# Green Creek 2012 summary report

July 8-10, 2012

State of California

Department of Fish and Wildlife

Heritage and Wild Trout Program



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#### Introduction

Green Creek, tributary to the East Walker River, is located approximately five miles southwest of Bridgeport, CA (Mono County) and supports wild populations of rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), and brown trout (*Salmo trutta*; Figure 1). The California Department of Fish and Wildlife (CDFW) Heritage and Wild Trout Program (HWTP) is evaluating Green Creek for candidacy as a designated Wild Trout Water. On an annual basis, the HWTP is responsible for recommending to the California Fish and Game Commission 25 miles of stream and one lake that fit the criteria for designation as Wild Trout Waters. 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. The HWTP evaluates candidate waters using a phased approach to systematically collect data and evaluate whether or not a stream or lake meets designation criteria.

Prior to 2012, the CDFW planted catchable-sized trout in Green Creek to support a put and take fishery. Due to logistical constraints, the hatchery trout allotment in Green Creek was suspended. In 2012, HWTP personnel conducted Phase 1 (initial resource) assessments to monitor the wild trout fishery and determine whether Green Creek meets the minimum qualifications for designation as Wild Trout Water. Survey goals and objectives were to collect baseline information on the fishery and habitat including species composition, size class structure, abundance, angler catch rates and whether natural recruitment is occurring.

#### Methods

#### Direct observation

Direct observation surveys were conducted from July 8<sup>th</sup> through10<sup>th</sup>, 2012 in Green Creek (15 sections) using snorkeling methods, an effective survey technique in many small streams and creeks in northern California and the Pacific Northwest (Hankin and Reeves 1988; Figures 2-3). Where feasible, sections were spaced approximately every three-tenths of a mile and the start of each section was selected at random. Specific section boundaries were located at distinct breaks in habitat type and/or stream gradient. Surveys were excluded from high-gradient, fast-water habitat not conducive to direct observation methodology. In addition, a meadow complex with numerous beaver ponds was located in the vicinity of Section 612; due to habitat complexity and wide stream widths, the majority of this habitat was excluded from the sample frame (Figure However, Section 612 was selected based on survey feasibility within this reach. Surveys were conducted in an upstream direction with two to five divers. The number of divers was determined based on wetted width, water visibility, and habitat complexity. 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, how and when to count (or not count) fish observed, safety considerations, etc.) prior to starting the survey. For each section, surveyors measured section length along the thalweg (ft), average wetted width, water depth and water visibility (ft). Water and air temperature (°C; in the shade) was also measured. 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. 1988). Representative photographs were taken and coordinates were recorded for the section boundaries using Global Positioning System hand-held units (North American Datum 1983). Fish abundance was estimated in each section by species (fish/mi) and averaged across all sections. For the latter, all observed fish were summed by species for all sections and divided by the total survey length.

#### Angler use

Angling assessments were conducted by HWTP personnel (Headquarters) in Green Creek on July 10<sup>th</sup>, 2012 in the vicinity of direct observation Sections 912 and 1012. Anglers used fly fishing gear and recorded total effort (hrs). All landed fish were identified to species. Fish were measured (total length; inches) using a calibrated landing net and counted by size class as described above in the direct observation survey methodology. Catch per unit effort (CPUE; fish/hr) was calculated for each angler and averaged across the survey effort.

## Results

## Direct observation

A total of 15 direct observation sections were surveyed, covering 2022.5 ft of habitat (Table 1). The 15 sections consisted of 9% riffle, 80% flatwater, and 13% pool habitat with substrate dominated by cobble, gravel, sand, and silts/fines with some boulder (Figure 5). Water temperature was measured between 11 to 20 °C and air temperature was between 17 and 30 °C, depending on location and time of day. Mean wetted width was 28.8 ft and mean water depth was 1.2 ft. A total of 67 rainbow trout, 455 brook trout, 200 brown trout, 86 unknown trout, and two suckers (*Catostomus* sp.) were observed. Suckers were not identified to species.

Rainbow trout size class distribution was 25% YOY, 42% small-, 30% medium-, and 3% large-sized fish (Figure 6). Brook trout size class distribution was 12% YOY, 64% small-, 22% medium-, and 3% large-sized fish. Brown trout size class distribution was 6% YOY, 64% small-, 30% medium-, and 1% large-sized fish. Unknown trout size class distribution was 56% YOY, 35% small-, and 9% medium-sized fish. Average fish abundance for Green Creek was estimated at 195 rainbow trout/mi, 427 brook trout/mi, 1042 brown trout/mi, 204 unknown trout/mi, and four suckers/mi. Divers also observed freshwater mollusks (not identified to species), leeches (*Hirudinea* sp.), and western toads (*Bufo boreas*).

During the direct observation surveys, two potential barriers to upstream fish migration were documented (Figures 2, 3, and 7). These barriers consisted of a 10-foot and 35-foot waterfall, both of which cascaded over bedrock and boulders.

#### Angler surveys

Two individuals participated in the angling effort and captured a total of eight brown trout and four brook trout in 2.25 hours of effort (Table 2). Catch rates were zero and 4.4 fish/hr with an average of 2.2 fish/hr. Size class distribution of captured trout was 75% small- and 25% medium-sized fish.

## Discussion

Snorkel surveys were previously conducted by the HWTP in Green Creek on October 2<sup>nd</sup>, 1997 from the Green Creek Campground downstream to Dynamo Pond. Trout abundance in 1997 was estimated at 49 rainbow trout/mi, 787 brook trout/mi, and 230 brown trout/mi. Abundance estimated in 2012 showed an increase for rainbow and brown trouts and a decrease for brook trout compared to 1997. Neither survey attempted to differentiate wild from hatchery-trout. Although it is likely that hatchery rainbow trout were present in both years, their relative proportion to the wild rainbow trout population is unknown.

Brook and brown trouts appear distributed throughout Green Creek. Rainbow trout were observed in the lower and upper portions of the creek, but appeared absent in the meadow complex located in the middle portion (Sections 612-912). This area contained numerous beaver ponds and low-velocity flatwater areas (Figure 4). Rainbow trout absence in this reach may be due to poor habitat condition for this species or competitive dominance of brook and brown trouts.

## Conclusion

Green Creek meets multiple criteria for Wild Trout Water designation, including the presence of wild trout populations with multiple size classes, no stocking of hatchery fish, and suitable habitat. Although angling assessments in 2012 were limited in scope and duration, Green Creek may provide a fast-action fishery (> 2 fish/hr) with the possibility of catching three species of trout. Current angling regulations for Green Creek fall under the General Sierra District regulations with an open season from the last Saturday in April through November 15<sup>th</sup> (no gear restrictions) and a daily bag and possession limit of five and ten fish, respectively. Up to ten brook trout per day less than ten inches total length may be taken and possessed in addition to the other daily bag and possession limit. A US Forest Service (USFS) campground, located in the upper reach, provides public recreational opportunities. The portion of Green Creek surveyed in 2012 from Dynamo Pond upstream consists of state and federal lands (USFS Toiyabe National Forest and Bureau of Land Management).

Green Creek was historically stocked to provide a put and take fishery; however, due to difficult access and long drives times from the closest state fish hatchery and the presence of a wild trout population, the stocking allotment was removed. The HWTP recommends continued population-level monitoring of the wild trout fishery in Green Creek for potential designation as a Wild Trout Water. Consideration should be given to increase the geographic scope of future sampling to include Dynamo Pond (Figure 8) and headwater lakes, as well as collect data over a multi-year period to better understand trends in the population. Current angling regulations and angler use should be evaluated to ensure a self-sustaining fishery is maintained.

Two Angler Survey Boxes (ASBs) are installed on Green Creek but have not been maintained or monitored since 2009. ASBs can be a useful tool to evaluate catch rates and sizes, angler use and satisfaction, and gear preferences. The HWTP recommends maintenance and upkeep of these, as well as collaboration with USFS, Bureau of Land Management, local stakeholders, landowners and recreational users (including anglers).

#### 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. 3<sup>rd</sup> 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.



Figure 1. Vicinity map of 2012 Green Creek survey location

S 760 FOR 8229 7. IATIONAL Greek Canyon 112 212 312 AYIO 412 512 612 712 812 912 1012 1112 Sinnamon Meadow 212 1312 1412 512 REST 0 1 31 OIYAB T Direct observation survey locations 1 Barrier locations 0.5 2 Miles

Figure 2. Detail map of 2012 Green Creek direct observation survey locations and potential barriers to upstream fish migration

Figure 3. Aerial map of 2012 Green Creek direct observation survey locations and potential barriers to upstream fish migration



Figure 4. Representative photographs of meadow complex in Green Creek in 2012: beaver ponds (top) and low-velocity flatwater areas (bottom)



Figure 5. Representative photographs of Green Creek



Figure 6. Graph of 2012 Green Creek direct observation survey data: observed trout size class distribution



Figure 7. Photographs of potential barriers to upstream fish migration observed in 2012: 10-foot waterfall located between Sections 1112 and 1212 (top) and approximately 35-foot waterfall located upstream of Section 1512 (bottom)





Figure 8. Representative photographs of Dynamo Pond



	Section length	Habitat type	Species	Number of fish observed					Estimated
Section					Small	Medium	Large	Total	density
	(fť)			YUY	< 6"	6"-11.9"	12"-17.9"		(fish/mi)
			rainbow trout	2	0	2	1	5	357
112	74.0	flaturate v/viffla	brook trout	0	1	0	0	1	71
		flatwater/riffle	brown trout	0	1	1	0	2	143
		-	unknown trout	0	1	0	0	1	71
212	125.2	flatwater -	rainbow trout	4	8	0	1	13	548
			brook trout	0	2	0	0	2	84
			brown trout	2	3	5	0	10	422
			unknown trout	2	2	0	0	4	169
	77.5	flatwater	rainbow trout	1	0	0	0	1	68
312			brook trout	1	0	0	0	1	68
			brown trout	1	16	6	2	25	1703
412		flatwater	rainbow trout	0	12	1	0	13	413
	166.0		brown trout	4	16	3	0	23	732
	166.0		unknown trout	5	20	1	0	26	827
			sucker	-	-	-	-	2	64
512		- pool - -	rainbow trout	1	0	0	0	1	30
	176 4		brook trout	1	1	0	0	2	60
	170.4		brown trout	0	65	18	4	87	2604
			unknown trout	3	0	2	0	5	150
	204.0	flatwater	brook trout	0	101	30	0	131	3391
612			brown trout	0	50	7	0	57	1475
			unknown trout	1	3	0	0	4	104
	240.0	flatwater	brook trout	0	1	2	0	3	66
712			brown trout	3	54	16	3	76	1672
			unknown trout	3	1	2	0	6	132
812	130.0	flatwater	brook trout	0	1	0	0	1	41
			brown trout	0	11	5	2	18	731
			unknown trout	0	0	1	0	1	41
	173.4	flatwater	brook trout	1	1	0	0	2	61
912			brown trout	1	38	9	0	48	1462
			unknown trout	8	1	1	0	10	304
1012	76.4	- flatwater - -	rainbow trout	1	0	0	0	1	69
			brook trout	1	0	3	0	4	276
			brown trout	5	15	6	1	27	1866
			unknown trout	4	2	0	0	6	415
1112	179.0	- flatwater	rainbow trout	7	3	0	0	10	295
			brook trout	7	8	10	2	27	796
			brown trout	35	12	11	0	58	1711
			unknown trout	23	0	0	0	23	678
1212		3 flatwater/riffle	rainbow trout	1	3	8	0	12	492
	128.8		brook trout	0	3	3	0	6	246
			brown trout	2	8	8	0	18	738

# Table 1. 2012 Green Creek direct observation survey data

# Table 1 continued

	Section	Habitat type		Number of fish observed					Estimated
Section	length (ft)		Species	YOY	Small < 6"	Medium 6"-11.9"	Large 12"-17.9"	Total	density (fish/mi)
1312	92.0	flatwater -	rainbow trout	0	1	3	0	4	230
			brook trout	0	0	1	0	1	57
			brown trout	0	1	1	0	2	115
			unknown trout	2	0	0	0	2	115
1412	80.8	pool	rainbow trout	0	0	4	0	4	261
			brook trout	0	7	8	0	15	980
			brown trout	0	2	1	0	3	196
1512	99.0	riffle -	rainbow trout	0	1	2	0	3	160
			brook trout	0	2	2	0	4	213
			brown trout	0	0	1	0	1	53
			unknown trout	0	0	1	0	1	53

# Table 2. 2012 Green Creek angling data

		<b>F</b> ffort		Numb			
Angler	Date	(hrs)	Species	Small	Medium	Total	(fish/hr)
				< 0	0-11.9		
Dettmar	7/10/2012	1.50	-	0	0	0	0.0
Webster	7/10/2012	2.75	brown trout	5	3	10	4.4
			brook trout	4	0	12	
Average							