# Fall River 2012 summary report

## July 24-26, 2012

State of California

Department of Fish and Wildlife

Heritage and Wild Trout Program



Prepared by Stephanie Hogan and Cameron Zuber

#### Introduction

The Fall River, located in northeastern California (Shasta County), is tributary to the Pit River (Figure 1) and is a spring-fed system that contains wild populations of rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). The Fall River became one of the first streams in California to receive Wild Trout designation. Wild Trout Waters are those that support self-sustaining wild trout populations, are aesthetically pleasing and environmentally productive, provide adequate catch rates in terms of numbers or size of trout, and are open to public angling (Bloom and Weaver 2008). Wild Trout Waters may not be stocked with catchable-sized hatchery trout.

This famed trout fishery is well-publicized; however, much of the surrounding land in the Fall River Valley is privately owned, so public access to the fishery is limited and generally necessitates use of a boat. From its origin at Thousand Springs downstream to the mouth of the Tule River, the open fishing season is from the last Saturday in April through November 15<sup>th</sup> with gear restrictions and size and bag limits in place (artificial lures with barbless hooks; maximum size limit of 14 inches total length; two-fish bag limit).These special fishing regulations also apply to Spring Creek. Downstream of the confluence with the Tule River, California Department of Fish and Wildlife (CDFW) Sierra District General Regulations apply (open from the last Saturday in April through November 15th with a two-fish bag limit). The designated Wild Trout area of the Fall River spans from Thousand Springs downstream to the Pit #1 Powerhouse Intake, including Spring Creek (Figure 2) but excluding all other tributaries, and comprises approximately 22.4 miles of stream habitat.

The CDFW has a long-standing history of monitoring this system including electrofishing, visual observation, and angler use surveys since the early 1970s. Data from these surveys are used to monitor species abundance, instream distribution, size class composition, and angler use data. In 2012, the CDFW Heritage and Wild Trout Program (HWTP):

- Conducted direct observation surveys at three long-term monitoring sites on the Fall River to evaluate species composition, size class structure, abundance, and habitat condition
- Evaluated angler use, catch rates, and catch sizes utilizing a longstanding Angler Survey Box (ASB) located at a boat launch near Island Road
- Evaluated angler use, catch rates, and catch sizes at four newlyestablished ASB locations
- Conducted a roving creel census (implemented by HWTP Northern Region personnel) to better understand angler use, catch rate, and catch

size and to compare results with the voluntary ASB data

This report summarizes the results of the HWTP 2012 direct observation and ASB monitoring assessments in the Fall River.

#### Methods

#### Direct observation

Direct observation surveys were conducted from July 24<sup>th</sup>-26<sup>th</sup>, 2012 using snorkeling methods, an effective survey technique in many small streams and creeks in northern California and the Pacific Northwest (Hankin and Reeves 1988). Although the Fall River is not a "small stream" and direct observation surveys are inherently challenging in a river of this size and depth, they were employed in recent years to avoid potential fish injury from boat electrofishing, which was previously utilized. To replicate previous direct observation efforts, section boundaries were located using written directions, maps, and geographic coordinates (North American Datum 1983). Surveys were conducted in a downstream direction with either 10 or 13 divers, depending on wetted width, water visibility, habitat complexity, and the number of trained staff available. Divers maintained an evenly-spaced line perpendicular to the current and counted fish by species. All observed trout were further separated and counted by size class. Size classes were divided into the following categories: young of year (YOY); small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches); and extra-large ( $\geq$  18 inches). YOY are defined by the HWTP as age 0+ fish. emerged from the gravel in the same year as the survey effort. Depending on species, date of emergence, relative growth rates, and habitat conditions, the size of YOY varies greatly, but is generally between zero and three inches in total length. If a trout was observed to be less than six inches in total length but it was difficult to determine whether it was an age 0+ or 1+ fish, by default it was classified in the small (< 6 inches) size class.

Divers were instructed in both visual size class estimation and proper snorkel survey techniques (establishing a dominant side, determining the extent of their visual survey area, and how and when to count (or not count) fish observed, safety considerations, etc.) prior to starting the survey. Two personnel on paddle craft participated in the survey by helping divers maintain their dive lanes and acted as a safety backup and lookout for the dive team. For each section, surveyors measured water and air temperature (°C), average wetted width, water depth and water visibility (ft). Representative photographs were taken and section lengths were determined based on Geographic Information System analysis (at a scale of 1:3000). Habitat type (flatwater, riffle, or pool) was identified following Level 2 protocol as defined in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). Both sectional and overall fish abundance (fish per mile; fish/mi) was calculated by species (for the latter, all observed fish were summed by species for all sections and divided by the total

#### survey length).

#### Angler use

Voluntary ASB data were examined to better understand angler use, catch rates, catch sizes, and angler satisfaction. A long-standing ASB is located at a publicly accessible boat dock on Island Road, within the designated Wild Trout reach and forms from this location were analyzed for the years 2003 through 2012. In addition, four new ASB were installed in October, 2011 on private property (with restricted access) within the designated reach (Percy's Place, Whipple Ranch, Circle Seven Ranch, and Spinner Fall Lodge; Figure 2). Data from these newly-established locations were evaluated in 2012. Forms missing pertinent information (date, number of hours fished, and/or fish size classes) were not included in the analysis. Catch per unit effort (CPUE; fish/hour; fish/hr) was calculated for each form and was averaged across all forms in each given year.

#### Results

#### Direct observation

The Fall River is characterized by slow moving flatwater; riffles and deep pools are mostly absent. During the survey effort, water visibility ranged from 7 to 15 feet, depending on location and was influenced by changes in cover complexity and/or turbidity. Vegetation (both submerged and overhanging), large woody debris, and water depth provided fish cover. Weather during the survey effort ranged from partly cloudy (Section 1) to sunny and clear (Sections 2-3). Water temperature ranged from 11 °C to 13 °C, although surveyors noted warmer pockets of water in certain areas. Air temperature ranged from 27 °C to 31 °C. A total of four miles of stream habitat were surveyed (total length of all three sections), with an average wetted width of 147.8 ft and average water depth of 5.1 ft.

Section 1 is 1.4 miles in length and was surveyed on July 24<sup>th</sup>, 2012. Divers observed 3621 rainbow trout, two brown trout, 59 unknown trout, 102 suckers (*Catostomus* sp.), and one sculpin (*Cottus* sp.; Table 1). Divers also observed crayfish, tadpoles, frogs and leeches (not identified to species), western pond turtles (*Clemmys marmorata*), kingfisher (*Alcedinidae* sp.), and one river otter (*Lontra canadensis*). Rainbow trout size class distribution was 43% YOY, 38% small-, 13% medium-, 6% large-, and 1% extra-large-sized fish (Figure 3). All observed brown trout were in the small-size class. Unknown trout size class distribution was 85% YOY, 2% small-, 10% medium-, and 3% large-sized fish. Estimated fish abundance in Section 1 was 2586 rainbow trout/mi, one brown trout/mi, 42 unknown trout/mi, 73 suckers/mi, and one sculpin/mi.

Section 2 is 0.8 miles in length and was surveyed on July 25<sup>th</sup>, 2012. Divers observed 3943 rainbow trout and 1880 unknown fishes. The latter were most likely suckers but were too small to identify (less than 60 mm). Divers also

observed aquatic beetles (not identified to species) and muskrat (*Ondatra zibethicus*). Rainbow trout size class distribution in Section 2 was 15% YOY, 44% small-, 21% medium-, 17% large-, and 2% extra-large-sized fish (Figure 4). Abundance was estimated at 4929 rainbow trout/mi and 2350 unknown fishes/mi.

Section 3 is 1.8 miles in length and was surveyed on July 26<sup>th</sup>, 2012. A total of 1352 rainbow trout, one unknown trout, 2362 suckers, and five sculpin were observed. In addition, two small- and one large-sized deceased fish were observed. Water visibility was poor in this section (7 ft) and fish detection was likely biased low. Rainbow trout size class distribution was 42% YOY, 42% small-, 6% medium-, 7% large-, and 3% extra-large-sized fish. The one unknown trout observed was in the extra-large size class (Figure 5). Abundance was estimated at 751 rainbow trout/mi, 1 unknown trout/mi, 1312 sucker/mi, and 3 sculpin/mi.

In 2012, the HTWP surveyed four miles of stream habitat and observed 8916 rainbow trout, two brown trout, 60 unknown trout, 2464 suckers, 6 sculpin, and 1880 unknown fishes. Overall fish abundance was estimated at 2229 rainbow trout/mi, 1 brown trout/mi, 15 unknown trout/mi, 616 suckers/mi, 2 sculpin/mi, and 470 unknown fishes/mi. The highest density of rainbow trout was observed in Section 2 and the only brown trout was observed in Section 1. Section 3 had the lowest observed trout density.

#### Angler use

Data from the Island Road ASB were examined for the years 2003 through 2012. Reported CPUE ranged from 0.6 to 1.39 fish/hr, with a mean of 1.1 (Figure 6 and Table 2). The majority of fish reported caught for all years were rainbow trout. In 2012, a total of 13 voluntary ASB forms were analyzed and anglers reported catching 61 rainbow trout and 1 brown trout, with a total effort of 76.5 hrs. Size class distribution of captured rainbow trout was 11% small-, 28% medium-, 44% large- and 16% extra-large-sized fish. The one brown trout reported caught was in the small-size class.

A total of 106 voluntary ASB forms were analyzed in 2012 from the four newlyestablished ASB locations. Reported CPUE ranged from zero to 4.00 fish/hr, with a mean of 1.12 fish/hr (Table 3). Anglers reported catching 780 rainbow trout with a size class distribution of 3% small-, 34% medium-, 50% large-, and 13% extralarge-sized fish. Zero brown trout were reported caught.

#### Discussion

The HWTP has conducted direct observation surveys in the Fall River since 1993; for comparative purposes, density estimates for all observed trout species were compared among survey years (Figures 7-8). These estimates were based on the total number of trout observed by species among all sections in a given year (not all sections were surveyed each year; Table 4). These estimates were then averaged across all years, allowing for a comparison between the most

recent estimated density of a species and the long-term average density based on historic data. Rainbow trout densities within the survey sections have ranged from 1647 fish/mi (1995) to 6803 fish/mi (2009) since 1993, with an average of approximately 3442 fish/mi. Estimated rainbow trout density in 2012 was lower than the long-term, aggregate average and showed a 26% decrease from that observed in 2010. Few brown trout were observed in either 2010 or 2012; this low density estimate appears consistent across time.

For comparative purposes, density estimates for suckers were generated from 2007 through 2012 survey data. These estimates were based on the total number of suckers observed among all sections in a given year (not all sections were surveyed each year). Suckers were only observed in 2008 (251 sucker/mi), 2009 (one sucker observed), and 2012 (609 sucker/mi). Estimated sucker density in 2012 was the highest observed and was a 2.5 times increase from 2008 density estimates. Density estimates were not compared among years for other non-salmonids; all other fishes are generally observed in relatively low densities and their numbers appear consistent across time.

The HWTP also examined size class distribution over time. Prior to 2007, size classes were divided into three categories (< 6 inches; 6-12 inches; and  $\geq$  12 inches), rather than the five size classes used from 2007 through 2012 (see Methods). To compare data across time, categories were grouped together to reflect the three size classes used prior to 2007. In addition, rainbow trout observed in Section 2 in 1993 were not tallied by size class; therefore, this year was removed from the analysis. Rainbow trout size class distribution over time appears relatively consistent. The majority of fish observed fell within the smallsize class (< 6 inches) and larger-sized fish ( $\geq$  12 inches) represented a smaller percentage of the surveyed population (Figure 9). Brown trout size class distribution has been inconsistent over time (Figure 10); this may be due to the relatively small number of brown trout observed each year, possible misidentification of brown and/or rainbow trout (due to the difficulties of differentiating YOY trout and/or adults in deeper areas of the river due to limited water visibility), decreased detection of brown trout due to species-specific habitat preferences or flight response, and/or natural population dynamics. Similar observations of low detection of larger-sized brown trout were observed by the HWTP in Hat Creek (Shasta County) during an effort to compare direct observation snorkel and boat electrofishing methodologies (Weaver and Mehalick 2010).

In 2012, local landowners were concerned that flow and wetted widths on the Fall River were decreased from previous years. Average wetted width and water depth were compared between 2007, 2010, and 2012 (Tables 5-6). Measurements were taken in Sections 1-3 for all years except 2007 (wetted width and water depth measurements were not taken in Section 3). Section 3 was, therefore, removed from the analysis (Figures 11-12). Average wetted width (140.1 ft) and water depth (5.2 ft) in 2012 was lower than the long-term,

aggregate average (152.8 ft wetted width and 5.7 ft water depth) and showed an 18% and 17% decrease (respectively) from that measured in 2010.

The installation of four new ASBs bolstered the number of voluntary angler forms submitted and may provide a broader representation of anglers. A roving angler creel census was conducted in 2012 by HWTP Northern Region personnel (CDFW 2012) to provide more comprehensive insights into angler use and satisfaction with the Fall River fishery. These data were not summarized for the purposes of this report.

#### Conclusion

The Fall River wild trout population is dominated by rainbow trout. Public concern has been expressed that anthropogenic changes in the Fall River Valley and areas upstream of the survey sections may have negatively affected the Fall River wild trout fishery, including increased sediment-loading from Bear Creek or other sources, cattle grazing, agricultural runoff, and degraded stream banks. A long-standing dataset of direct observation surveys on the Fall River allows the CDFW to compare fish densities, species composition, and age class structure over time. This enables the HWTP to closely monitor this fishery by detecting changes in fish distribution, age class composition, and other population parameters. In 2009, a restoration project occurred in Bear Creek in collaboration with Streamwise Consulting and the Fall River Resource Conservation District to reduce sediment loads in the upper Fall River. The HWTP recommends monitoring project success and potential changes to the fishery and habitat.

Based on the results of the 2009 Fall River direct observation surveys, the HWTP recommended selecting new sections for future surveys due to concerns that the three historic sections may or may not be representative of the fishery as a whole (Weaver and Mehalick 2009). The three long-term monitoring sections are relegated to the upper one-half of the system and do not include the headwaters, any tributaries, or the lower section of the river downstream of the confluence with the Tule River. Unfortunately, the latter portion of the Fall River is not conducive to direct observation surveys due to increased water depths and wetted width, dense aquatic vegetation, and poor water visibility. Consideration should be given to developing new survey methodologies to better assess this portion of the river, as well as increase future sampling to include portions of the headwaters.

Heritage and Wild Trout Program Northern Region personnel have committed to updating the Fisheries Management Plan for the Fall River in 2013; once revised, this document should provide guidelines for sampling strategy (direct observation, electrofishing, ASB, creel, etc.), methods, survey locations, and monitoring frequency for this world class fishery.

#### References

Bloom, R. and J. Weaver. 2008. The California Heritage and Wild Trout Program Handbook (Draft). State of California Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual. 3rd Edition. Vol. 1. State of California Resources Agency. Department of Fish and Game. Inland Fisheries Division.

Hankin, D.G. and G.H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences. 45:834-844.

California Department of Fish and Wildlife. 2012. Fall River and Hat Creek monitoring. State of California Natural Resources Agency. Heritage and Wild Trout Program. Northern Region. Redding, CA.

Weaver, J. and S. Mehalick. 2009. Fall River 2009 Summary Report. State of California Natural Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program. Rancho Cordova, CA.

Weaver, J. and S. Mehalick. 2010. Hat Creek 2010 Summary Report. State of California Natural Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program. Rancho Cordova, CA.



Figure 1. Vicinity map of Fall River survey location

Figure 2. Detail map of Fall River, including the Wild Trout designated area, 2012 section locations and ASB locations



Figure 3. Graph of 2012 Fall River Section 1 direct observation survey data: observed trout size class distribution by species





Figure 4. Graph of 2012 Fall River Section 2 direct observation survey data: observed coastal rainbow trout size class distribution



Figure 5. Graph of 2012 Fall River Section 3 direct observation survey data: observed coastal rainbow trout size class distribution



Figure 6. Graph of Fall River Island Road ASB forms reporting CPUE (fish/hr) from 2003-2012 (long-term average in red)



Figure 7. Graph of Fall River coastal rainbow trout estimated density by year from 1993-2012 (long-term average in red)

Figure 8. Graph of Fall River brown trout estimated density by year from 1993-2012 (long-term average in red)





Figure 9. Graph of Fall River observed rainbow trout size class distribution by year (1995-2012)



Figure 10. Graph of Fall River observed brown trout size class distribution by year (1995-2012)

Figure 11. Graph of Fall River Section 1 and 2 average wetted width in 2007, 2010 and 2012 (long-term average in red)



Figure 12. Graph of Fall River Sections 1 and 2 average water depth in 2007, 2010, and 2012 (long-term average in red)



					Number of fish observed							
Section	Section Section length		Species	VOV	Small	Medium	Large	Extra- large	Total	Estimated density (fish/mi)		
	(11)			TUT	< 6"	6"-11.9"	12"- 17.9"	≥ 18"	- Totai			
			rainbow trout	1546	1375	465	206	29	3621	2586		
			brown trout	0	2	0	0	0	2	1		
1	7392.0	flatwater	unknown trout	50	1	6	2	0	59	42		
		-	sucker	-	-	-	-	-	102	73		
			sculpin	-	-	-	-	-	1	1		
	4004.0	flatwatar	rainbow trout	607	1752	840	677	67	3943	4929		
2	4224.0	natwater	unknown fishes	-	-	-	-	-	1880	2350		
			rainbow trout	566	565	82	99	40	1352	751		
2	0504.0	flatwatar	unknown trout	0	0	0	0	1	1	1		
3	9504.0	natwater -	flatwater	natwater	sucker	-	-	-	-	-	2362	1312
							sculpin	-	-	-	-	-

Table 2. Summary of Fall River Island Road ASB data from 2003-2012

Year	Number of forms analyzed	Effort (hrs)	Total brown trout reported caught	Total rainbow trout reported caught	Total trout reported caught	CPUE (fish/hr)
2003	31	161	3	168	171	1.06
2004	27	184	0	177	177	0.96
2005	16	80.5	1	106	107	1.33
2006	26	126	0	104	104	0.83
2007	12	51	0	71	71	1.39
2008	8	36	0	69	69	1.92
2009	6	33	1	26	27	0.82
2010	10	48.5	1	60	61	1.26
2011	5	26.8	0	16	16	0.62
2012	13	76.5	1	61	62	0.67

NI seles s		Number rainbow trout reported captured							
Number of forms analyzed	Effort (hrs)	Small	Medium	Large	Extra- large	Total	CPUE (fish/hr)		
anaryzeu		< 6"	6"-11.9"	12"-17.9"	≥ 18"				
106	717.5	21	264	393	102	780	1.12		

#### Table 3. Summary of Fall River newly-established ASB data from 2012

### Table 4. Fall River direct observation survey data (1993-2012)

				Sect	ion 1				
	Number	Numb	er of rainbo	w trout ob	served	Number of brown trout observed			
date	of divers	< 6"	6"- 11.9"	≥12"	Total	< 6"	6"- 11.9"	≥12"	Total
08/25/93	12	3762	288	68	4118	58	1	6	65
08/01/95	9	106	113	40	259	0	0	1	1
08/05/97	13	5765	708	254	6727	0	0	7	7
07/29/98	11	3995	3412	1763	9170	0	3	10	13
08/04/99	12	4506	1079	394	5979	0	6	9	15
08/01/01	13	2653	2520	1014	6187	0	0	0	0
08/05/04	11	1235	1292	469	2996	0	0	2	2
07/17/07	12	5331	490	203	6024	42	10	0	52
07/29/08	12	2437	88	164	2689	11	1	0	12
07/20/09	9	9158	1081	508	10747	0	0	1	1
07/26/10	15	2037	1015	347	3399	2	2	2	6
07/24/12	12	2921	465	235	3621	2	0	0	2

#### Section 2

Survey	Number	Numb	Number of rainbow trout observed				Number of brown trout observed			
date	of divers	< 6"	6"- 11.9"	≥12"	Total	< 6"	6"- 11.9"	≥12"	Total	
08/23/93	11		1322		1322	n	one recorde	ed	n/a	
08/02/95	10	440	1134	874	2448	n	one recorde	ed	n/a	
08/06/97	12	1420	1113	1418	3951	n	one recorde	ed	n/a	
07/28/98	13	389	1355	503	2247	0	3	3	6	
08/03/99	12	2145	1674	681	4500	0	5	0	5	
07/31/01	13	1190	3515	1052	5757	0	0	0	0	
08/04/04	11	391	1051	687	2129	n	one recorde	ed	n/a	
07/17/07	12	5362	2100	854	8316	2	0	0	2	
07/29/08	12	2482	757	950	4189	0	0	0	0	
07/21/09	9	2019	1420	781	4220	0	0	0	0	
07/28/10	15	981	2145	2166	5292	0	0	0	0	
07/25/12	13	2359	840	744	3943	0	0	0	0	

#### Table 4 continued

				Sect	ion 3						
Survoy	Number	Numb	Number of rainbow trout observed				Number of brown trout observed				
date	of divers	< 6"	6"- 11.9"	≥12"	Total	< 6"	6"- 11.9"	≥12"	Total		
08/24/93	11	2421	806	290	3517	0	1	4	5		
08/02/95	11	2090	1303	486	3879	0	0	1	1		
08/06/97	12	1602	704	480	2786	0	0	1	1		
07/30/98	12	3175	1356	653	5184	0	0	1	1		
08/04/99	12	2371	817	188	3376	0	0	2	2		
08/01/01	13	664	1438	851	2953	0	0	0	0		
08/05/04	11	2106	2599	1336	6041	0	0	0	0		
10/04/07	11	2160	1230	291	3681	0	0	0	0		
07/30/08	16	6004	377	293	6674	0	0	0	0		
07/28/10	15	2164	1441	1010	4615	0	0	0	0		
07/26/12	13	1131	82	139	1352	0	0	0	0		

				Sect	ion 4				
Survey	Number	Numb	er of rainbo	w trout ob	served	Num	ber of brow	n trout obs	erved
date	of divers	< 6"	6"- 11.9"	≥12"	Total	< 6"	6"- 11.9"	≥12"	Total
07/27/10	16	962	58	58	1078	0	0	1	1

Table 5. Fall River wetted width measurements in 2007, 2010, and 2012

	Average			
Year	Section 1	Section 2	Section 3	Average
2007	129.5	164.2	-	146.9
2010	126.0	217.0	152.0	165.0
2012	122.4	157.8	163.2	147.8
	153.2			

	Averag			
Year	Section 1	Section 2	Section 3	Average
2007	5.3	6.0	-	5.6
2010	5.8	6.7	6.4	6.3
2012	3.4	7.0	5.0	5.1
	5.7			

\_\_\_\_\_

Table 6. Fall River water depth measurements in 2007, 2010, and 2012