Steelhead		Chinook Salmon	
Location	Trips	Hours	½ lbers	Adults	Grilse	Adults
Area 1 -Mouth to Highway 101 Bridge						
Shore	6,708	26,899	2	54	112	3,318
Boats	2,921	12,333	0	44	93	751
Total	9,629	39,232	2	98	205	4,069
Area 2 - Highway 101 to Coon Creek Falls						
Shore	4,303	20,948	2	83	48	350
Boats	4,444	25,746	1	213	385	2,857
Total	8,747	46,693	3	296	432	3,206
Grand Total	18,376	85,925	5	393	638	7,275
2001 Season	20,119	88,053	63	237	1,178	7,285
2000 Season	14,150	57,184	58	72	1,080	2,196

2002 Harvest and Effort Patterns

The average length of each trip expanded to 4.6 hours per trip. It is our hypothesis that the larger quotas and larger daily bag limit brought the anglers back (Table 2).

During the 2002 season, Area 2 anglers harvested slightly less fish than Area 1 (Table 1). Anglers (boat and shore) in Area 1 accounted for 54.0% (4,274 / 7,913) of the total chinook salmon and 24.8% (99/398) of the steelhead harvested. Anglers in Area 2 harvested the remainder. Area 1 anglers accounted for 52.3% (9,629/ 18,376) of angler trips and only 45.6% of the angler hours (39,232/ 85,925). Most of these fish harvested in Area 1 were by shore anglers at the mouth.

Table 2. The Number of Angler Trips, Hours, and Average Length of Trip in the Lower Klamath River Sport Fishery for the Last Ten Seasons, 1992-2002.

Year	Total Trips	Total Hours	Average Trip
1992	11,190	33,080	3.0
1993	16,081	51,889	3.2
1994	15,100	54,748	3.6
1995	19,881	63,369	3.2
1996	27,929	91,019	3.3
1997	18,402	67,154	3.6
1998	17,606	52,145	3.0
1999	11,852	45,109	3.8
2000	14,150	57,184	4.0
2001	20,116	88,053	4.3
2002	18,376	85,925	4.6

The harvest per hour of chinook salmon was tied for the second highest rate over the last 22 years (Figure 3). In 1996 and in 2002 the catch per hour was 0.092 fish per hour. The highest catch per hour was in 2001 with a 0.096 fish per hour. The average catch per hour for the last 22 years was 0.049 fish per hour.

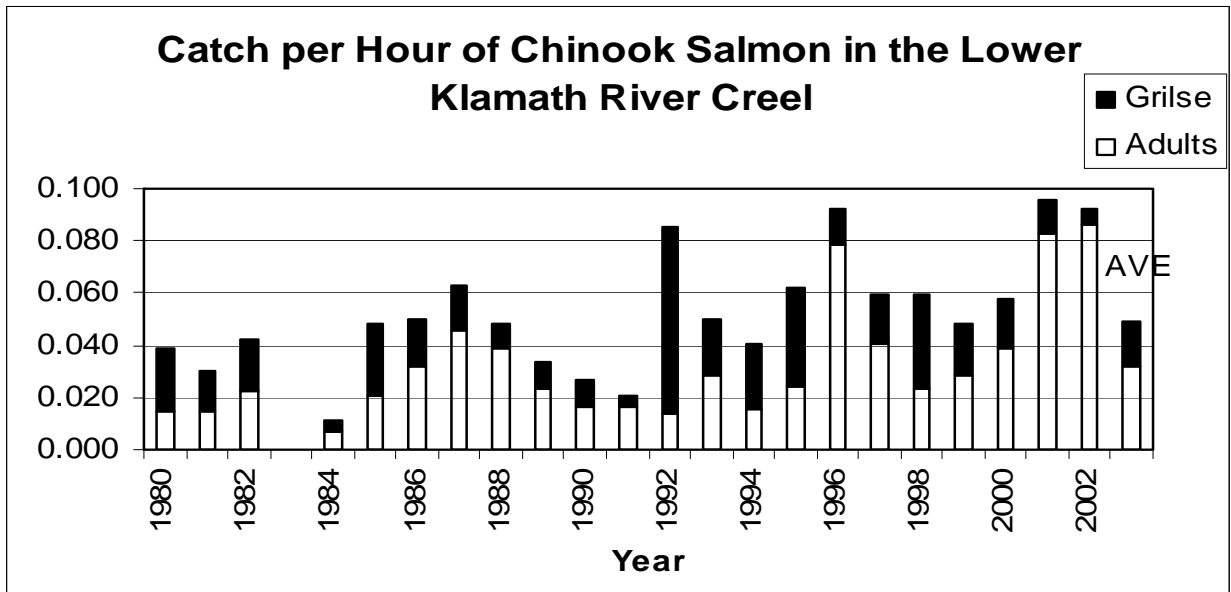


Figure 4. Harvest Per Hour of Chinook Salmon from the Sport Harvest on the Lower Klamath River Creel 1980 – 2002.

Catch and Release

Catch and release numbers were recorded as part of the creel interview. Anglers were specifically asked if these fish were released rather than lost. Numbers should only be used as an estimation for following trends as they can be highly subjective. I estimated anglers released 4,783 half-pounders, 6,036 adult steelhead, 405 grilse, and 2,985 adult chinook salmon (Tables 3 and 4). In addition, 12 grilse and 243 adult coho salmon were released this season. The majority of coho salmon harvested and released occurred in Area 2. Anglers tend to fish later into the season in Area 2, when coho are present.

Table 3. Number of Chinook and Coho Salmon and Steelhead Caught and Released from the Lower Klamath River Creel for the Last Eight Seasons 1994-2002.

Year	Chinook		Steelhead		Coho	
	Grilse	Adults	<42	>41	Grilse	Adults
94	290	2,571	4,044	198	0	0
95	175	14,408	1,049	259	0	33
96	521	1,438	1,944	256	7	11
97	34	1,015	1,479	516	0	0
98	330	1,317	1,738	460	10	19
99	1,897	1,164	1,189	346	2	5
00	757	6,253	8,103	1,129	17	43
01	464	1,720	11,892	2,997	12	242
02	405	2,985	4,783	6,036	12	243

Table 4. Summary of Estimated Chinook Salmon and Steelhead Caught and Released During the 2002 Lower Klamath River Creel Census.

Site	Angler		Steelhead		Chinook Salmon	
	Trips	Hours	½ lbers	Adults	Grilse	Adults
Area 1 -Mouth to Highway 101 Bridge						
Shore	6,708	26,899	158	161	135	492
Boats	2,921	12,333	238	143	30	405
Total	9,629	39,232	396	304	165	897
Area 2 - Highway 101 to Coon Creek Falls						
Shore	4,303	20,948	2,673	3,129	73	622
Boats	4,444	25,746	1,714	2,603	167	1,466
Total	8,747	46,693	4,387	5,732	240	2,088
Grand Total	18,376	85,925	4,783	6,036	405	2,985
2001 Total	20,119	88,053	11,892	2,997	464	1,720
2000 Season	14,150	57,184	8,103	1,129	757	6,253

Run Timing

Adult fall-run chinook salmon harvest below the Hwy 101 bridge (Area 1) peaked during Julian week 36. An earlier peak in that area during Julian Week 34 was the end of the spring run. Above the Hwy 101 bridge, the peak weeks for harvest of adult fall-run chinook occurred during Julian weeks 36 and 37 (Figure 5). For grilse, chinook the peak harvest occurred during Julian Week 36 for both Areas (Figure 5). Grilse harvest only made up 8.6% of total chinook harvest. Of the total chinook harvest, 43% occurred in Area1 at the mouth this season (Table 1).

The peak week of adult chinook released in Area 1 was Julian Week 36, while the peak week of adult chinook released in Area 2 was Julian Week 38 (Figure 6). For grilse chinook, peak releases occurred during Julian Week 36 for both Areas (Figure 6).

More adult steelhead (393) were harvested than half-pounders (5). The peak of the adult steelhead harvested was Julian week 32 in Area 1 and Julian week 39 for Area 2 (Figure 7). The only half-pounders harvested in Area 1 were in Julian week 34 and in Area 2, Julian week 33 was the peak (Figure 7) In talking with anglers, they stated they start fishing for steelhead usually in July, and creel counts start during Julian Week 32 at the beginning of August, therefore we miss the early portion of the steelhead run.

Regulations allow anglers to keep only hatchery origin steelhead. Large numbers of steelhead were caught and released this year. Anglers released 6,035 adult and 4,783 half-pounders this season (Table 4). In Area 1 the peak week for all steelhead released was Julian week 35. Area 2 is where the majority of steelhead are harvested and released. Julian Week 35 was the peak week for half-pounders released in Area 2 (Figure 8). A smaller peak occurred during Julian Week 35 and then another peak occurred during Julian Weeks 38 and 39 for adult steelhead released in Area 2 (Figure 8).

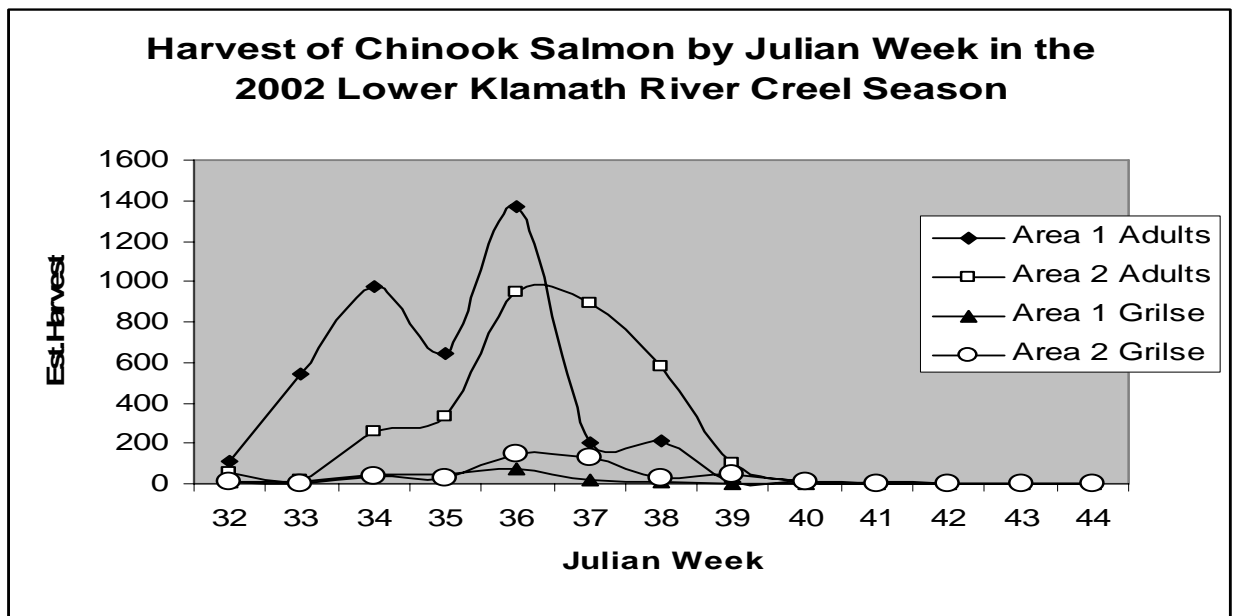


Figure 5. Chinook Salmon Harvest By Julian Week in Lower Klamath River for the 2002 Creel Season.

Table 5. Fish Harvested and Released by Julian Week During the 2002 Lower Klamath River Creel Census.

JULIAN WEEK			Harvest				Released			
	Trips	Hours	Steelhead ½ lb	Adult	Chinook Grilse	Adult	Steelhead ½ lb	Adult	Chinook Grilse	Adult
32	1,395	5,148	0	39	24	164	386	166	7	39
33	1,808	7,416	2	26	9	560	809	181	0	37
34	2,520	10,689	3	20	81	1,238	880	537	68	157
35	3,491	15,094	0	40	72	973	1,020	1,080	73	189
36	3,220	14,863	0	50	213	2,316	379	560	130	1,010
37	2,481	12,947	0	17	150	1,092	324	633	73	448
38	1,850	10,693	0	83	33	788	222	1,163	34	889
39	759	4,305	0	84	49	117	292	1,157	11	144
40	380	2,126	0	20	7	16	62	245	9	64
41	242	1,380	0	14	0	11	154	161	0	7
42	93	541	0	0	0	0	100	58	0	0
43	87	488	0	2	0	0	119	84	2	2
44	49	236	0	0	0	0	35	11	0	0
Total	18,376	85,925	5	393	638	7,275	4,783	6,035	405	2,985

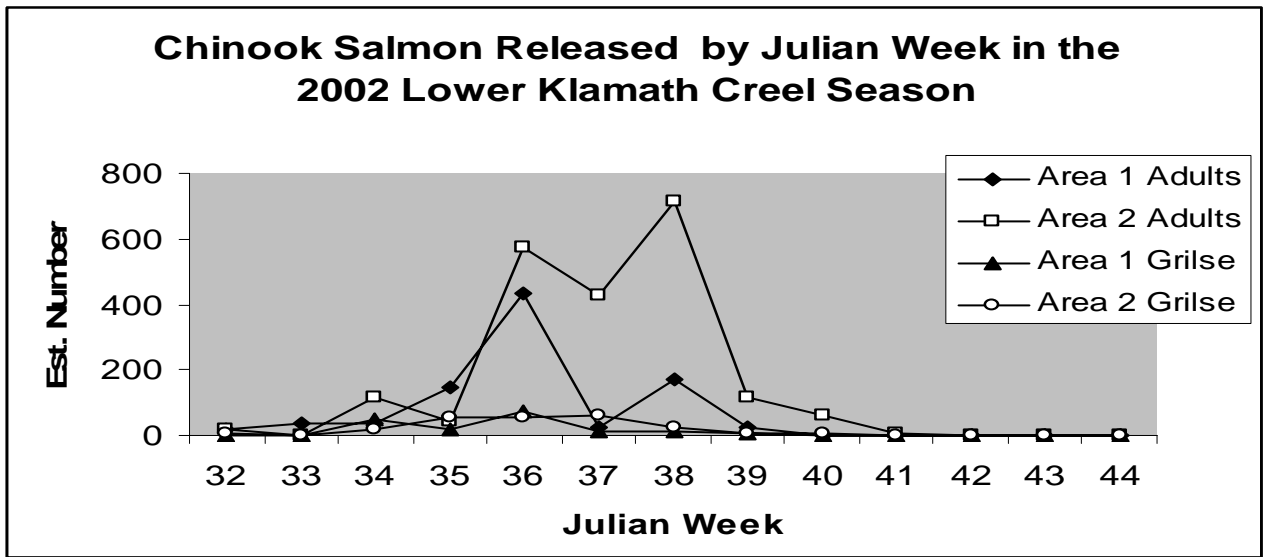


Figure 6. Chinook Salmon Released By Julian Week in the Lower Klamath River for the 2002 Creel Season.

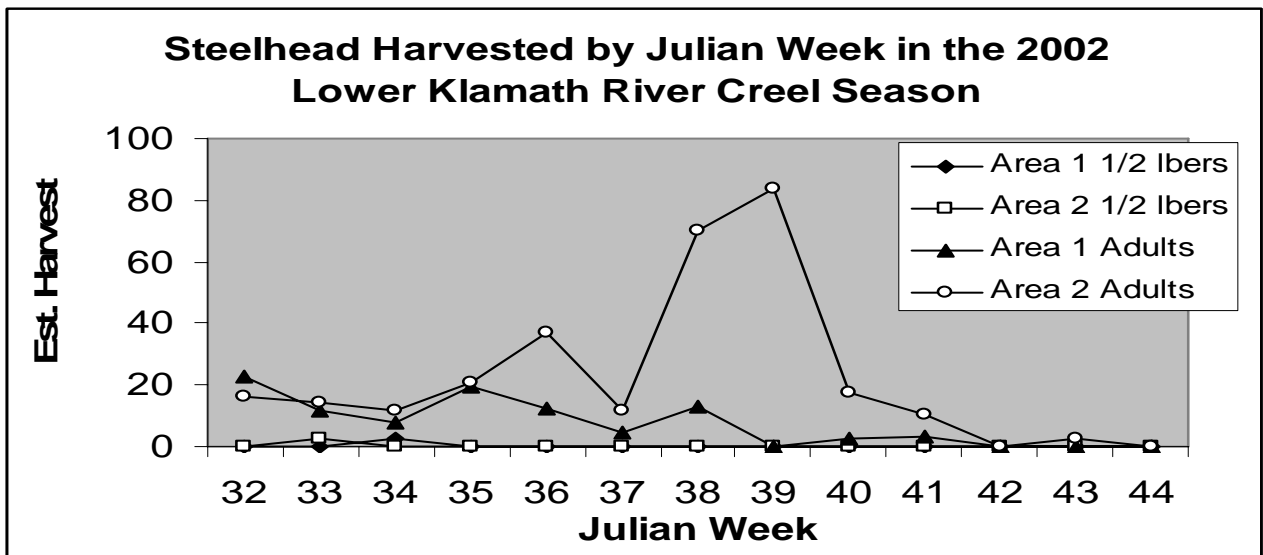


Figure 7. Steelhead Harvested During the 2002 Lower Klamath River Creel Season.

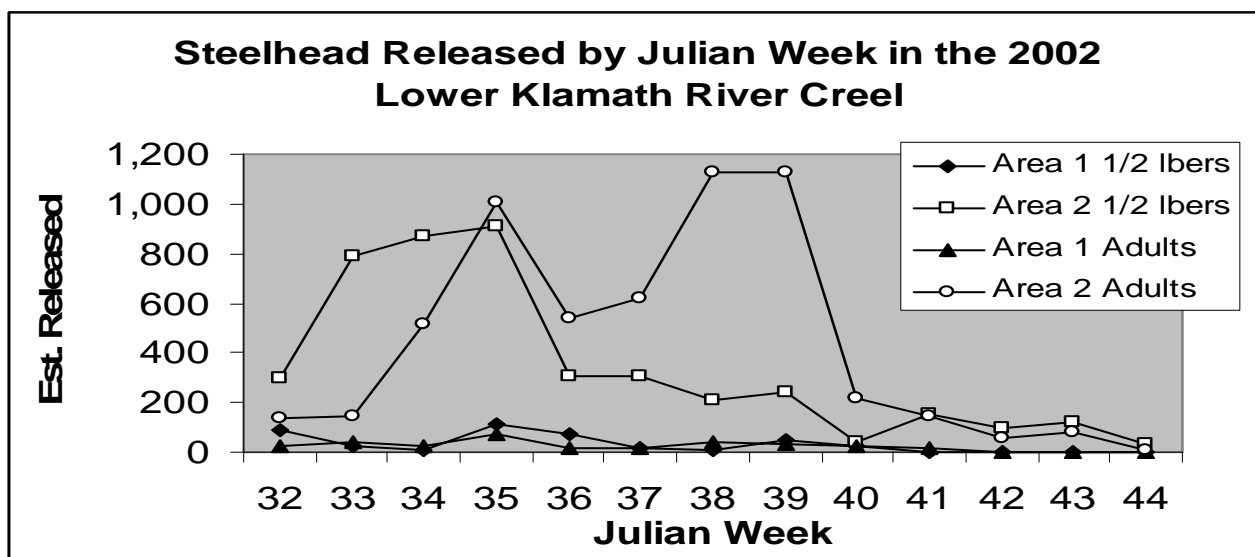


Figure 8. Steelhead Released By Julian Week During the Lower Klamath River 2002 Creel Season.

Coded-Wire Tag Recovery

Klamath River Project personnel recovered 96 heads of adipose fin-clipped (Ad+CWT) chinook salmon during Julian Weeks 29 through 42 of the 2002 season. Seventeen were from non-random recoveries (NRR) wherein anglers and or resort owners saved their fish heads for our personnel. These NRRs were not used to estimate the harvest of marked hatchery origin (Ad+CWT) chinook salmon (Table 6). However, were used to calculate run timing (Figure 9).

Of these 96 tags, 74 were adult chinook salmon while 22 were grilse chinook salmon. This year there were three tags not included in Table 6 that were from chinook tagged on the Columbia River. The three were from Wells Hatchery, Snake River and Wenatchee. The fourth tag not included in Table 6 was from a fish with a tag from a 2001 brood year. The fish was 91 cm. The tag was actually lost during extraction, but a “tag” was found...not the correct one. We assigned it a tag code of 700000. This tag code is for unresolved tags.

Fin-clipped fall run grilse ranged in size from 45 to 75 cm and averaged 53.2 cm. Fin-clipped fall-run adults ranged in size from 59 to 102 cm and averaged 74.7 cm. All fin-clipped fish observed in the angler survey were assigned a head tag which allowed tracking of each adipose clipped fish through the extraction and decoding process.

There are standard codes for tags not recovered; 100000- no tag found, 200000- tag lost,

300000-no head recovered; 400000-tag unreadable; and 700000 tag code unresolved. For the heads recovered this season, seven heads had no tags in them (100000), one was lost during extraction (200000), one head was not recovered (300000) and no tags were unreadable (400000), while the 87 remaining were all decoded.

Hatchery Contribution

Randomly recovered, marked chinook composed 2.4 % (79/3,267) of the actual chinook harvested. With expansions made for sampling and tag code, I estimate 1,735 hatchery fish were harvested (Table 7). Hatchery fish represented an estimated 21.9% (1,735/7,913) of the entire sport harvest. We recovered 75 random recovered tags from Klamath and Trinity Basin origin chinook.

In addition to the random recovered tags, we had 17 non-random recovered (NRR) tags. These are heads brought to us from fish with adipose clips that were recovered on days we were not sampling a particular area. These are used for run timing purposes. Ten of these NRR tags were from adult chinook and seven from grilse based on the estimated size of head at the time of recovery or recorded fork length. One of the ten NRR adults and one of the seven NRR grilse did not have tags in them (100000).

Klamath River Origin Chinook Salmon

We decoded 16 random recovered tags from Klamath River origin chinook (0 five-year-olds, 5 four-year-olds, 7 three-year-olds and 4 two-year-olds). These chinook represent seven marked groups from Iron Gate Hatchery (Table 6). When expanded by sampling and by tag code Iron Gate Hatchery origin fish account for 13.9% (1,106/7,913) of the sport harvest (Table 7).

The peak for Klamath River origin chinook harvest was Julian Week 34, Personnel recovered Klamath River coded-wire-tagged fish between Julian week 34 and Julian week 38. Harvest of marked chinook dropped off completely by the end of Julian week 40 (Figure 9).

Trinity River Origin Chinook Salmon

We decoded 48 random recovered tags from Trinity River fall-run origin chinook (1 five-year-olds, 17 four-year-olds, 20 three-year-olds and 10 two-year-olds). We also randomly recovered 4 spring-run Trinity River Hatchery origin chinook (0 five-year-olds, 0 four-year-olds, 4 three-year-olds and 0 two-year-olds, Table 6). Of these tags, 15 fall-run and 4 spring-run Trinity River Hatchery mark groups were represented. Trinity River origin fish represented 7.9% (629/7,913) (7.2% fall-run and 0.74% spring-run) of all the marked chinook in the angler survey (Table 7).

Trinity River spring-run chinook tag recovery began during Julian Week 29 and extended through Julian Week 36. Fall-run fish began to appear in tag recoveries during Julian week 34

and continued through Julian Week 40. Trinity River fall-run tags peaked during Julian weeks 36 and 37 (Figure 9).

During the 2002 season, sport in-river harvest by stock can be described as follows: Trinity River spring-run chinook dominated the harvest up to Julian week 34. Klamath River fall-run chinook were present and peaked at Julian week 37. The bulk of the Trinity River fall-run tags were collected during Julian week 36. No more coded-wire tagged chinook were recovered after Julian week 40 (Figure 9). However, I believe the data is skewed to earlier in the season because no tags were recovered in the creel census after Julian Week 40, anglers stopped harvesting fish later in the fish kill.

Table 6. Coded-Wire-Tag Information from Iron Gate Hatchery (IGH) and Trinity River Hatchery (TRH) for Chinook Salmon Obtained from the Lower Klamath River Creel 2002 season.

CWT Codes	Release Data			Recovery Data			
	Strain	BY	Site	Creel	NRR	FL	Dates
Adult Chinook							
06-52-35	Fall	97	TRH	1	0	89	9/4
06-26-41	Fall	98	TRH	15	1	64- 102	8/23-9/19
06-52-45	Fall	98	TRH	1	0	78	9/15
06-56-42	Fall	98	TRH	1	0	85	9/6
0601020301	Fall	98	IGH	0	1	82	8/26
0601020303	Fall	98	IGH	1	0	85	9/19
0601020304	Fall	98	IGH	4	1	81 - 91	8/23-9/19
06-52-50	SPR	99	TRH	0	1	--	7/25
06-52-52	SPR	99	TRH	1	0	78	8/15
06-52-53	SPR	99	TRH	0	1	77	8/10
06-52-58	SPR	99	TRH	3	0	67 - 79	7/18-9/7
06-52-54	Fall	99	TRH	2	3	64 - 87	8/25-9/25
06-52-56	Fall	99	TRH	1	0	81	9/7
06-52-57	Fall	99	TRH	2	0	64, 72	9/8-9/23
06-52-59	Fall	99	TRH	15	1	59 - 84	8/31-9/7
0601020310	Fall	99	IGH	3	0	72 - 87	9/7- 9
0601020311	Fall	99	IGH	3	0	66 - 77	8/25-9/19
0601020312	Fall	99	IGH	1	0	73	8/23
100000	no tag found			4	1	67- 78	7/11-9/18
200000	Tag lost			1	0	61	9/13
300000	Head not			1	0	78	9/15

	recovered						
Total				60	10		
Grilse Chinook							
06-52-70	SPR	00	TRH	0	1	--	7/26
06-52-65	Fall	00	TRH	1	0	52	9/13
06-52-67	Fall	00	TRH	1	0	55	9/9
06-52-71	Fall	00	TRH	1	0	56	9/7
06-52-72	Fall	00	TRH	1	0	59	10/5
06-52-73	Fall	00	TRH	2	0	51, 55	8/26, 9/12
06-52-76	Fall	00	TRH	1	1	53, 58	9/9, 9/11
06-52-80	Fall	00	TRH	3	0	49 - 52	9/13-9/23
0601020305	Fall	00	IGH	0	1	56	9/12
0601020307	Fall	00	IGH	0	1	56	9/12
0601020309	Fall	00	IGH	1	1	75	9/7 - 9/9
06-63-53	Fall	00	IGH	0	1	45	9/5
06-63-54	Fall	00	IGH	3	0	46,47	9/13-9/15
100000	no tag found			1	1	50	7/11, 9/9
Totals				15	7		
Grand Total				75	17		

Table 7. 2002 Creel Survey Recoveries of Coded-Wire Tagged Chinook Salmon Expanded for Sampling and Hatchery Production By Brood Year.

Hatchery Run	Brood Year				Expanded Total	% by Hatchery Run	% of total harvest
	1997	1998	1999	2000			
TRH SPR	0	3	52	4	59	3.4	0.7
TRH Fall	25	153	291	101	570	32.8	7.2
IGH Fall	0	361	539	206	1,106	63.7	13.9
Total	25	517	882	311	1,735		21.9
% by year	1.4	29.7	50.8	17.9			

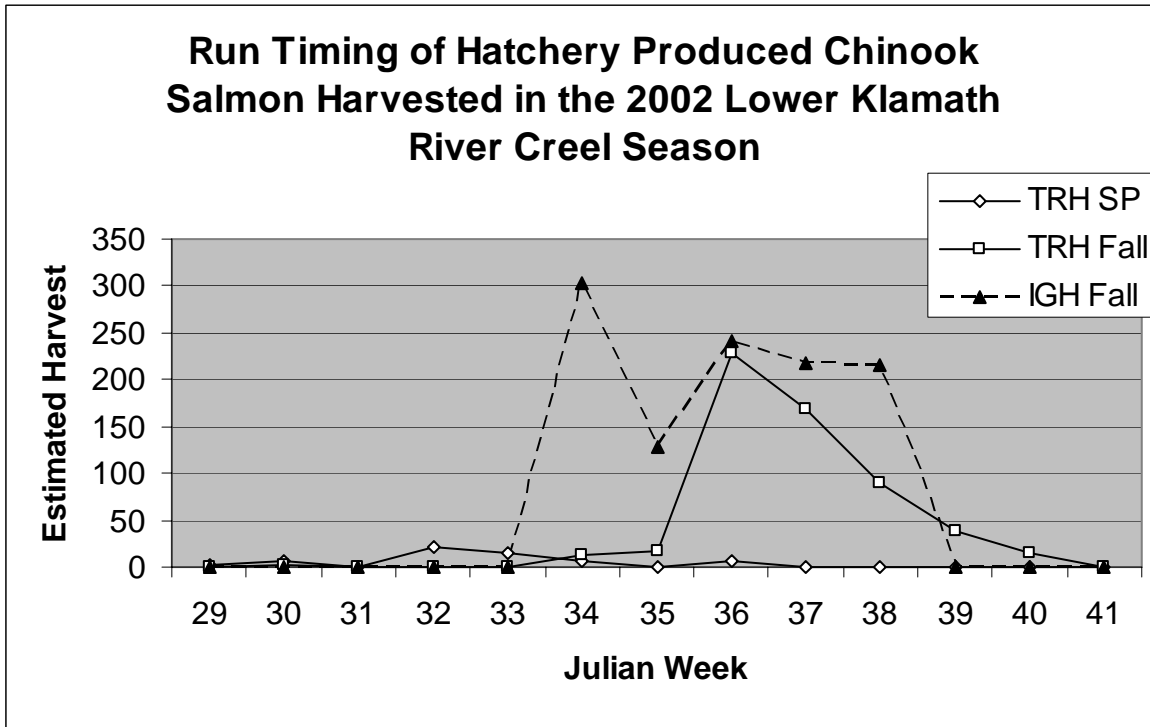


Figure 9. Timing by Julian Week of Coded Wire Tags, Expanded for Sampling and by Individual Tag Code, Recovered from Chinook Salmon in the Lower Klamath River 2002 Creel Season.

Potential Impacts of Fish Kill on Sport Fishery

When comparing the run timing of the 2002 to the 2001 season for adult chinook salmon it appears that anglers may have missed out on at least three to four weeks of fishing due to the large number of fish dieing. Both years had large quotas, and were not constrained by seasons, restrictions or closures. The 2002 seasons' harvest of adult chinook was well ahead of 2001 by the time fish started dieing during the end of Julian Week 37(Table 8).

The loss of three to four weeks angling opportunity hurt the local economy. People left in droves as the carcasses of dead fish piled up on the beaches around them. Many of the guides cancelled their trips because of the die off.

Table 8, Chinook Harvest and Released from the Lower Klamath River Creel in the 2001 and 2002 Seasons by Julian Week.

JULIAN WEEK			Harvest				Released			
	2001 Hours	2002 Hours	01 Chinook Grilse Adult		02 Chinook Grilse Adult		01 Chinook Grilse Adult		02 Chinook Grilse Adult	
32	2,950	5,148	10	123	24	164	24	12	7	39
33	8,092	7,416	45	583	9	560	2	40	0	37
34	8,900	10,689	55	501	81	1,238	23	44	68	157
35	12,230	15,094	97	1,574	72	973	22	226	73	189
36	14,108	14,863	79	655	213	2,316	19	48	130	1,010
37	12,500	12,947	304	1,384	150	1,092	54	505	73	448
38	10,106	10,693	141	1,294	33	788	23	457	34	889
39	7,272	4,305	248	647	49	117	84	152	11	144
40	5,106	2,126	74	368	7	16	26	175	9	64
41	3,416	1,380	75	112	0	11	112	47	0	7
42	1,832	541	40	38	0	0	50	7	0	0
43	1,042	488	8	8	0	0	29	15	2	2
44	496	236	0	0	0	0	0	5	0	0
Total	88,051	85,925	1,178	7,285	638	7,275	468	1,732	405	2,985

DISCUSSION

During the 2000 creel season, a terminal hook and line gear restriction was implemented at the mouth to reduce the chance of fish being snagged. Because of the configuration of the mouth (longer channel flowing through the spit) during the 2002 season it was the prime area of harvest during this fishing season. The gear restriction seems to have done little to restrict harvest. Weather has had more impact on limiting harvest than gear restrictions.

The large quota made for happy anglers and data was easy to gather. With such a large quota, I believe anglers were taking advantage and making multiple trips and taking more fish than what was legally allowed. For anglers below the Hwy 101 bridge to actually release fish, means there had to be plenty of full freezers. When possible, creel technicians will report flagrant disregard of regulations to Law Enforcement.

No more coded-wire tagged fish were collected from the sport creel after Julian Week 40. Fishing effort had dropped off significantly as a result of the fish kill.

CONCLUSION

The 2002 season resulted in the 8th largest run-size (CDFG 2002) for fall-run chinook salmon in the Klamath Basin over the last 26 years and the catch per hour for all chinook salmon (grilse and adults combined) for this season was the highest on record. This seasons' harvest was predicted to be larger and probably have been greater for both the sport and gill-net harvest if the fish kill had not occurred.

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Appendix 1. List of Julian weeks and their calendar equivalents.

Julian week	Inclusive dates			Julian week	Inclusive dates		
1	01-Jan	-	07-Jan	27	02-Jul	-	08-Jul
2	08-Jan	-	14-Jan	28	09-Jul	-	15-Jul
3	15-Jan	-	21-Jan	29	16-Jul	-	22-Jul
4	22-Jan	-	28-Jan	30	23-Jul	-	29-Jul
5	29-Jan	-	04-Feb	31	30-Jul	-	05-Aug
6	05-Feb	-	11-Feb	32	06-Aug	-	12-Aug
7	12-Feb	-	18-Feb	33	13-Aug	-	19-Aug
8	19-Feb	-	25-Feb	34	20-Aug	-	26-Aug
9 a/	26-Feb	-	04-Mar	35	27-Aug	-	02-Sep
10	05-Mar	-	11-Mar	36	03-Sep	-	09-Sep
11	12-Mar	-	18-Mar	37	10-Sep	-	16-Sep
12	19-Mar	-	25-Mar	38	17-Sep	-	23-Sep
13	26-Mar	-	01-Apr	39	24-Sep	-	30-Sep
14	02-Apr	-	08-Apr	40	01-Oct	-	07-Oct
15	09-Apr	-	15-Apr	41	08-Oct	-	14-Oct
16	16-Apr	-	22-Apr	42	15-Oct	-	21-Oct
17	23-Apr	-	29-Apr	43	22-Oct	-	28-Oct
18	30-Apr	-	06-May	44	29-Oct	-	04-Nov
19	07-May	-	13-May	45	05-Nov	-	11-Nov
20	14-May	-	20-May	46	12-Nov	-	18-Nov
21	21-May	-	27-May	47	19-Nov	-	25-Nov
22	28-May	-	03-Jun	48	26-Nov	-	02-Dec
23	04-Jun	-	10-Jun	49	03-Dec	-	09-Dec
24	11-Jun	-	17-Jun	50	10-Dec	-	16-Dec
25	18-Jun	-	24-Jun	51	17-Dec	-	23-Dec
26	25-Jun	-	01-Jul	52 b/	24-Dec	-	31-Dec

a/ Eight-day week in each leap year (years divisible by 4).

b/ Eight-day week every year.