

# **Merced River 2008 Summary Report**

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Heritage and Wild Trout Program  
California Department of Fish and Game



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## Introduction:

A fisheries and habitat assessment of the Merced River was conducted by the California Department of Fish and Game's (DFG) Heritage and Wild Trout Program (HWTP) in October, 2008. Three miles of the Merced River (Mariposa County) is designated by the California Fish and Game Commission as a Wild Trout Water from the Yosemite National Park boundary downstream to Forestra Bridge near El Portal, California (Figures 1 and 2). This portion of the river contains wild populations of coastal rainbow (*Oncorhynchus mykiss irideus*) and brown trout (*Salmo trutta*) and is managed by the HWTP. In 2008, the HWTP conducted Phase 4 (ongoing monitoring) multiple pass electrofishing surveys on three sections of the Merced River (Figures 2-5) and this report summarizes the results of these surveys.

Figure 1. Map of Merced River study area (red box)



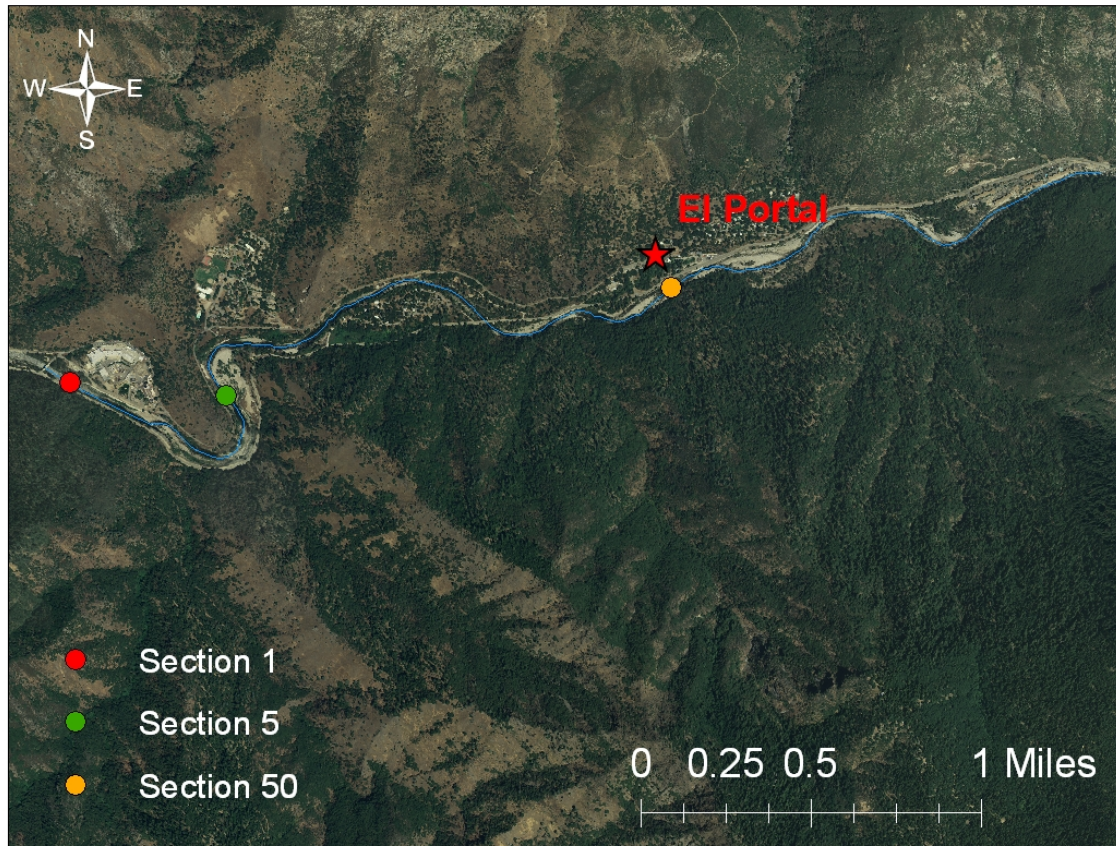
## Methods:

Multiple pass electrofishing is used to generate population data including species composition, size and age class structure, and estimates of biomass and density. These data can be compared over time to study trends in the population. In 2008, two historic electrofishing sections (Sections 1 and 5) and one new section (Section 50) were surveyed (Figure 2). To locate the specific boundaries of the two historic sections, we used information from past surveys, including site sketches, written descriptions, and GPS coordinates. Section 50 was selected based on survey feasibility; HWTP staff



examined numerous areas of the river and selected a section that would be possible to safely and effectively electrofish.

Figure 2. Map of Merced River Wild Trout-designated area (blue line) and location of 2008 survey sections (colored dots)



At each section boundary, nylon mesh block nets were installed across the wetted width, effectively closing the population within the section. Both sides of the nets were secured above bankful, heavy rocks were placed side by side along the bottom of the nets, and the nets were secured in such a way as to hold the top of the net out of the water. These nets were routinely monitored and inspected throughout the survey to ensure their integrity and to prevent fish from moving outside of the section during the course of the survey.

Prior to electrofishing, physical measurements of the stream and environmental conditions were taken, including air and water temperature (in the shade) and conductivity (both specific and ambient). These factors were used to determine appropriate electroshocker settings. GPS coordinates were recorded for both the upstream and downstream boundaries of the section. Current weather conditions were noted and the area was scouted for any species of concern prior to commencing electrofishing.

Based on stream width, habitat complexity, and water visibility, personnel needs were determined. We assigned individuals to shock, net, and tend live cars throughout the duration of the survey. For each of the three sections, the survey crew consisted of six shockers, six netters, and between two and three live car tenders. Surveys were initiated at the lower block net and proceeded in an upstream direction, with netters capturing fish and placing them in live cars to be held until processed. Live cars are 50 gallon plastic trash bins, perforated with holes to allow water circulation. Three passes were conducted within each section, with fish from each pass stored separately. Over the course of the survey, fish were handled carefully to minimize injury and stress. Fish were processed separately by pass number. Each fish was identified to species and was measured from head to tail (total length in millimeter). Using a digital scale, weights were recorded (grams). For fish that were too large to be measured on the digital scale, a spring scale was used. Fish were then recovered in live cars secured in the stream (with fresh flowing water) and released back into the section.

A habitat assessment was conducted to document resource condition by collecting base-line data on habitat types and quality, water conditions, substrate, discharge, bank condition, etc. The HWTP habitat assessment is a pared down synthesis of Rosgen (1994) and the California Salmonid Stream Habitat Restoration Manual (CSSHRM) (Flosi et al 1988). Section length was measured along the thalweg. The section length was then divided into five cells of equal length. Wetted widths were measured at the center of each of the five cells. Across each width transect, five depths were taken (also at the center of five evenly divided cells), and both widths and depths were averaged for each section.

Stream characteristics, including active erosion (erosion occurring in the present), erosion at bankful, and canopy closure were measured as percentages of either the total stream area (canopy cover) or bank area (erosion). Section percentages were defined for each habitat type (riffle, flatwater, and pool) following Level II protocols as defined by the CSSHRM. Using visual observation, we quantified substrate size classes and the percentage of each class relative to the total bottom material within the wetted width. A rating (between poor and excellent) was given to the instream cover available to fish and cover types were identified and defined as percentages of total instream cover. The change in water surface elevation (section gradient) and streamflow were measured. Representative photographs of the section were taken.

Fish measurements were entered into DFG's FISH database and were extracted into MicroFish. Based on the capture rate (number of fish captured per pass) and probability of capture, a population estimate was determined for each species in each section. MicroFish also calculated the average weight of each species by section. We then used the population estimate to determine biomass (pounds per acre) and density (fish per mile) of each species. Fish biomass estimates incorporate habitat parameters such as section length, average wetted width, and average weight of fish (by species). Density estimates are determined based on the population estimate and section length. The biomass and density estimates of the three sections were averaged to assess the overall fish populations in the Wild Trout-designated area of the Merced River.

## Results:

The Merced River Wild Trout-designated area is a low gradient (1%) snow and spring-fed stream dominated by boulders and cobble. Fish cover is fair to good in this reach, with boulders providing the majority of instream cover. Water turbulence and aquatic vegetation also provided limited cover. Water temperature, measured each morning, was consistently 16° Celsius (C) and air temperature ranged between 19° and 21° C. There was little evidence of either active or bankful erosion. The Merced River's channel in this area is open and wide; canopy cover was estimated at less than ten percent for each of the three sections and wetted widths ranged from 62 to 106 feet. Average water depth was consistent among the three sections at approximately one foot and water visibility was greater than four feet. Streamflow was measured at 33 cubic feet per second (cfs) in Section 1, 62 cfs in Section 5, and 23 cfs in Section 50.

Section 1, adjacent to the Yosemite National Park Administrative Complex, approximately 300-feet upstream of Forestra Bridge (Figure 3), was surveyed on October 7<sup>th</sup>. Section 1 is flatwater-dominated, with a small riffle representing approximately 10 percent of the total habitat. Total section length was 315 feet, including a side braid 76 feet in length. The HWTP captured 4 coastal rainbow trout, 24 California roach (*Lavinia symmetricus*), 130 Sacramento pikeminnow (*Ptychocheilus grandis*), 50 Sacramento sucker (*Catostomus occidentalis*), 285 sculpin (*Cottus* spp.), and 3 smallmouth bass (*Micropterus dolomieu*) (Table 1). Based on section length and the number of coastal rainbow trout captured, density estimates for Section 1 were calculated at approximately 67 coastal rainbow trout per mile (Table 2).

Table 1. Summary of 2008 Merced River electrofishing data

	Species	Section Length (ft)	Number of fish Captured	Estimated Population (in-section)	Section Average Weight (g)	Estimated Biomass (lb/acre)	Estimated Density (fish/mi)
Section 1	coastal rainbow trout	315	4	4	129.8	2.10	67
	California roach		24	29	3.6	0.42	486
	Sacramento pikeminnow		130	151	3.9	2.39	2531
	Sacramento sucker		50	56	221.0	50.13	939
	<i>Cottus</i> spp.		285	308	5.0	6.24	5163
	smallmouth bass		3	4	7.4	0.12	67
Section 5	coastal rainbow trout	180	13	13	228.8	15.00	381
	brown trout		3	5	214.0	5.40	147
	California roach		9	14	62.0	4.38	411
	Sacramento pikeminnow		85	139	58.9	41.29	4077
	Sacramento sucker		138	155	150.5	117.63	4547
	<i>Cottus</i> spp.		189	214	70.2	75.76	6277
Section 50	coastal rainbow trout (wild)	318	10	10	205.2	10.07	166
	coastal rainbow trout (hatchery)		1	1	182.0	0.89	17
	brown trout		1	1	97.7	0.48	17
	California roach		3	4	6.4	0.13	66
	Sacramento pikeminnow		24	25	5.4	0.66	415
	Sacramento sucker		94	102	302.8	151.61	1694
	<i>Cottus</i> spp.		246	257	4.7	5.93	4267
	smallmouth bass		11	11	73.4	3.96	183

Figure 3. 2008 Merced River Section 1 map (left; red line represents the section) and site photograph (right)





Section 5, surveyed on October 8<sup>th</sup>, was a flatwater section 180 feet in length and was located adjacent to El Portal Road and the Yosemite Institute. HWTP surveyors captured 13 coastal rainbow trout, 3 brown trout, 9 California roach, 85 Sacramento pikeminnow, 138 Sacramento sucker, and 189 sculpin (Table 1). Trout density estimates were approximately 381 coastal rainbow trout per mile and 147 brown trout per mile (Table 2). Fish processors noted that a few of the Sacramento suckers had external parasites (Figure 6).

Figure 4. 2008 Merced River Section 5 map (left; green line represents the section) and site photograph (right)



Section 50 was surveyed on October 9<sup>th</sup> and consisted of a 318 foot riffle adjacent to a large parking area on the north side of Highway 140 (upstream of Section 1 and downstream of Section 5). This was the only section surveyed in 2008 where instream fish cover was good; the cover ratings of both Sections 1 and 5 were rated as fair. During the electrofishing effort, it was noted that small bottom-dwelling fish, including sculpin and suckers, were able to find cover under the boulders, making capture difficult. Three passes yielded a total of 11 coastal rainbow trout (one of these was of hatchery origin), 1 brown trout, 3 California roach, 24 Sacramento pikeminnow, 94 Sacramento suckers, 246 sculpin, and 11 smallmouth bass (Table 1). The parasites observed on Sacramento suckers in Section 5 were also noted in Section 50; 26 of the Sacramento suckers captured in Section 50 had a parasite (Figure 6), representing 28 percent of the suckers captured in this section. In addition to the fish species captured, we observed a racer snake (*Coluber constrictor*). Based on the capture rate for each species, we estimated 183 coastal rainbow trout per mile and 17 brown trout per mile in Section 50.

Figure 5. 2008 Merced River Section 50 map (left; orange line represents the section) and site photograph (right)



Figure 6. 2008 Photographs of Sacramento suckers with external parasites from Section 50



Based on the 2008 data from all three sections coastal rainbow trout ranged in size from 70 to 384 millimeters (mm) total length. The average length was 242 mm and average weight was 159 grams (g). Brown trout ranged in size from 95 to 445 mm and averaged 217 mm in total length and 246 g in weight. Overall population densities of the two species were estimated at 210 coastal rainbow trout per mile and 55 brown trout per mile.



Table 2. Comparison of estimated fish densities by section and species in the Merced River from 1984-2008

Section Number	Survey Date	Estimated density (fish per mile)						
		coastal rainbow trout	brown trout	California roach	Sacramento pikeminnow	Sacramento sucker	sculpin	smallmouth bass
1	10/2/1984	581	299	0	2147	4699	4699	53
	8/29/1985	1629	137	0	2314	2143	6771	823
	10/9/1987	259	0	0	2921	2139	10456	591
	11/9/1988	107	21	64	363	684	4681	534
	8/14/2001	375	17	0	1277	3355	4973	0
	10/7/2008	67	0	486	2531	939	5163	67
5	8/15/2001	17	194	0	0	1207	2931	0
	10/8/2008	381	147	411	4077	4547	6277	0
50	10/9/2008	166	17	66	415	1694	4267	183

### Discussion:

In 2008, we were limited by the number of shockers and netters, particularly in Sections 1 and 5. The HWTP recommends using additional personnel for future surveys (increase to 8 shockers and 8 netters). When measuring streamflow, there was a discrepancy in discharge between sections. Sections 1 and 50 are both downstream of Section 5, yet Section 5 had a discharge of approximately double that of the lower sections. This may be due to error in measurement, equipment malfunction, subterranean flow in this area, or the presence of a water diversion between Sections 50 and 5. Most likely it was due to an error in measurements and, based on the flows measured in the other sections, we will assume flow in this area was between 20 and 35 cfs.

Initial examination indicated that the sculpin captured were riffle sculpin (*Cottus gulosus*). However, when examining the native ranges of different sculpin species after completion of the field surveys, it was found that prickly sculpin (*C. asper*) are also native to this drainage. Because we assumed all sculpin captured were riffle sculpin and did not examine them at the level necessary to differentiate riffle from prickly, we are identifying all sculpin captured during these surveys as *Cottus* spp. for accuracy and consistency. In future surveys, an effort should be made to identify each sculpin to species.

During the process of site selection for the survey section (Section 50), HWTP staff accessed the river at multiple points throughout the study area. During this reconnaissance, a lack of spawning gravel was observed. This was corroborated by data collected on substrate size during the habitat assessments. In addition, very few small trout were captured across all three survey sections. The HWTP recommends future

surveys focused on locating suitable spawning areas in order to better understand reproduction and recruitment in this system.

A comparison of data from past electrofishing efforts on the Merced River shows relatively low densities over time of both coastal rainbow and brown trout (1984-2008) (Table 2). Section 1 has been surveyed with the greatest frequency over this 20-plus year time frame and provides density estimates of coastal rainbow trout ranging from 67 fish per mile (in 2008) to 1629 fish per mile (in 1985). Compared to the 2001 estimates (the most recent electrofishing effort prior to 2008), there was a large decline in coastal rainbow trout numbers in Section 1 in 2008. However, there was a marked increase in coastal rainbow trout numbers in Section 5 from 2001 to 2008. Overall, in 2008, an average of the three sections yielded a coastal rainbow trout density of 210 fish per mile.

Currently, HWTP regional biologists are conducting a creel census on the Merced River from the Yosemite National Park boundary downriver to Briceburg. The study area includes both stocked and non-stocked areas (DFG stocks rainbow trout from Forestra Bridge downstream to the confluence with the South Fork Merced River). The purpose of the study is to quantify angler use, catch rates and satisfaction on the Merced River and is pending analysis.

The Merced River Wild Trout-designated area is publicly accessible, scenic, and contains wild coastal rainbow and brown trout. It is open to fishing all year with gear restrictions of artificial lures with barbless hooks only. Although trout densities are low and our electrofishing effort did not yield any trophy-sized trout (trophy trout being defined as larger than 18 inches), anglers appear to value this fishery and the results of the ongoing creel census should provide important information about the recreational value of the fishery. Due to the markedly low densities of trout observed in this three-mile stretch of river, the HWTP recommends re-evaluating the designation of this fishery as a Wild Trout Water.

## **References:**

Flosi, Gary; S. Downie; J. Hopelain, et al. 1998. California Salmonid Stream Habitat Restoration Manual. State of California Resources Agency. 3<sup>rd</sup> Edition. Department of Fish and Game. Vol. 1.

Rosgen, D.L., 1994. A Classification of Natural Rivers. Catena Vol. 22 169-199.