

Smith River Adult Trout and Salmon Surveys Summer 2006

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*Two fish counting teams practice technique in the big pool at Rock Creek Ranch.
(www.thomasbdunklin.com/gallery/FishCount)*

Background

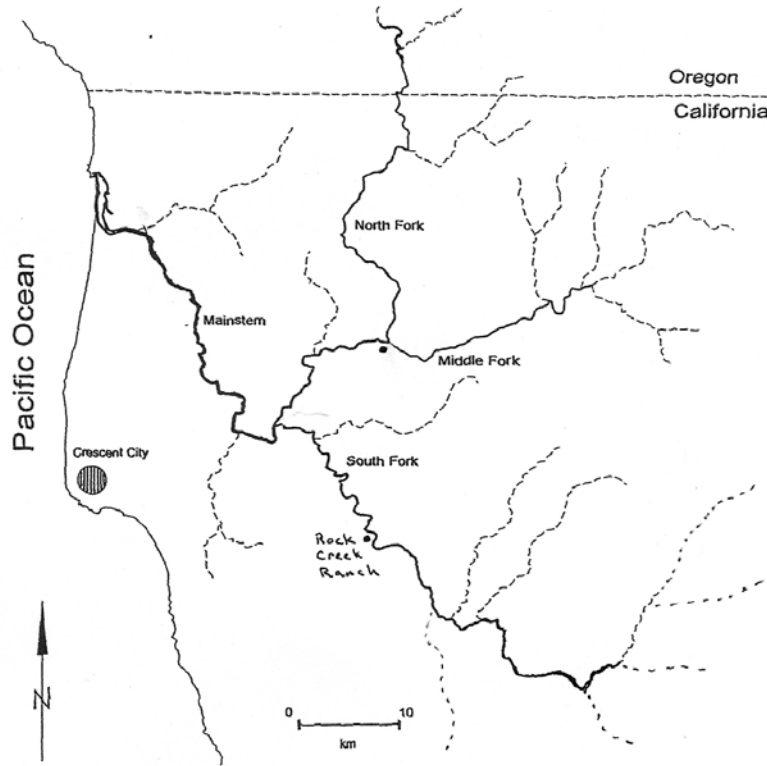
The Smith River Alliance has led coordination, training and data collection for the annual summer “Fish Count” since 2000. The project is done in collaboration with the Smith River National Recreation Area (USFS) who conducted similar surveys in previous years and with the California Department of Fish and Game (CDFG) who has periodically provided funding. The primary objectives of the project are to record annual abundance and distribution of all adult fish, and to detect any trends or changes. This report includes results from the 2006 Fish Count and data from previous surveys as an appendix.

The three main forks of the Smith River comprise over 70 miles of adult salmon and trout holding habitat that can be readily surveyed by snorkelers in summer due to low flows, exceptional visibility, and depths not in excess of thirty feet (Figure 1). The first official fish survey of these forks was performed by CDFG contractors in 1988. The USFS conducted intermittent surveys from 1989 to 1999. Survey techniques and levels of effort varied between years and among crews. Since 2000, up to 50 volunteers have gathered each year at Rock Creek Ranch on the South Fork to train alongside available experts and agency staff. The Fish Count has developed unparalleled instructional resources and has become a popular educational event, providing a unique opportunity for community involvement in natural resource monitoring.



*Coastal cutthroat trout approximately 10” in length
(Photo by Z. Larson)*

Figure 1: The location of the Smith River's three forks and Rock Creek Ranch. Large tributaries are shown with dashed lines. The solid lines represent confirmed summer access by anadromous fish. Actual upstream limits may be higher.



Survey Methods

The following method has been designed, in corroboration with participants from twelve years of Smith River fish surveys, to be the best method for accurate counts of adult fish in the three forks of the Smith River. Teams of two or more snorkelers count adult fish while moving from the upstream to the downstream end-points of designated survey segments¹. Survey segments range in length from 1.0 to 4.5 miles. All segments of each Fork of the river are surveyed in the shortest period of days possible. In response to limited crews, segment selection follows an upstream moving pattern that minimizes the possibility of missing upstream migrating fish. The South Fork is prioritized because it has the longest running data set.

Each team is assigned a captain with adequate experience for confirming fish identification and providing leadership in the application of best techniques. Team captains tally observed fish on dive slates before and after surveying each large pool. All

¹ The term “segments” is used in accordance with a hierarchical classification of stream habitat (Frissell et al 1996) that reserves the term “reach” for shorter, non-contiguous sections of river.

snorkelers are also trained in swiftwater safety. The following techniques are employed to increase the probability of observing each fish and reduce the probability of over-counting:

- Snorkelers all receive training in the Smith River prior to collecting data.
- Each team includes one or more divers capable of investigating holding sites under cover of boulders, logs or ledges.
- A diver is “spotted” by adjacent snorkelers to avoid unseen displacement of fish.
- Teams maintain positions and assigned lanes while moving downstream.
- A minimum three snorkelers are used for all but the small headwater segments.
- Snorkelers communicate each fish observation by pointing and vocalizing.
- Teams keep all heads in the water until completely through each pool or run.
- Riffles, pocket-water and turbulent areas are surveyed to the degree possible without compromising safety.
- Rapid entry into pools from upstream riffles is preceded by the stealthy entry of one or more snorkelers from the bank.
- Snorkelers calibrate their size estimates underwater by using props of known length.
- Fish counting activity is conducted between the hours of 9:30 and 4:30 pm to provide optimal light conditions.

All species are tallied according to categories listed in Table 1. Juvenile salmonids are not targeted in this survey, but snorkelers are trained in their identification and instructed to report any observations of juvenile coho salmon.

Results

Twenty-two river segments, totaling 47 miles, were surveyed in 2006. Surveys covered 25 contiguous miles of the South Fork (Bucks Creek to MF confluence), 18 miles contiguous miles of the Middle Fork (Sikiyou Fork to Milepost 9), and a four-mile segment of the North Fork from Baldface Creek to Major Moore Bridge. Surveys commenced on Saturday, July 29 when 42 volunteers plus five agency staff completed 13 segments and 29 miles. All participants were trained or re-trained according to the methods described above. An additional 4 volunteers assisted with driving. CDFG and Smith River NRA staff, along with several volunteers surveyed addition segments, concluding on August 3 with the North Fork.

A total of 11 spring Chinook, 25 summer steelhead, 17 half-pounders, 92 resident rainbow trout and 1361 cutthroat trout were observed in 2006. Table 1 reports the total numbers of adult fish counted in the South Fork and Middle Fork. No steelhead or chinook adults were seen in the North Fork, but cutthroat were counted at moderate to high levels of abundance. As with previous years, suckers were not observed in the upper segments of either fork. Number of fish per reach and other details are reported in the Appendix Table.

As quality assurance steps, I interviewed team leaders about data, investigated discrepancies and examined the number of cutthroat trout per mile seen by each team with respect to the average, maximum and minimum trout per mile for all segments and from past years. Data from two segments indicated errors and were replaced by re-surveys on the following day. The data from re-surveys fell within the typical range.

Table 1: Total counts of adult fish for surveyed segments of the South Fork (25 Miles) and Middle Fork (18 Miles) Smith River, Summer 2006.

Fish Category	Species	Size Range (inches)	South Fork	Middle Fork
Cutthroat, large	<i>O. clarki clarki</i>	12 – 20"	336	231
Cutthroat, medium	<i>O. clarki clarki</i>	10 – 12"	242	130
Cutthroat, small	<i>O. clarki clarki</i>	7 – 10"	174	96
Resident Rainbow	<i>O. mykiss</i>	10 – 12"	43	45
Steelhead	<i>O. mykiss</i>	16 – 28"	11	14
Half-pounder	<i>O. mykiss</i>	12 -- 16"	10	7
Chinook	<i>O. tshawytscha</i>	18 – 42"	11	0
Sucker	<i>C. rimiculus</i>	8 – 20"	4	23

Water clarity in the South Fork enabled identification of fish at distances of up to 30 feet, depending on sunlight and other factors. As typical during warm summers, water clarity in the South Fork began deteriorating in early August due to increases in suspended algae. The water clarity change was most pronounced in the lower and warmer segments.

HoboTemp[®] probes recorded temperature hourly at three locations in the South Fork and handheld thermometers were used to check temperature at convenient locations in the Middle Fork, North Fork and upper South Fork. According to the probes, water temperature peaked on July 25 at all three South Fork locations. Maximum temperature was 77° at Craigs Beach (lowest site), 75° at RCR and 74° at the GO Road Bridge. Smoothed average temperatures for the three sites (Figure 3) show that, while the distances are nearly equivalent, Craigs Beach was 2-3° warmer than RCR throughout summer, and the upper site was never more than one degree cooler. The thermograph at RCR (Figure 4) shows temperature fluctuated 4-5° degrees daily with the lowest temperature near noon and the highest temperature in the late evening. Daily average water temperature in the South Fork generally decreased 5-8° between July 25 and August 3.

During the period of the Fish Count, South Fork temperature at RCR ranged from 61.5° to 75.1° (18.4-23.9° C). Handheld readings indicated that the South Fork above Bucks Creek and the Middle Fork above Patrick Creek remained at least 5° cooler than the South Fork at RCR. As in previous years, the Middle Fork below the North Fork was as warm or warmer than the lowest South Fork. The North Fork at Major Moore (13 miles above the Middle Fork) measured 64° on August 2. Cutthroat trout were observed to be using thermal refugia of springs in the North Fork, and in the lower portions of both the Middle and South Forks.

Figure 2. Floating (7-day average) water temperature from an hourly monitoring probe in the lower South Fork Smith River, 7/1/06 – 8/4/06.

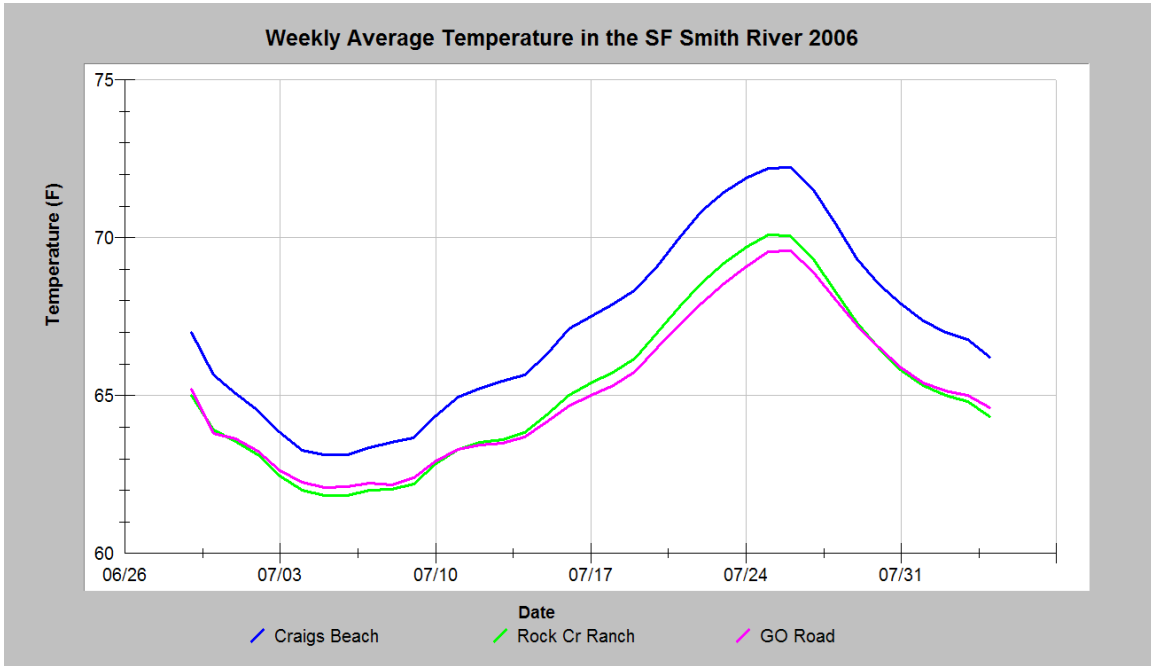
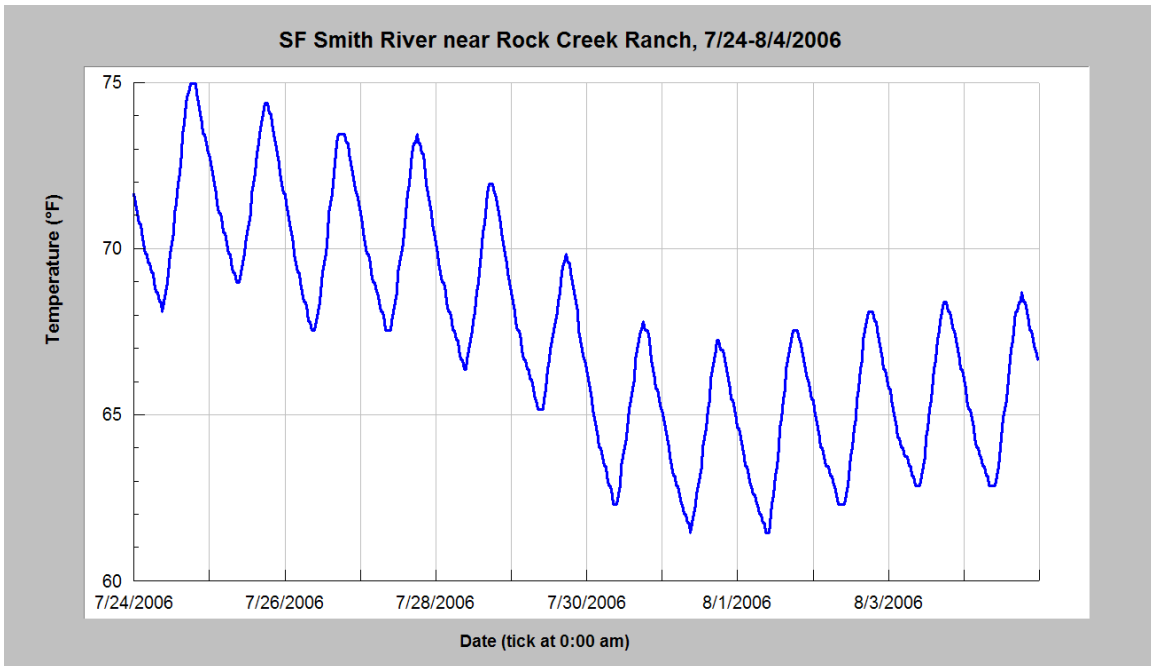


Figure 3. Daily average, minimum and maximum water temperature from an hourly monitoring probe in the lower South Fork Smith River, 7/1/05 – 8/4/05.



Discussion

With a total of 47 miles surveyed and more than 50 participants, the 2006 Fish Count was one of the most extensive annual efforts yet. More importantly, enhanced training, tight coordination of surveys within a one-week period, and a professional crew from the CDFG Wild Trout Program combined to produce the highest quality of surveys yet conducted.

This report does not formally analyze density or distribution of fish surveyed. The previous report (Reedy 2005) investigated patterns of distribution for cutthroat trout and rainbow trout and also tabulated for comparison results of all previous summer fish counts on the Smith River. Analysis of distribution patterns and trends will be the focus of a special report for the tenth anniversary (2009) of annual surveys by the Smith River Alliance and collaborators.

Observed abundance of cutthroat trout ranged from 40-120 fish/mile. The highest density of cutthroat trout was again found in the Middle Fork above the North Fork. More total cutthroat trout per mile were counted in 2006 than any other year prior. The year with the next highest count was 2005. This doesn't necessarily indicate an increasing abundance of cutthroat trout in the Smith River. The entire increase may be the result of an increased percentage of actual fish that are observed; better instruction and more thorough effort have resulted in more accurate counts. Most of the increase in cutthroat numbers comes from the number small cutthroat trout seen. Also, the proportion of medium relative to large trout has increased. As expected, better training and leadership has enhanced observational effort and corrected overestimation of size.

Still, the accuracy of counts is subject to several factors. Some fish will always be missed (negative bias) and poor technique or weak leadership can result in double counting of fish (positive bias). Inaccurate estimation of size introduces error among three categories of *O. mykiss* (large juveniles, resident rainbows, half-pounders and steelhead), as well as among three classes of cutthroat trout. Counts of resident rainbow trout and half-pounders probably suffer the greatest inaccuracies, because these fish can be misidentified in multiple ways.

The magnitude of all errors has certainly been reduced by formal instructional material, including a custom poster board presentation, and the draft Fish Count Instructional Video produced by Thomas Dunklin. The final video product will further clarify technique and common fish identification problems. At this point, large increases in the percentage of fish observed are not expected. Consistent training, protocols and leadership over the next several years are essential to detecting any actual trends in fish abundance.

Numbers of adult chinook and steelhead observed in 2006 were within the range found in previous years, although 12 steelhead found within the uppermost segment of the upper Middle Fork represent a unique observation. The undisputed count was made by Mike McCain, Fish Biologist for the Smith River NRA. Four of the thirteen other steelhead,

and eight of the eleven total chinook were found in the upper segments of the South Fork. Most of the seventeen half-pounders observed were also found in the upper South Fork segments. These observations suggest the need to distinguish an “upper South Fork” as those segments above the Big Flat valley and the last direct road access. The upper South Fork is cooler and hosts a higher density of adult salmonids.

The quality of summer holding habitat for adult anadromous fish in forks of the Smith River is limited by water temperature in warm years like 2006. In the lower South Fork and Middle Fork, recorded maximum temperature surpassed 72° and daily average temperature surpassed 68°, thresholds of stress to holding adults (McCullough 1999). Temperature stresses would be expected to move adult salmon and steelhead further up the forks of the Smith River in hot years like 2006. Low-flow access and deep pools can be found for an additional 6-10 miles above the uppermost extent of 2006 surveys in both the South and North Forks. Until all these segments are included in the annual survey, the Fish Count cannot accurately address total actual numbers of steelhead and chinook.

Considerable uncertainty remains about both the history and viability of spring-run chinook and summer steelhead stocks in the Smith River. Why do we not have more of these fish? Are these runs merely alternative life history expressions of the more abundant fall and winter runs? Are they supplemented by Rogue River or Klamath Basins strays? Additional monitoring and research is needed to address if these populations are distinct and self-sustaining.

Acknowledgements

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APPENDIX

Fish observed by segment in the South, Middle and North Forks, Smith River, summer 2006.

CTT = Coastal cutthroat trout; RBT = Resident rainbow trout; SHT = Steelhead trout; 1/2 lb'r = Half-pounder steelhead.

Fork	Segment Top	Segment Bottom	Miles	DATE	CTT<10"	CTT10-12"	CTT>12"	RBT	SHT	1/2 lb'r	Chinook	Suckers	Leader	Crew#
SF	Eightmile Creek	Buck Creek	1.8	3-Aug	29	25	15	6	1	6	0	0	CDFG	3
SF	Buck Creek	McClendon Ford	2.0	3-Aug	15	17	16	6	2	3	8	0	CDFG	3
SF	McClendon Ford	Indian Bar	3.2	29-Jul	46	28	20	8	1	0	0	0	M. Reichmuth	3
SF	Indian Bar	Hurdygurdy Cr	3.0	29-Jul	25	22	12	10	1	0	0	1	Reedy	4
SF	Hurdygurdy Cr	Steven Bridge	1.2	30-Jul ¹	30	17	9	1	1	0	0	0	CDFG	4
SF	Steven Bridge	Rattlesnake Slide	1.1	30-Jul ¹	22	12	4	0	0	0	0	0	CDFG	5
SF	Rattlesnake Slide	Rock Cr Ranch	3.5	29-Jul	50	39	44	0	2	1	1	0	Casey Justice	4
SF	Rock Cr Ranch	Sand Camp	1.2	29-Jul	22	24	10	NA ²	0	NA ²	1	NA	Tyler Gillespie	5
SF	Sand Camp	Carter Falls	2.4	29-Jul	34	17	18	0	2	0	0	NA	Joe Gillespie	5
SF	Carter Falls	Above Surprise	3.2	29-Jul	16	14	7	0	1	0	0	NA	Bill Buckley	3
SF	Above Surprise	Craigs Beach	1.0	29-Jul	20	17	10	NA ²	0	0	0	NA	Brian/Corey	4
SF	Craigs Beach	Middle Fork	1.1	29-Jul	27	10	9	12	0	0	1	3	Craig Strong	3
NF	Baldface Cr	Major Moores	4.1	2-Aug	92	34	26	4	0	0	0	0	CDFG	3
MF	Siskiyou Fk	Patricks Cr	3.2	1-Aug	29	25	32	0	12	0	0	NA	McCain	2
MF	Patricks Cr	Madrone Camp	3.2	1-Aug	67	39	12	17	0	3	0	0	CDFG	3
MF	Madrone Camp	Panther Flat	3.2	31-Jul	68	26	24	9	0	4	0	4	CDFG	3
MF	Panther Flat	North Fork	2.2	29-Jul	36	17	13	8	2	0	0	0	Scott Bowman	4
MF	North Fork	Mary Adams Br	1.7	29-Jul	14	6	8	NA ²	0	NA ²	0	NA	Willits	4
MF	Mary Adams Br	MP9	4.3	29-Jul	17	17	7	11	0	0	0	19	McCain	4

¹These two segments were re-surveyed on this date after review of data collected on July 29.

²Data not collected or failed to meet quality assurance criteria.