1998 to 1999 Willow Creek Anadromous Monitoring Spawning and Downstream Migrant Trap Report

Funded by: Senate Bill-271
Department of Fish and Game
Contract #FG 8078 WR

Prepared By: Lower Trinity Ranger District
Six Rivers National Forest
October 7, 1999

Contract:	#FG 8078 WR
Location of Work:	The map coordinates of the trap are T7N, R5E, Section 29. The trap is accessed by taking Hwy 96 at Willow Creek and going north across the bridge that crosses Willow Creek, turn right at the gate adjacent to the motel, and down through a Willow Creek Community Services District easement. The trap site is approximately 260 meters upstream of the confluence of Willow Creek and the Trinity River. The spawning survey reach is also best accessed at the mouth of Willow Creek.
Dates of Work:	Spawning surveys were conducted from late October 1998 through late December on Willow Creek. The downstream migrant trap was installed in Willow Creek and operating by March 23, 1999. Fish were counted from March 24, 1999 through July 19, 1999.
Hours:	Approximately 100 hours will be charged to CDFG, for this first season of operation; exact costs will be submitted with our first bill.
Costs:	About $1,000 will be charged to CDFG for this first season of operation; exact costs will be submitted with our first bill. The majority of the 1999 trapping costs will be covered by USFS.
Project Objectives:	This project has several purposes. Spawning surveys and downstream migrant trapping helps evaluate habitat quality and the success of past enhancement efforts in Willow Creek. It also serves as a control for past Horse Linto Creek hatchery supplementation. A separate, but similar and related study is occurring in Horse Linto Creek as well.

Executive Summary

This report ties together two related, but separate tasks: fall salmon spawning surveys and spring/summer juvenile salmonid down-stream-migrant (DSM) trapping. Both tasks are discussed in chronological detail on the following pages. This work could not continue without financial assistance, such as the CDFG grant we received that will fund work up to winter 2001. Conducting both tasks provides us with much better information and a more complete picture of what's going on with anadromous fish than only conducting one task or the other.

Fall spawning surveys found only 17 chinook redds in 1998, which is by far the lowest number of redds seen in Willow Creek during this decade. The previous low was 34 redds, and the average of 1991 to 1997 was 74 redds. However, 1999 DSM trapping work estimated 18,468 chinook outmigrants, the highest number documented this decade and more than double the average of the previous four years. Chinook outmigration peaked in late June this year and almost all juvenile chinook appeared to have emigrated by the time the trap was closed in July.

The Horse Linto Creek watershed had similar chinook results, with very low numbers of spawners producing record numbers of outmigrants. Horse Linto is the nearest adjacent Trinity tributary containing chinook and was the site of a hatchery supplementation project. The Willow Creek chinook population was augmented (as in past years) by at least one stray from the Horse Linto Hatchery in 1998.

The dichotomy of low spawner numbers resulting in record high numbers of outmigrants cannot be precisely explained, but the following facts are relevant to the discussion: Some redds were almost certainly missed. High flows and chronic turbidity during the 1998 spawning season may have been factors (see Appendix A for survey dates) in missing redds. Another possible explanation is that a number of fish spawned after our surveys ended; we did observe that chinook spawning in several other watersheds including Horse Linto continued into late January.

Several factors may have resulted in better egg to alevin survival. Spawning began later than usual in Willow Creek, basically after the stream flow rose, so redds were generally constructed in better (safer from erosive flooding) locations than many redds were in previous years. Large woody debris enhancement projects in Willow Creek have increased stream complexity and improved spawning. Storm events from 1998 to 1999 in Willow Creek did not seem to create as much stream scour in 1998 to 1999 as we have seen in recent years.

No coho spawners were positively identified in Willow Creek, but the DSM trapping did find 4 young of the year (YOY) coho, the first we have seen in Willow Creek since 1996. Both adult and juvenile coho were also seen in the Horse Linto watershed.

Our spawning surveys cannot reliably document steelhead spawning, but DSM trapping found 450 1+ steelhead. There was insufficient data to make population estimates for steelhead. DSM trapping also documented 8,035 YOY steelhead. The abundance of YOY steelhead makes it appear that at least the lower two miles of Willow Creek provide good recruitment of steelhead; their survival to smolt stage will probably be enhanced by CDFG's recent fishing closure in Willow Creek.

1998 CHINOOK AND COHO SPAWNING REPORT
LOWER TRINITY RANGER DISTRICT
SIX RIVERS NATIONAL FOREST
WILLOW CREEK

Prepared By: Becky L. Dutra and Sean A. Thomas,
AmeriCorps Watershed Stewards Project

Edited By: Lee Morgan, USFS

Methods and Materials

Spawning surveys were conducted from mid October 1998 through late December on Willow Creek. AmeriCorps Watershed Stewards Project (WSP) members Becky L. Dutra and Sean A. Thomas were the primary surveyors and received assistance from experienced fisheries personnel and volunteers, and other WSP members. Occasionally surveys were prevented due to inclement weather and subsequent high flows; they commenced again when water levels allowed surveyors to work safely and accurately. Spawning survey effort has been relatively constant over the last eight years.

The primary species of anadromous fish observed in Willow Creek, was chinook salmon (*Oncorhynchus tshawytscha*). Fish habitat has been augmented in many places to mimic or enhance natural spawning sites; redd sites found near an enhanced site are recorded as artificial, whereas redds found where no augmentation has occurred are said to be natural. Numbers of live fish were recorded for informational purposes only, as an indicator of fish activity.

LTRD spawning crews collected heads from carcasses that possessed an adipose-fin-clip in order to recover CWTs. The 1998 sample size of CWTs was very small. Only fifteen CWTs were recovered out of seventeen adipose-fin-clipped fish found. One CWT was lost during recovery, lowering the total number of CWTs to fourteen. Of these, only one was originally recovered in Willow Creek. The heads were processed by LTRD personnel at the Hoopa Valley Tribal Fisheries office in Hoopa, CA. All CWTs were read by B. Dutra with assistance by S. Thomas and Hoopa Tribal Fisheries staff and were double-checked by Bill Jong at the CDFG office in Arcata, CA.

Scales were collected from carcasses retrieved from Willow Creek. B. Dutra and S. Thomas mounted all the readable scales at the Hoopa Tribal Fisheries Office These scales were then aged by readers in the Yurok Tribal Fisheries Program and in part by readers at the Hoopa Tribal Fisheries Department. The age class components were calculated as a percentage of the total carcass sample size for each watershed and are presented in Figure 1 on page **6**. Aging accuracy was an issue with all LTRD scale samples. Based on a sample size of thirteen fish with both a CWT (known age) and scales, Yurok readers aged eleven fish correctly (at least two of three readers aged correctly) and two incorrectly (two or more readers aged incorrectly) for an accuracy of 85%. Scale sample sizes from fish of an unknown age were small, with only 13 samples from Willow. Small sample sizes should serve as a caution when viewing and making assumptions about the given age classes shown in Figure 1; this data is for general information purposes only.

Results and Discussion

Coho

Our surveyors were never sure they observed coho in Willow Creek and no coho carcasses were recovered. They thought they might have seen coho and subsequent DSM trapping did yield a few (young of the year) YOYs in summer 1999.

Chinook

Table 1 shows that only a total of 17 redds were found in Willow Creek in 1998. This is the lowest observed spawning activity since 1991 (the total number of redds recorded from 1991 to 1998 on Willow Creek are shown in Appendices B & C). About 40 % of redds were located at enhanced sites. Using the CDFG recommended expansion of 2.25 fish per redd, the total number of spawning fish in Willow Creek in 1998 was calculated as 38 fish.

Table 1
1998-99 Lower Trinity Ranger District spawning survey totals for chinook salmon (*Oncorhynchus tshawytscha*) for comparison with previous years.

CREEK	LIVE FISH	CARCASSES				REDDS		
		F♀	M♂	U	TOTAL	NAT	ART	TOTAL
Willow	29	6	2	10	18[α]	11	7	17

This total seems extremely low, and DSM trap data on Willow Creek for 1999 should indicate how accurate LTRD spawning surveys were. DSM data indicated that either many more fish spawned than were documented or that egg to alevin survival was very high. Perhaps both explanations are partially valid.

High flows and chronic turbidity during the 1998-spawning season may have been factors (see Appendix A for survey dates) in missing redds. Locating 18 carcasses, but only 17 redds likewise suggests redds were missed. However, Willow Creek spawning surveys are annually hampered by turbidity and 1998 survey results should have been similar to previous years and recorded the majority of redds observable during the survey period. Another possible explanation is that a number of fish spawned after our surveys ended; we did observe that spawning in several other watersheds including Horse Linto continued into late January.

Several factors may have resulted in better egg to alevin survival. Spawning began later than usual in Willow Creek, basically after the stream flow rose, so redds were generally constructed in better (safer from erosive flooding) locations than many redds were in previous years. Large woody debris enhancement projects in Willow Creek have increased stream complexity and improved spawning. Storm events from 1998 to 1999 in Willow Creek did not seem to create as much stream scour in 1998 to 1999 as we have seen in recent years.

Hatchery Component of Spawners

The CWTs recovered on the Lower Trinity Ranger District during the 1998 season were mostly from Horse Linto Hatchery fish. Horse Linto Hatchery fish were 100% ad-clipped/tagged

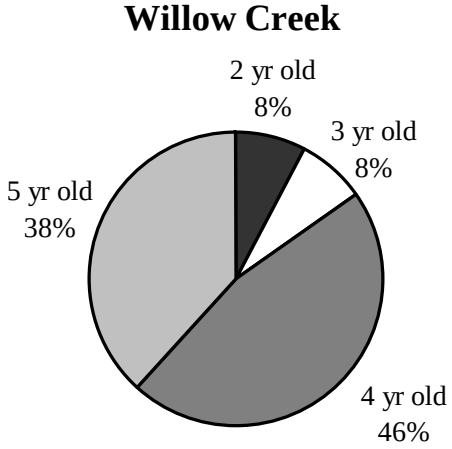
when possible. This year a total of eleven CWTs were recovered from five-year-old, 1993 brood year, Horse Linto Hatchery chinook (#062928). One chinook from the Horse Linto Hatchery was found in Willow Creek and the remainder was found within the Horse Linto Creek watershed. Such occasional straying to Willow Creek has been seen in most of the previous years in this decade.

Age Component of Spawners

Scales recovered from 13 Willow Creek carcasses suggested that Willow had the age classes shown in Figure 1. This information should not be relied on too heavily due to the small sample size, but it is fairly consistent with the results from the Horse Linto watershed, which had a larger sample size (see that accompanying report). The scale data showed varying growth realized for each of the age classes recovered. In some cases as much as a ten-inch difference in fork-length per age class was noted. Also, there was a noticeably high percentage of five-year-olds returns (Figure 1). It is not known why a greater number of fish held over in the ocean an additional year before returning to spawn. These growth and migration observations may be attributed to the El Nino event that occurred in 1998.

We did not expect to see a large number of returning four-year-old chinook. This was because DSM numbers in 1995 for YOY chinook in Willow Creek were very low, apparently due to the flooding that occurred that winter in this and other watersheds.

Figure 1
1998-99 age class percentages of spawning salmon in Willow Creek on the Lower Trinity Ranger District as calculated from scale samples



Appendix A
Willow Creek 1998 Spawning Survey Summaries on the Lower Trinity Ranger District

Willow Creek

REACH	DATE	LIVE FISH	CARCASSES	REDDS
0 – 8100	10/16/98	0	0	0
0 – 8100	10/22/98	0	0	0
0 – 8100	10/28/98	2	0	0
0 –10800	11/02/98	3	1	3
0 – 10020	11/09/98	2	1	1
0 – 10020	11/20/98	18	0	6
0 – 10000	12/17/98	1	7	6
0 – 9450	12/29/98	3	9	1
TOTALS	**8 Survey Days**	**29**	**18**	**17**

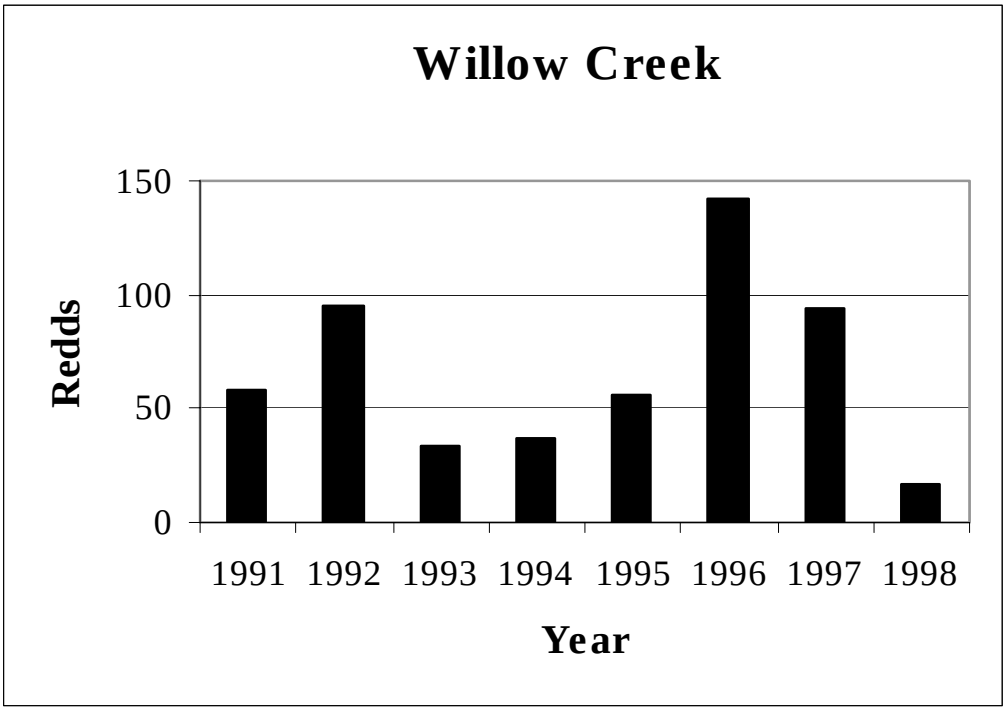
Appendix B

Willow Creek Spawning Survey Totals from 1991 to 1998 on the Lower Trinity Ranger District

CREEK	SURVEY DAYS	LIVE FISH	CARCASSES	REDDS		TOTAL REDDS
				NAT	ART	
1991	4	57	29	37	21	58
1992	5	100	13	68	27	95
1993	9	74	17	15	19	34
1994	6	81	8	28	9	37
1995	5	112	13	35	21	56
1996	5	215	53	59	83	142
1997	7	138	43	71	23	94
1998	8	29	18	14	3	17

Appendix C

Redd Totals for Willow Creek from 1991 to 1998 for the Lower Trinity Ranger District



1999 Down Stream Migrant (DSM) Trapping Report

LOWER TRINITY RANGER DISTRICT
SIX RIVERS NATIONAL FOREST
WILLOW CREEK

Prepared By: Cindy A. Walker, USFS

DSM Trapping Executive Summary

The downstream migrant trap was installed in Willow Creek and operating by March 23, 1999. Fish were counted from March 24, 1999 through July 19, 1999. Fish were trapped for a total of 107 days. In 1995 through 1999, a rotary screw trap was used on Willow Creek. In 1991 through 1993 pipe traps were used in Willow Creek, in 1994 no trapping was done in Willow Creek.

A total of 4,740 chinook salmon (*Oncorhynchus tshawytscha*), 4 coho salmon *(Oncorhynchus kisutch)*, and 8,485 steelhead trout (*O. mykiss)* were captured. 8,035 steelhead were YOY (young of the year), and 450 steelhead were 1+ (one year old or older). The overall catch per unit effort or CPUE (number of fish captured per trapping day) was 44.30 for chinook, and 79.30 for steelhead. Other fish species caught in the trap were 525 dace (*Rhinichthys spp.*), 60 sculpin (*Cottus spp.*), 111 lamprey (*Entosphenus spp.*), 2 threespine sticklebacks (*Gasterosteus aculeatus*), and 1 sucker (*Catostomus spp.*).

The expanded population estimates of total outmigration during the period of trapping for chinook were 18,468. This is the largest number of outmigrants estimated per year in this decade. Chinook outmigration peaked in late June this year.

There was insufficient data to make population estimates for steelhead. The abundance of YOY steelhead make it appear that at least the lower two miles of Willow Creek provide good recruitment of steelhead; their survival to smolt stage will probably be enhanced by CDFG's recent fishing closure in Willow Creek.

This year, the spring/summer peak emigration of one year old and older steelhead occurred in April. An unknown number of 1+ steelhead emigrated in the winter, when we were unable to trap. We plan to install the trap by the end of March to best monitor the 1+ steelhead and YOY chinook in 2000.

Introduction

In 1999, for the eighth year, a downstream migrant trap was placed in Willow Creek in order to monitor the outmigration of juvenile salmon and steelhead. In 1991 through 1993, pipe traps were used in Willow Creek, but this technique was ineffective. In 1994, no trapping was done in Willow Creek. In 1995 through 1999, a rotary screw trap was used in Willow Creek. The downstream migrant trap was installed in Willow Creek and operating by March 23, 1998. Fish were counted from March 24, 1998 through July 19, 1994, for a total of 107 trapping days. There were two rotary screw traps in operation this year, one in Willow Creek, and the other in Horse Linto Creek.

Willow Creek is large tributary of the Trinity River located in Humboldt County, California. The first 2 miles are utilized by salmon, and an additional 12 miles are accessible to determined steelhead when low flow barriers can be passed. The map coordinates for the confluence of Willow Creek with the Trinity River are T7N, R5E, and Sec. 29. The Willow Creek watershed is currently under a Coordinated Resource Management Plan (CRMP) program between the California Department of Fish and Game (CDF&G), Willow Creek Community Services District (WCCSD) and Six Rivers National Forest (SRNF). The objective of the CRMP program is to restore the salmon and steelhead populations of Willow Creek.

A considerable amount of restoration work has taken place within the Willow Creek basin. Boulder weirs, boulder deflectors and boulder clusters have been placed in Willow Creek to create spawning and rearing habitat for anadromous salmonids. Twenty large woody debris structures have been added to the stream to provide cover and complexity. Blasting has been done to improve access for steelhead at nine barrier sites. Approximately forty-five acres of erosive surfaces and slide areas were re-vegetated in the Willow Creek drainage between 1989 and 1999.

The effectiveness of these projects in improving salmonid habitat has been monitored through a variety of studies. Spawning surveys by the SRNF are conducted annually to determine the number of salmon redds. Willow Creek was habitat typed in 1987 and 1991 to determine the amount and types of habitat available for use by salmonids. For further information on studies and restoration work conducted on Willow Creek see the 1992 Willow Creek Stream Report (Dale and LeBlanc, on file at the Lower Trinity Ranger District).

This downstream migrant trap study was conducted to provide an annual index of the production of chinook and coho salmon, and steelhead. In addition, it provides an indication of the effectiveness of the previously noted habitat improvement work.

Materials and Methods

A rotary screw fish trap manufactured by E. G. Solutions, Inc. was used in 1999. The trap is powered by water entering a 1.5-meter diameter cone. Moving water enters the perforated cone and impinges upon an internal auger screw assembly causing the cone to turn. Fish entering the cone are forced into and retained in a live box. Mop heads are used in the live well to provide escape cover for smaller fish. The trap was emptied daily when it was in use. The cone was elevated out of the water by a winch when it was not in use.

When comparing data with downstream migrant traps on the Klamath and Trinity River, as well as previous years in Willow Creek, there have been significant numbers of fish moving downstream in March and April (Craig 1990). We have set a goal for getting the trap in the water

in March and to be trapping by April 1st. This year we were able to achieve our goal. We feel that we were trapping when the majority of the chinook were migrating this year.

The map coordinates of the trap are T7N, R5E, Section 29. The trap site is approximately 260 meters upstream of the confluence of Willow Creek and the Trinity River (Figure 1). The trap was placed in the thalweg of the creek, except when high flows prevented it.

Fish were counted seven days a week when the weather permitted, and personnel were available to operate the trap. We closed the trap in windy and stormy conditions or on weekends when no personnel was available. The trap was closed for one day in March, three days in April, three days in May, one day in June, and three of the days that the trap was open in July, for a total of 11 days during the trapping period. See the comment section of the Appendices for days when the trap was closed.

When there were large numbers of fish, the fish would be grouped into size classes by species. The size classifications of fish fork lengths started at 25-40 mm, and recorded in increments of 10 mm, e.g. 41-50, 51-60, and 61-70 etc., up to >160 mm. When there were more than 10 fish of the same species and size, they would be scooped into a pan and a subset measured. For example, 10 fish estimated to be in the 25-40 mm class size would be grouped together and two of them measured. The data collector would then enter 10 fish in the 25-40 mm size class.

The fish were immediately returned to the creek unless they were to be used for mark and recapture efforts to measure trap efficiency. Coho, YOY steelhead, and chinook less than 51 mm were not used to measure trap efficiency. Fish used to test trapping efficiency were taken approximately 160 meters upstream in buckets and dyed with Bismark Brown Y dye. Two grams of dye were used per 25 gallons of water. Fish were placed in the dye solution for approximately 20 minutes, and then they were counted and released. The dye was effective for a maximum of three of four days. Over 85% of the recaptured fish were caught the following day. A few more were caught on the second day, and rarely one or two the third day. The dyed fish that were recaptured in the trap were used for gauging the efficiency of the trap. Trap efficiency was calculated as the percentage of the dyed fish that were trapped again.

For the days during which the trap was closed, an estimated capture was calculated by averaging the previous four days' catch, or the following four days' catch. These numbers were added to the totals of fish actually caught to estimate the total migration out of the stream during the trapping period. To determine the expanded population estimate, we took the total chinook caught that week, and added in the estimated capture for the days the trap was closed; that number was divided by the trap efficiency. Five mark and recapture tests were done with chinook to determine the trap efficiencies (Table 1). The mean was 27.88%, with a standard error of 3.2. Mark and recapture tests were preformed May 19 through June 29, 1999.

We had insufficient data to try to estimate an expanded population of 1+ steelhead. Separating juvenile steelhead into 1+ and 2+ classes was problematic due to differential growth rates so it was not attempted. However, separating YOYs from 1+ (one year old and older) was relatively easy. Steelhead with fork lengths longer than 51 mm in March and April were called 1+. Fork lengths longer than 61 mm were called 1+ in May and the first week in June. Steelhead with fork lengths longer than 71 mm were called 1+ for the rest of the trapping season.

Results

More chinook and steelhead were trapped this season than in any previous year on Willow Creek (Table 2). The CPUE for chinook and steelhead in 1999 was also higher than in previous trapping years (Table 3).

Chinook

A total of 4,740 chinook were caught during the 1999 trapping season. When we added the estimated the number of fish that might have been caught on the days the trap was closed, we came up with 5,149 chinook during the trapping season. Using the trap efficiency data, and estimated captures for when the trap was closed, we estimated that 18,468 chinook salmon outmigrated during the trapping period. The catch per unit effort or CPUE (number of fish captured per trapping day), for the season was 44.30 fish per day. The peak weekly total (week when the most chinook were caught in the trap) occurred during the week of June 20 through June 26 (Figure 2). A total of 980 chinook were caught during that week. The CPUE for that week was 140.00 fish. The highest numbers of chinook caught on any one day was June 29, when 280 chinook were caught in the trap.

Chinook fork lengths were separated into size classes and graphed to demonstrate how the frequency of each size class shifted throughout the season (Figures 3-7). Since we caught chinook for only five days in March, I didn't try to draw any conclusions on size classes or graph size classes. During the months of April and May, the dominant size class was less than 40 mm. In June, the 41- 50 mm size class and the 51-60 mm size class chinook were almost equal at 1237 and 1238. Trapping mortalities for chinook were 0.25% for the entire trapping period.

Steelhead

A total of 8,485 steelhead were captured in the trap. Of those, 450 steelhead were in the 1+ age group. The CPUE of all steelhead for the season was 79.30 steelhead per day. The weekly peak occurred during the week of June 13 through June 19 (Figure 8). 2,346 steelhead were caught in the trap that week. The CPUE for that week was 335.14 steelhead per day. The highest numbers of steelhead caught on any one day was June 15, when 471 steelhead were caught in the trap. The weekly peak for 1+ steelhead occurred during the week of May 16 through May 22 (Figure 9). A total of 108 1+ steelhead were caught in that week. The CPUE for the 1+ class was 4.20 steelhead per day.

Steelhead fork lengths were separated into size classes and graphed to demonstrate how the frequency of fish found in each size class shifted throughout the season (Figures 10-15). In April, 71-80 mm steelhead were the most frequently caught. In May, 81-90 steelhead were the most frequently caught. In June, and July, 25-40 mm young of the year steelhead emerging from the gravel were the most dominant size class. Reported trap mortalities for steelhead were very low, averaging less than 1% for steelhead during the entire trapping period. Since we caught steelhead for only four days in March, I didn't try to draw any conclusions on size classes or graph size classes.

Steelhead 1+ outmigration was reasonably good this year, but YOY production was much higher than previous years. Presumably the watershed was well seeded with steelhead last year.

Coho

Four coho salmon were caught this year in the Willow Creek trap. They were caught in June and July, and were in the 41-60 mm size classes.

Miscellaneous Fish

Total numbers of non-salmonid fishes caught in the trap, included 525 speckled dace, 60 sculpin, 111 pacific lamprey, 2 threespine sticklebacks and 1 sucker.

Discussion

The purpose of the downstream migrant traps is to compare the relationship between redd counts, downstream migrant production, and subsequent adult return, and to monitor the effectiveness of the stream restoration projects in increasing salmon production. The trapping should be a long-term program in order to compare annual variations in production.

As can be seen when comparing Table 3 and Table 4 (Page ??), increases in chinook redds do not always result in increases in downstream migrant chinook, and conversely, lower numbers of redds counted do not mean that there will be fewer fish in the trap the following year. Redds counted in the 1998-1999 spawning season were lower than in the past six seasons, and yet the numbers of fish caught in the trap were higher than ever before. The catch per unit effort (Table 3) shows the dramatic increase in chinook and steelhead numbers.

The Horse Linto Creek watershed had similar chinook results in 1998 to 1999, with very low numbers of spawners producing record numbers of outmigrants. Horse Linto is the nearest adjacent Trinity tributary containing chinook and was the site of a hatchery supplementation project. The Willow Creek chinook population was augmented (as in past years) by at least one stray from the Horse Linto Hatchery in 1998. Horse Linto and Willow have both been on a general upswing in numbers of spawners during this decade, with the exception of 1998. Numbers of outmigrants in Horse Linto have varied annually, presumably in response to egg to alevin survival. There is insufficient data to discuss further similarities or differences between Horse Linto and Willow creeks at this time.

The dichotomy of low spawner numbers in Willow resulting in record high numbers of outmigrants cannot be precisely explained, but the following facts are relevant to the discussion: Some redds were almost certainly missed. High flows and chronic turbidity during the 1998 spawning season may have been factors (see Appendix A for survey dates) in missing redds. Another possible explanation is that a number of fish spawned after our surveys ended; we did observe that chinook spawning in several other watersheds including Horse Linto continued into late January. This thought is consistent with the fact that we saw many late-emerging fry in both watersheds.

Several factors may have resulted in better egg to alevin survival. Spawning began later than usual in Willow Creek, basically after the stream flow rose, so redds were generally constructed in better (safer from erosive flooding) locations than many redds were in previous years. Large woody debris enhancement projects in Willow Creek have increased stream complexity and improved spawning. Storm events from 1998 to 1999 in Willow Creek did not seem to create as much stream scour in 1998 to 1999 as we have seen in recent years. The weekly peak outmigration came late this year. Late spawning and late emergence might have

been advantageous to survival. The stream flows were down in June by the time our peak emigration out of the stream came. DSM trapping appears to be the best way to get an index of the actual results from the prior years spawning.

Our DSM data on 1+ steelhead should only be used as a comparative annual index, but our YOY data appears to give a good indication of how well seeded the stream is in a given year. Based on the last few years data, generally not enough 1+ steelhead were trapped weekly to conduct mark and recapture efforts. In 1996, 298 of 1,511 steelhead were the 1+ class; in 1997, 289 of 1,853 steelhead were 1+; in 1998, 600 of 2,977 were 1+. This year, we captured 450 1+ and older steelhead. The majority of the 1+ steelhead came out in a period of two weeks, and then numbers tapered off to almost nothing. For this reason, trap efficiency tests for 1+ steelhead cannot be performed over the whole season.

We want to stress that our 1+ steelhead data is a production index, rather than a population estimate, since we only trap in spring and summer. Recently emerged steelhead fry that are trapped are most likely just moving downstream in search of a territory in the creek. Those fry that are displaced to the river are likely to have very poor survival to adulthood. For this reason the only meaningful index for steelhead production is the 1+ and older age class.

Minimizing detrimental effects to fish while DSM trapping requires that the crew pays special attention to the weather. When storms cause water levels to rise quickly, large amounts of detritus are picked up and sucked into the trap at a much faster rate than the debris screen on the back is capable of removing it. Size of debris is an issue as well, since the debris screen will only carry away leaves and small woody debris. Large debris can build up and crush the fish in the live box. Sticks and debris that accompany a sudden high water event can pile up in the cone and clog the entrance. Windy conditions have also caused large amounts of wood to be blown down into the stream and carried into the trap. This can also cause the live box or the cone to fill up with debris and kill fish. We continue to monitor the weather and to anticipate when the wind or storms will cause the trap to become inundated with debris, and close the trap.

Recommendations

Install the trap as early as possible. Ideally the trap would be installed and working by the end of March if stream flows will permit. When storm events occur during the trapping season, the trap should be monitored carefully and the cone should be elevated out of the water when the stream carries more debris than the trap screen can remove. Mark and recapture efficiency tests need to be conducted frequently, at least once per week, or anytime that significant changes in fish numbers are noted. We should try using lesser numbers (probably a minimum of 40 chinook or 25 1+ steelhead) to conduct mark and recapture tests next trapping season if greater numbers aren't available in a given week. Having the trap open seven days a week makes it feasible to conduct more mark and recapture tests. We will mark the 1+ and older steelhead whenever large numbers of 1+ and older steelhead are moving downstream.

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