Smith River Adult Trout and Salmon Surveys, Summer 2005

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Prepared on behalf of the Smith River Alliance by:

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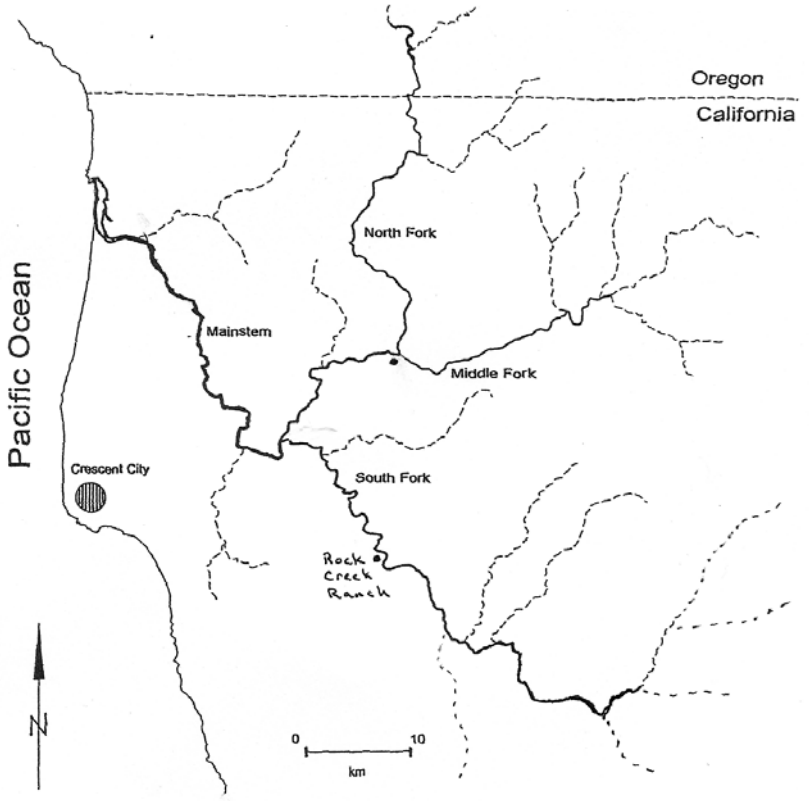
Introduction

The Smith River Alliance coordinated surveys of adult fish in the Smith River during the summer of 2005 under contract with the California Department of Fish and Game (CDFG) and funded by Steelhead Fishery Report-Restoration Card Program. The Smith River Alliance began the "fish count" in 2000 in an effort to continue past monitoring by the Smith River National Recreation Area (USFS) and CDFG. The objectives of the project are to record annual abundance and distribution of salmonids and to detect any changes in their populations or habitat use. This report includes the results from 2005 and data appendices. A more comprehensive project report, to be completed by the end of the year, analyzes project objectives, data trends and methodology.

The three main forks of the Smith River comprise over 70 miles of adult salmon and trout holding habitat that can be surveyed by snorkelers due to low summer 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 between 1992 and 1999. None of these annual efforts completed more than 50 miles and survey techniques varied. Since 2000, volunteers have been recruited and trained alongside available experts and agency staff. Survey segments have been described and prioritized. Most importantly, a thorough protocol has been established. The annual Fish Count weekend at Rock Creek Ranch gathers 40 or more people for training and field surveys in the South Fork. The Fish Count has become a popular educational event and provides a unique opportunity for community involvement in fisheries monitoring.

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

Teams of two or more snorkelers count adult fish while moving from the upstream to the downstream end-points of designated survey segments[1]. A minimum three snorkelers are used for all but the small headwater segments. 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. Faced with limited available assistance, the South Fork is prioritized because it has the longest running data set, and segments known to have the best holding habitat are prioritized over those where past data indicates fewer fish.

Each team is assigned a captain with adequate experience for confirming fish identification and providing leadership in the application of optimal techniques. Team

[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.

captains tally observed fish on dive slates before and after surveying each large pool. Teams are also trained in swiftwater safety.

The following optimal 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 a snorkeler who dives to examine holding sites under cover of boulders, logs or ledges. The diver is "spotted" by adjacent snorkeler to avoid unseen displacement of fish.
- Teams maintain positions and assigned lanes while moving downstream.
- 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.

Fish are counted within species/categories listed in Table 1. The target species include all types of adult salmonid fish present in the Smith River during summer, as well as suckers. 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

A total of 5 spring Chinook, 15 summer steelhead, 23 half-pounders, and 72 resident rainbow trout and 922 cutthroat trout were observed in 2005 (Table 1). Fourteen individual segments, totaling 34 miles, were surveyed. Surveys covered 23 contiguous miles of the South Fork and 11 miles of the Middle Fork. Surveys occurred from July 23 to August 18, 2005. Of the 11 segments of the South Fork, all but the two uppermost were completed within the first five days. Data for each segment is presented in Appendix Table A.

Juvenile Chinook and steelhead were seen in every segment. No juvenile coho were observed. As with previous years, suckers were not observed in the upper segments of either fork, but these observations do not necessarily describe upstream limits to their distribution. Fish counts and ancillary survey data for each segment were added to an ongoing database used to generate annual summaries (Appendix Table B).

A total of 36 people participated in the surveys, of which 28 participated only on July 23 when 18 miles were completed. An additional 3 people assisted with vehicles. Other than one fisheries biologist from CDFG and myself, all participants were volunteers. Sixteen volunteers had prior experience with these surveys. All participants were trained or retrained according to the methods described above.

Table 1: Total counts of adult fish for surveyed segments of the South Fork (23 Miles) and Middle Fork (11 Miles) Smith River, Summer 2005.

Fish Category	Species	Size Range (inches)	South Fork	Middle Fork
Cutthroat, large	*O. clarki clarki*	*12 – 20"*	216	52
Cutthroat, medium	*O. clarki clarki*	*10 – 12"*	252	74
Cutthroat, small	*O. clarki clarki*	*7 – 10"*	222	106
Resident Rainbow	*O. mykiss*	*10 – 12"*	46	26
Steelhead	*O. mykiss*	*16 – 28"*	13	2
Half-pounder	*O. mykiss*	*12 -- 16"*	16	7
Chinook	*O. tshawytscha*	*18 – 42"*	2	3
Sucker	*C. rimiculus*	*8 – 20"*	4	2

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. The count of large cutthroat was a high anomaly (35 fish/mi) for one segment and a low anomaly (0 fish/mi) for another segment. These two anomalous counts were replaced with data from re-surveys performed within five days. The data from re-surveys fell within the typical range.

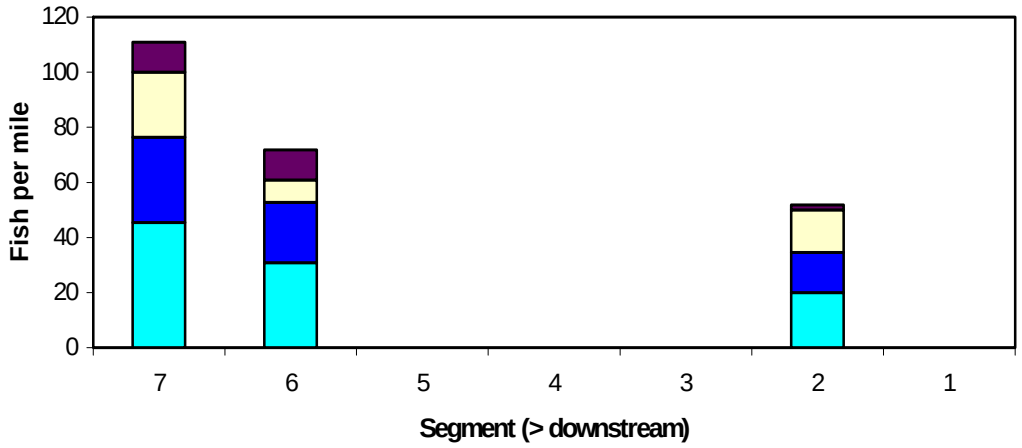
Cutthroat trout and rainbow trout were abundant enough to analyze relative abundance through the calculation of fish per mile. Relative abundance between species and segments in the South Fork and Middle Fork (Figure 2) indicated patterns of distribution. Resident rainbow trout were more common in upper segments, but always rare compared to cutthroat trout. Abundance of cutthroat trout increases moving downstream in the South Fork, yet the highest density of cutthroat trout, in all three size classes, occurred in the upstream most section of the Middle Fork.

Chinook, steelhead and half-pounders were so rare that numbers were left tallied by segment and presented in Appendix Table A. The five Chinook observed offer too little information for analysis except that they were all found in reaches and pools where they have been frequently found before. The majority of observed steelhead (7 of 13) and half-pounders (12 of 16) in the South Fork were found in the uppermost three segments, which represent only 30% of the miles surveyed. In the Middle Fork, no steelhead were found in the upper segments. More half-pounders were observed in the upper segments of the Middle Fork than in the lower segment.

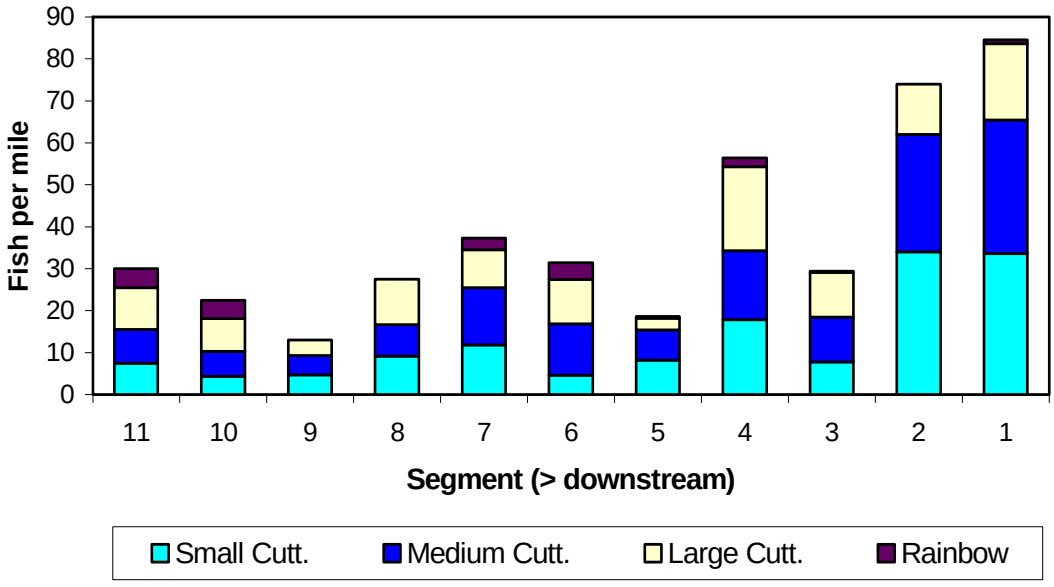
Water clarity in the South Fork enabled identification of fish at distances of up to 30 feet, depending on sunlight and other factors. As typical during warm summers, water clarity in the South Fork deteriorated in the first two weeks of August due to increases in suspended material (i.e. algae). The water clarity change was most pronounced in the lower and warmer segments. The survey schedule in 2005 pre-empted any problems with deteriorating water clarity.

Figure 2. Relative abundance of observed adult trout by segment in the (A) Middle Fork and (B) South Fork Smith River, Summer 2005. No bars indicate segments not surveyed.

A) Middle Fork

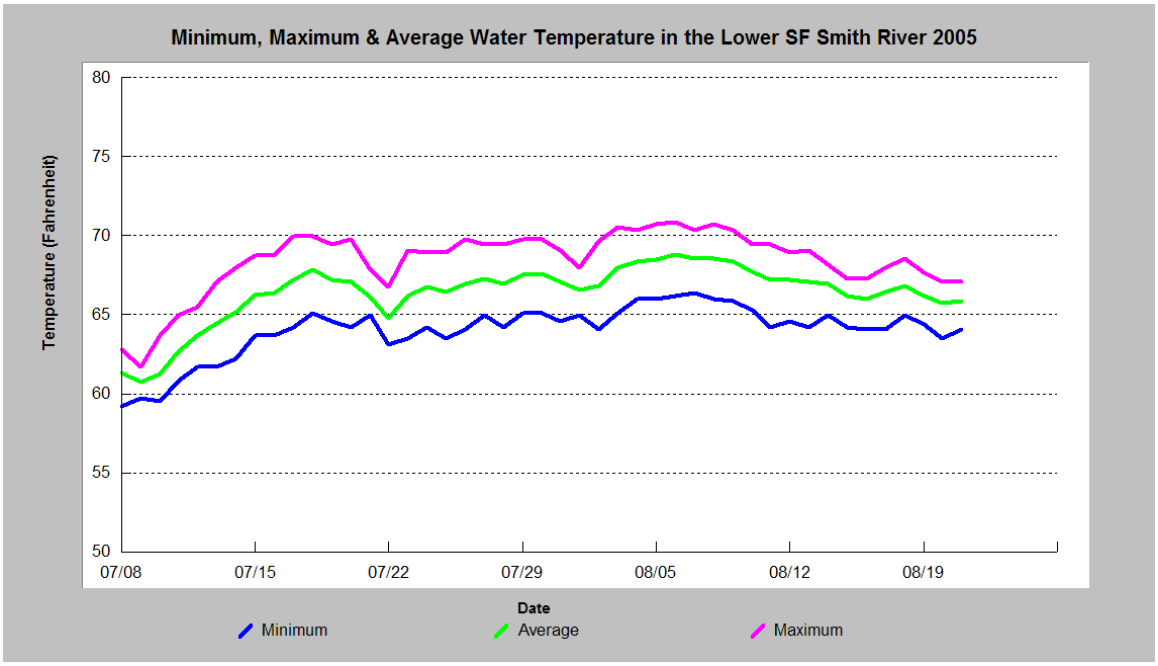


B) South Fork



Hand-held thermometers were used on the upper and lower segments of each fork and a continuous temperature probe was used to measure temperature hourly in the lower South Fork. Handheld readings indicate that maximum water temperatures in the Middle Fork ranged from 60 degrees in the upper segments to 72 degrees in the lower segment, while the South Fork ranged from 60 degrees to 69 degrees, respectively. The hourly data show that temperature in the lower South Fork peaked on August 6 at 71.8 degrees, while the daily average remained between 65 and 68 degrees for the period of survey (Figure 3). Cutthroat trout were observed to be using thermal refugia of springs in the lower portions of both forks.

Figure 3. Daily average, minimum and maximum water temperature from an hourly monitoring probe in the lower South Fork Smith River, 7/8/05 – 8/20/05.



Discussion

Large cutthroat trout and steelhead trout were more abundant in the South Fork than Middle Fork. Snorkelers counted cutthroat trout greater than 10" at an overall density of 20 fish/mile in the South Fork and 11.5 fish/mile in the Middle Fork. Snorkelers observed thirteen steelhead in the South Fork, yet found only two in the Middle Fork. A difference in steelhead abundance between forks would probably persist even if more of the Middle Fork had been surveyed. Fish count data from previous years (Appendix Table B) and casual assessment of holding habitat indicate that few, if any, additional steelhead could be expected to be found in the segments of the Middle Fork not surveyed in 2005.

The most conspicuous physical differences between the Middle Fork and the South Fork result from the confluence of the North Fork in Gasquet and the distinction of a Lower Middle Fork (segments 1-3) and an Upper Middle Fork (segments 4-7). The Lower Middle Fork is slightly larger than the South Fork and runs two to five degrees F warmer. The Upper Middle Fork (especially segments 6 and 7 which are above Patrick Creek) is considerably smaller than even segment 11 of the South Fork.

General differences in abundance between the South Fork and Middle Fork are not apparent for other species. However, rainbow trout abundance is much higher in the upper Middle Fork than in any other segment. The exceptional abundance of resident trout in these segments was noted in the early 1990's by Mike McCain who hypothesized a local genetic influence from a trout farm that formerly operated near the mouth of Monkey Creek.

Number of observed steelhead trout and resident rainbow trout were higher in 2005 than in previous years when observed steelhead in the South Fork never surpassed eight. Previous surveys did not, but for one exception, include the segment from Buck Creek to Indian Bar where five steelhead were found in 2005. Resident rainbow trout were also more abundant in this segment than elsewhere. Higher counts in 2005 may also be a result of more thorough training and experience of snorkelers, thus a higher proportion of observed steelhead and rainbow trout.

The accuracy of the fish counts is subject to several factors. Detailed standards and thorough training minimize the missing of fish (negative bias) and the double counting of fish (positive bias). Inaccurate estimation of size introduces error in the distinction of three classes of cutthroat trout, as well as the distinction between large juveniles, resident rainbows, half-pounders and steelhead. Counts of resident rainbow trout and half-pounders probably suffer the greatest inaccuracies, because these fish can be easily misidentified in multiple ways. Improved training and quality controls will improve accuracy for all fish categories. This methodological topic and the subject of detecting statistical change in abundance over time will be addressed in a separate report that summarizes five or more years of surveys.

The South Fork has excellent summer holding habitat for adult anadromous fish, particularly in upper segments where water remains cool. In the lower South Fork, recorded water temperature did not surpass 72 degrees F and daily average did not surpass 68, indicating a thermal regime of temporary and moderate stress to holding adults (McCollough 1999). Access at low flows and deep pools with large boulders can be found 6-12 miles above the uppermost extent of surveys in 2005. These uppermost segments are not well documented for summer holding of salmonids. They were made a particularly important priority for survey in 2005 in response to greater than normal summer flows and the following hypothesis: Anadromous fish will move higher to holding habitat in spring/summer than when flows are normal or low. Data from 2005 offers some supporting evidence for this hypothesis in the form of higher steelhead numbers in the upper South Fork.

Numbers of summer steelhead and spring Chinook are so low, even in the best habitat of the Smith River, as to provoke several hypotheses concerning the history and viability of these stocks. Are Smith River spring Chinook and summer steelhead merely alternative life history expressions of the more abundant fall and winter runs? Are they supplemented by Rogue River or Klamath Basins strays? Perhaps most interesting of all is the question, why, if summer holding habitat in the Smith River is so good, do we not have more of these fish? Additional monitoring and research should address if these populations can be distinct and self-sustaining.

Acknowledgements

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References

Frissell, C.A., Liss, W.J., Warren, C.E. and Hurley, M.D. (1986) A Hierarchical Framework for Stream Habitat Classification: Viewing Streams in a Watershed Context. Environmental Management 10 (2) pp 199-214.

McCullough, D. 1999. A Review and Synthesis of Effects of Alterations to the Water Temperature Regime on Freshwater Life Stages of Salmonids, with Special Reference to Chinook Salmon. Columbia Intertribal Fisheries Commission, Portland, OR. Prepared for the U.S. Environmental Protection Agency Region 10. Published as EPA 910-R-99-010.

APPENDIX Table A:
Fish observed by segment in the South Fork and Middle Fork Smith River, summer 2005.
CTT = Coastal cutthroat trout; RBT = Resident rainbow trout; SHT = Steelhead trout; ½ 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	26-Jul[1]	na	na	na	na	1	na	0	0	Darell Warnock	2
SF	Buck Creek	McClendon Ford	2.0	16-Aug	15	16	20	9	1	2	0	0	Reedy	2
SF	McClendon Ford	Indian Bar	3.2	24-Jul	14	19	25	14	5	10	0	0	Casey Justice	2
SF	Indian Bar	Hurdygurdy Cr	3.0	23-Jul	14	14	11	0	0	0	0	1	Darell Warnock	4
SF	Hurdygurdy Cr	Steven Bridge	1.2	23-Jul	11	9	13	0	1	0	0	0	Joe Gillespie	4
SF	Steven Bridge	Rattlesnake Slide	1.1	27-Jul[2]	13	15	10	3	1	0	0	1	Reedy	3
SF	Rattlesnake Slide	Rock Cr Ranch	3.5	23-Jul	16	43	37	14	4	2	2	0	Terry Jackson	3
SF	Rock Cr Ranch	Upper Bridge	2.2	23-Jul	18	16	6	1	0	0	0	1	Tedd Ward	5
SF	Upper Bridge	Carter Falls	1.4	28-Jul[2]	25	23	28	3	1	0	0	0	Reedy	3
SF	Carter Falls	Above Surprise	3.2	23-Jul	25	34	34	1	0	1	0	0	Casey Justice	3
SF	Above Surprise	Craigs Beach	1.0	23-Jul	34	28	12	0	0	0	0	0	Jim Bloomquist	4
SF	Craigs Beach	Middle Fork	1.1	23-Jul	37	35	20	1	0	1	0	1	Reedy	3
MF	Siskiyou Fk	Patricks Cr	3.2	18-Aug	50	34	26	12	0	4	0	0	Reedy	2
MF	Patricks Cr	Madrone Camp	3.2	2-Aug	34	24	9	12	0	2	1	0	Dana Brown	3
MF	Madrone Camp	Panther Flat	3.2											
MF	Panther Flat	North Fork	2.2											
MF	North Fork	Mary Adams Br	1.7											
MF	Mary Adams Br	MP9	4.3	1-Aug	22	16	17	2	2	1	2	2	Reedy	3
MF	MP9	South Fork	1.2											

[1]Data for the Eightmile to Buck Creek survey was compromised due to confusion regarding the bottom of the segment. Acceptably accurate data is presented here but no data from this segment is included in survey summaries.
[2]These two segments were re-surveyed on this date after quality assurance review of data collected on July 23.

APPENDIX Table B:
Summary of previous summer adult fish surveys in the main forks of the Smith River with total counts in the South Fork for Chinook salmon (CKS), steelhead trout (SHT), large cutthroat (CTT>12"), and resident rainbow trout (RBT).

Year	SF Date	Start	End	Miles	CKS	CTT>12"	SHT	RBT	Other Forks	Surveyors
1982	7/26-8/27	Eightmile	Middle Fork	25	11	91	5	NA	MF, NF	USFS?
1989	8/28	GO Road	Craigs Cr	13.2	2	125	5	NA		USFS?
1990	9/11	GO Road	Craigs Cr	13.2	0	138	7	NA		USFS?
1991	9/9-12	GO Road	Craigs Cr	13.2	1	51	8	NA	MF	Wood/Rogers
1992	9/3-5	Rattlesnake	Scaling Stat.	11	1	120	8	NA	MF, NF	USFS/Reedy
1993	9/7-9	Hurdygurdy	Middle Fork	15.2	17	111	4	NA	MF, NF	USFS/Reedy
1994	8/10 - 9/5	Harrington	Scaling Stat.	27	8	190	7	13	MF, NF	USFS/Reedy
1995	8/2-3	Hurdygurdy	Middle Fork	15.2	21	161	4	19	MF, NF	USFS/Reedy
2000	8/19	Hurdygurdy	Lower Concrete Br	8	1	101	2	2		SRA/Reedy
2001	8/18	Hurdygurdy	Scaling Stat.	13.2	2	235	1	6		SRA/Reedy
2002	8/24	Indian Bar	Gorge	15	14	283	4	17		SRA/Reedy
2003	8/6-14	Eightmile	Middle Fork	25	17	290	2	29	MF	SRA/Reedy
2004	8/15	Hurdygurdy	Scaling Stat.	13.2	12	126	8	39	MF	SRA/Reedy
2005	7/23-8/16	Buck Cr	Middle Fork	23	2	216	13	46	MF	SRA/Reedy

Note: Six Rivers National Forest provided the data from 1982, 1989, and 1990 without description of data collection methods or personnel. The above table lists all known surveys; The Middle Fork and North Fork were not surveyed in any year when the South Fork was not surveyed.