1998 Willow Creek Downstream Migrant Trap Report

Draft

Prepared By: C. A. Walker

Lower Trinity Ranger District

Six Rivers National Forest

September 1998

Executive Summary

The downstream migrant trap was installed in Willow Creek and operating by March 25, 1998. Fish were counted from March 26, 1998 through July 24, 1998. Fish were trapped for a total of 109 days. In 1995 through 1998, 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 2,905 chinook salmon (*Oncorhynchus tshawytscha*), and 2,978 steelhead trout (*O. mykiss)* were captured. 2,378 steelhead were YOY (young of the year), and 600 steelhead were 1+ (one year old or older). The overall catch per unit effort or CPUE (number of fish captured per trapping day) was 26.65 for chinook, and 27.32 for steelhead. Other fish species caught in the trap were 1,323 dace (*Rhinichthys spp.*), 44 sculpin (*Cottus spp.*), 110 lamprey (*Entosphenus spp.*), 6 threespine sticklebacks (*Gasterosteus aculeatus*), and 5 suckers (*Catostomus spp.*). No coho salmon (*Oncorhynchus kisutch*) were caught in the trap this year, nor were any located via snorkeling.

The expanded population estimates of total outmigration during the period of trapping for chinook was 10,236. This is the largest number of outmigrants estimated per year in this decade. 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 will attempt to install the trap by the end of March to best monitor the 1+ steelhead and YOY chinook.

Introduction

In 1998, for the seventh year, downstream migrant traps were 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. In 1994, no trapping was done in Willow Creek. In 1995 through 1998, a rotary screw trap was used in Willow Creek. The downstream migrant trap was installed in Willow Creek and operating by March 25, 1998. Fish were counted from March 26, 1998 through July 24, 1998, for a total of 109 trapping days. There were two rotary screw traps operated this year, one in Willow Creek, and the other in Horse Linto Creek.

Willow Creek is an eleven-mile tributary of the Trinity River located in Humboldt County, California. The map coordinates for the confluence of Willow Creek with the Trinity River are T7N, R5E, 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. The Bureau of Reclamation provides the funding for this project from the Trinity River Restoration Act.

A considerable amount of restoration work has taken place within the Willow Creek basin. Nine boulder weirs, two boulder deflectors and four 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 rearing habitat for fish. 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 1998.

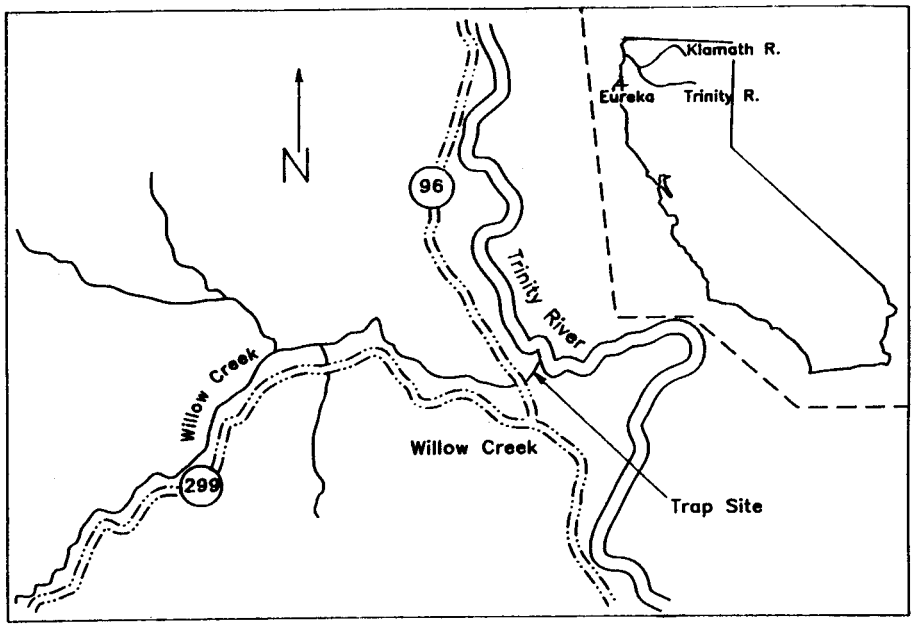
The effectiveness of these projects in improving salmonid habitat has been monitored through a variety of studies. Spawning surveys by the SRNF and CDF&G are conducted annually to determine the number of chinook salmon and steelhead redds. Willow Creek was habitat typed in 1987 and 1991 to determine 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 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 1998. 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. The cone can be elevated out of the water by a winch when it's not in use.

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 flows were too high in the early spring to allow 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 three days in March, five days in April, two days in May, and two days in July, for a total of 12 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 for trap efficiency tests. 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 25 minutes, then they were counted and released. The dye was effective for three or four days maximum. Over 90% 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. The expanded population estimates were determined by the total capture of chinook or steelhead divided by seasonal average percentage that was the determined trap efficiency. For the days during which the trap was closed, an estimated capture was calculated by averaging the previous three days' catch, or the following three 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. Two mark and recapture tests were done with chinook to determine the trap efficiencies. The mean was 34.33%, with a standard error of .026. Mark and recapture tests were preformed on June 11, 1998 and June 16, 1998. Although two mark and recapture tests were not very many, similar results have been seen in the past. In 1996, we were able to mark and recapture chinook twice with an average mean of 34.40%.

Separating juvenile steelhead into 1+ and 2+ classes can be problematic due to differential growth rates, but separating YOYs from 1+ (one year old and older) was relatively easy. Steelhead with fork lengths longer than 50 mm in March and April were called 1+. Fork lengths longer than 60 mm in May were called 1+, and steelhead with fork lengths longer than 70 mm were called 1+ in the rest of the trapping season.

Results

Chinook

A total of 2,905 chinook were caught during the 1998 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 3,514 chinook during the trapping season. Using the trap efficiency data, and estimated captures for when the trap was closed, we estimated that 10,236 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 26.65 fish per day. The peak week total (week when the most chinook were caught in the trap) occurred during the week of April 19 through April 25 (Figure 2). A total of 560 chinook were caught during that week. The CPUE for that week was 112.00 fish. The trap was closed for two days of that trapping week, and 140 fish per day was estimated for those two days. When the estimated daily totals were added in, the weekly total came to 840 chinook. The highest numbers of chinook caught on any one day was April 21, when 157 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 only trapped for three 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 41-50 mm. In June, the 51-60 mm size class chinook were the most frequently caught. By July, the most frequently captured size class was the 71-80 mm size. Reported trap mortalities for chinook were 1.14% for the entire trapping period.

Steelhead

A total of 2,978 steelhead were captured in the trap. Of those, 600 steelhead were in the 1+ and older age group. The CPUE of all steelhead for the season was 27.32 steelhead per day. The weekly peak occurred during the week of June 21 through June 27 (Figure 8). 830 steelhead were caught in the trap that week. The CPUE for that week was 118.57 steelhead per day. The highest numbers of steelhead caught on any one day was June 24, when 203 steelhead were caught in the trap. The weekly peak for 1+ steelhead occurred during the week of April 19 through April 25 (Figure 9). A total of 89 1+ steelhead were caught in that week. The CPUE for the 1+ and older size class was 17.8 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 -14). In April, 71-80 mm 1+ steelhead were the most frequently caught. In May, 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 only trapped for two days in March, I didn't try to draw any conclusions on size classes or graph size classes.

Coho

No coho salmon were caught this year in the Willow Creek trap.

Miscellaneous Fish

Total numbers of non-salmonid fishes caught in the trap, included 1,323 speckled dace, 44 sculpin, 110 pacific lamprey, 6 threespine sticklebacks and 5 suckers.

Discussion

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

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 the smallest of woody debris. Large debris can build up and crush the fish in the livebox. 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 livebox or the cone to fill up with debris and kill fish. We have been trying to anticipate when the wind or storms are causing the trap to become inundated with debris, and close the trap.

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 fish were migrating this year.

More chinook were trapped this season than in any previous year on Willow Creek (Table 1). The high numbers of chinook salmon that were trapped are most likely due to high numbers of adults observed in the winter salmon spawning surveys and favorable conditions for egg to alevin survival (Table 2). The CPUE for chinook in 1998 was also higher than in previous trapping years (Table 3).

As can be seen when comparing Table 1 and Table 2, increases in chinook redds do not always result in increases in down stream migrant chinook. The vagaries of winter weather especially as relates to scouring flooding is believed to have the greatest effect. DSM trapping appears to be the best way to get an index of how many yoys result from the prior years spawning.

In 1996, 298 of 1,511 steelhead were of the 1+ and older age class; in 1997, 289 of 1,853 steelhead were 1+ and older; in 1998, 600 of 2,977 were 1+ and older. For this reason, we will continue to perform trap efficiency tests for chinook, but probably not for the steelhead. Based on the last few years, not enough 1+ and older steelhead are trapped daily to conduct mark and recapture efforts. 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. We expect that this is an index rather than a population estimate for steelhead, since we only trap in spring and summer.

Total steelhead trapped were higher than in previous years, and the numbers of one+ steelhead caught this year was much higher than in previous years. One of the reasons we caught significantly higher numbers of one+ age steelhead was that the trap was installed early, and the one+ and older steelhead when emigration peaked in April.

We have had problems capturing enough fish in the Willow Creek trap to use for mark and recapture studies. This year we were able to mark chinook twice successfully, and use those marks to estimate the numbers of chinook outmigrating during the trapping period.

Recommendations

Install the trap as early as possible. Ideally the trap would be installed by the end of March with trapping to begin as close to the beginning of April as 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 a week, or anytime that significant change in fish numbers are noted. We will use lesser numbers of chinook to conduct mark and recapture tests next trapping season. Having the trap open seven days a week would makes it feasible to conduct more mark and recapture tests. Try to mark the 1+ steelhead at the beginning of the season in April, when the numbers are better.

References

Craig, J. L. 1992. Juvenile Salmonid Trapping on the mainstem Trinity River at Willow Creek and the Klamath River at Big Bar. U.S.F.W.S. Annual Report. FY 1990. AFF-1-FRO-92-13. Arcata, California.

Dale, R. And C. LeBlanc. 1992. Willow Creek stream report: summary of inventories and project work 1985-1992. An unpublished paper on file with Lower Trinity Ranger District, Willow Creek, California.

Lower Trinity Ranger District. 1992. Downstream migrant trap final report: Willow Creek, June-October 1991. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California..

LaBlanc, C. 1992. Downstream migrant trap final report: Willow Creek, May-October, 1992. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California.

Walker, C. A. 1993. Downstream migrant trap final report: Willow Creek, May-July, 1993. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California.

Walker, C. A. 1996. Downstream migrant trap final report: Willow Creek, April-June, 1995. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California.

Walker, C.A and Arey Kent, W. 1997. Downstream migrant trap final report. Willow Creek, April-July 1996. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California.

Walker, C. A. 1997. Downstream migrant trap final report: Willow Creek, April-July, 1997. An unpublished paper on file with Six Rivers National Forest, Willow Creek, California.