Hat Creek Summary Report
July 28, 2008

California Department of Fish and Game
Heritage and Wild Trout Program

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Introduction:

Hat Creek, in Shasta County, is a popular California fishing destination and one of the first streams in the state to receive designation as a Wild Trout Water by the California Fish and Game Commission. Flowing north out of Lassen National Park, Hat Creek enters the Pit River at Lake Britton and has wild populations of both coastal rainbow trout (*Oncorhynchus mykiss irideus*) and brown trout (*Salmo trutta*). The portion of Hat Creek from Powerhouse # 2 Dam downstream to Lake Britton is designated by the California Fish and Game Commission as a Wild Trout Water. The California Department of Fish and Game's (DFG) Heritage and Wild Trout Program (HWTP) monitors this fishery by conducting fishery assessments and angler surveys. In 2008, the HWTP conducted a direct observation snorkel survey along 1.7 miles of Hat Creek, within the Wild Trout-designated section, from the "Powerhouse # 2 riffle" (just downstream of the dam) to the Highway 299 Bridge (Figure 1).

Methods:

Direct observation surveys are conducted using snorkeling methods, an effective survey technique in many streams and creeks in northern California and the Pacific Northwest (Hankin & Reeves, 1988). To replicate previous survey efforts, HWTP located the boundaries of the section using written direction, maps, and GPS coordinates. The number of divers required was determined based on stream width, water visibility and habitat complexity. Sixteen personnel participated in the survey, including two boaters. Divers, maintaining an evenly-spaced line perpendicular to the current, counted fish by species. All observed trout were further categorized 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 (≥ 18 inches). The YOY category is 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 they are generally between zero and three inches in total length. If a trout was observed to be less than six inches but 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. Two personnel on paddle craft participated in the survey effort by boating behind the divers; these boaters helped divers maintain their position in the water and acted as a safety backup and lookout for the dive team. Water temperature and water visibility were measured and recorded and the section was documented with representative photographs. Section length was determined based on previous survey efforts and GIS analysis.

Results:

Sixteen DFG staff participated in the direct observation survey (14 divers and two boaters), which began at the bottom of the riffle just downstream of Hat Creek Powerhouse #2 and ended at the Highway 299 Bridge on July 28, 2008 (Figure 1). Divers performed the survey in a downstream direction. Weather conditions were sunny and clear. The section length was approximately 1.7 miles and surveyors observed 2831 coastal rainbow trout, 46 brown trout, six rough sculpin (*Cottus asperrimus)*, 46 speckled dace (*Rhinichthys osculus*), 21 Sacramento pikeminnow (*Ptychocheilus grandis*), and 2626 Sacramento suckers (*Catostomus occidentalis*) (Table 1). Turtles, clams, mussels, and crayfish were also observed but were not identified to genus or species. There were 39 additional trout that were observed but could not be identified to species. Based on section length and the total number of fish observed by species, fish densities were calculated (Table 2). The 39 trout not identified to species were included in the total trout density estimates only. Trout densities were compared to previous years' survey efforts (Table 3). The water temperature was 60 degrees Fahrenheit at 1:20 p.m. Water visibility was approximately six feet in this flatwater-dominated section.

Figure 1. Area map of Hat Creek and survey location (noted in red)

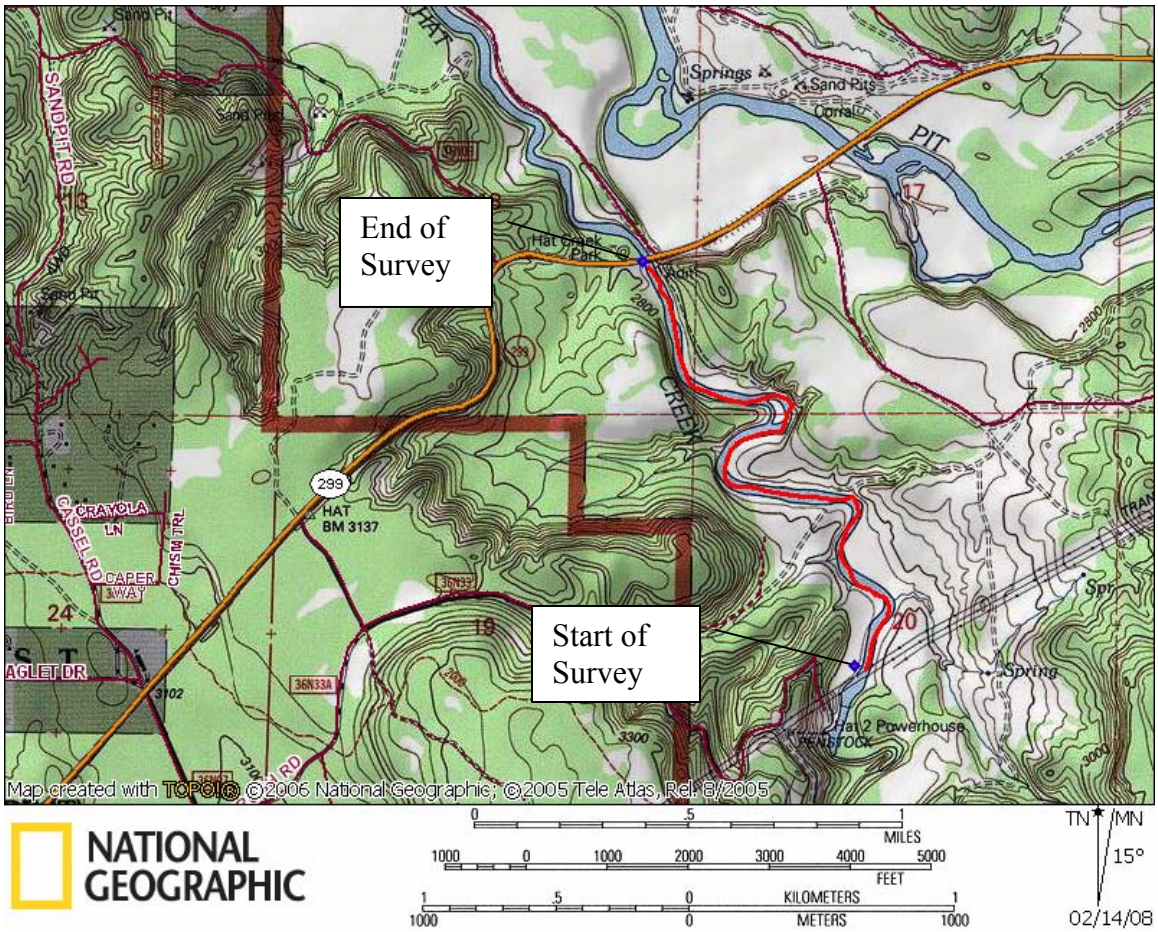


Table 1. Summary of 2008 direct observation survey results: number of fish observed and estimated density by species

Species	YOY	Small	Medium	Large	XLarge	Total	Estimated density (fish/mile)
		< 6"	6"-11.9"	12-17.9"	≥18"		
coastal rainbow trout	122	2292	342	60	15	2831	1665
brown trout	0	38	3	4	1	46	27
unknown trout	35	4	0	0	0	39	23
speckled dace						46	27
Sacramento pikeminnow						21	12
rough sculpin						6	4
Sacramento sucker						2626	1545

Table 2. Comparison of direct observation results 1993-2008

Survey Date	# of Divers	coastal rainbow trout		brown trout		total trout		Sacramento sucker	
		# observed	density (fish/mi)	# observed	density (fish/mi)	# observed	density (fish/mi)	# observed	density (fish/mi)
8/19/1993	8	5499	3235	117	69	5616	3304	422	248
8/26/1993	14	6613	3890	18	11	6631	3901	43	25
8/3/1995	11	5080	2988	3	2	5083	2990	512	301
8/7/1997	9	4394	2585	5	3	4399	2588	217	128
7/28/1998	13	3846	2262	191	112	4037	2375	198	116
8/3/1999	14	5523	3249	161	95	5684	3344	402	236
7/16/2007	9	572	336	38	22	610	359	1999	1176
7/28/2008	14	2831	1665	46	27	2877	1692	2626	1545

Figure 2. Comparison of fish density estimates from direct observation surveys, 1993-2008

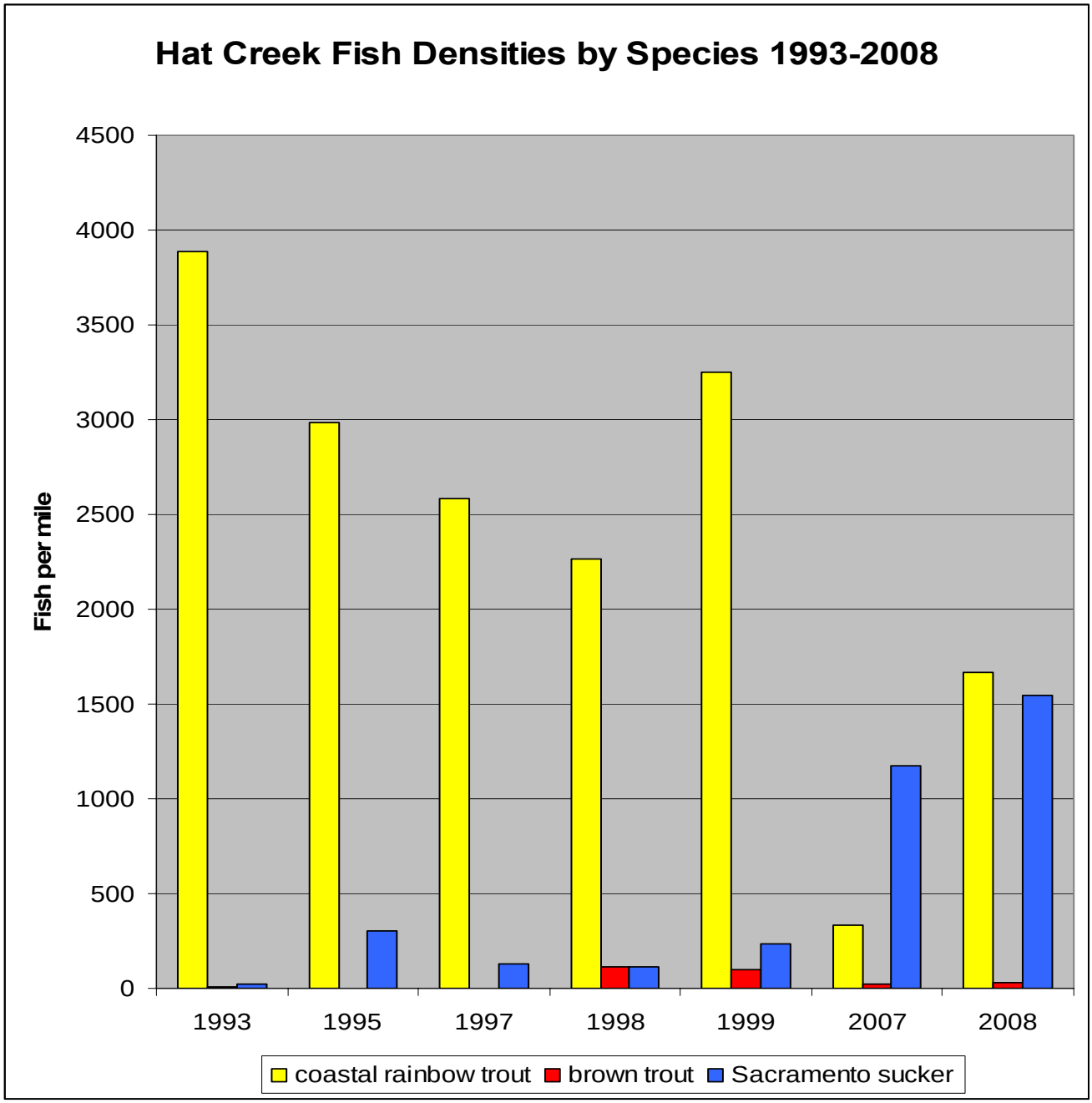


Figure 3. Total annual catch (2003-2007) from angler survey box data in the Wild Trout-designated section of Hat Creek. At all sites, anglers reported catching predominantly coastal rainbow trout with some brown trout. For 2006 (at Powerhouse), the total fish reported caught included one pikeminnow.

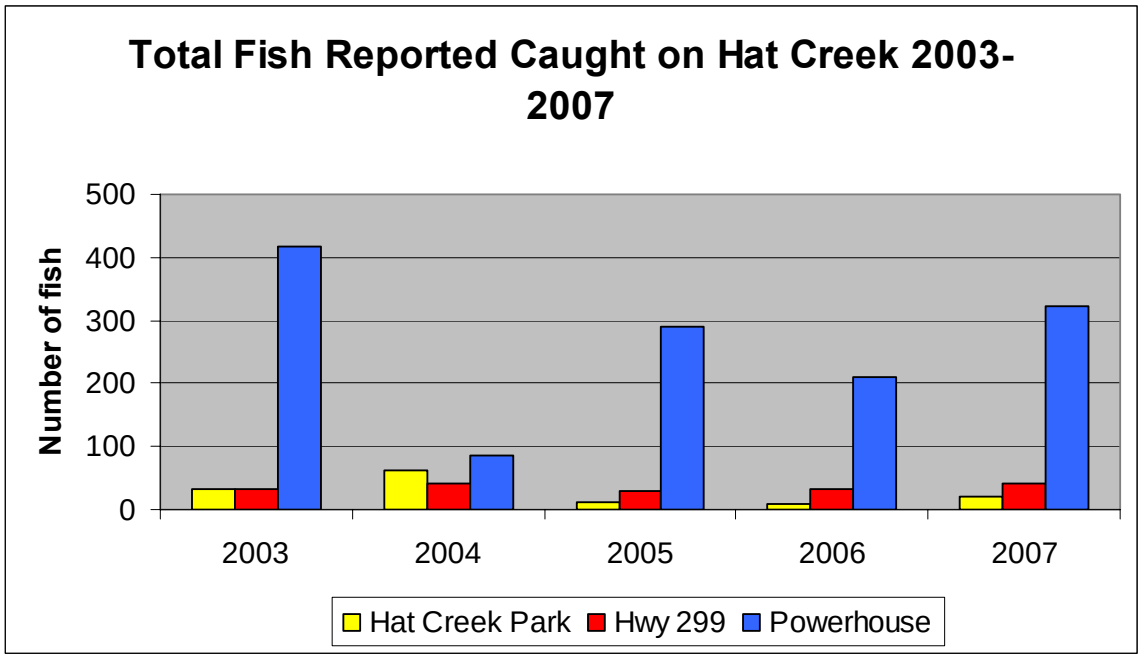
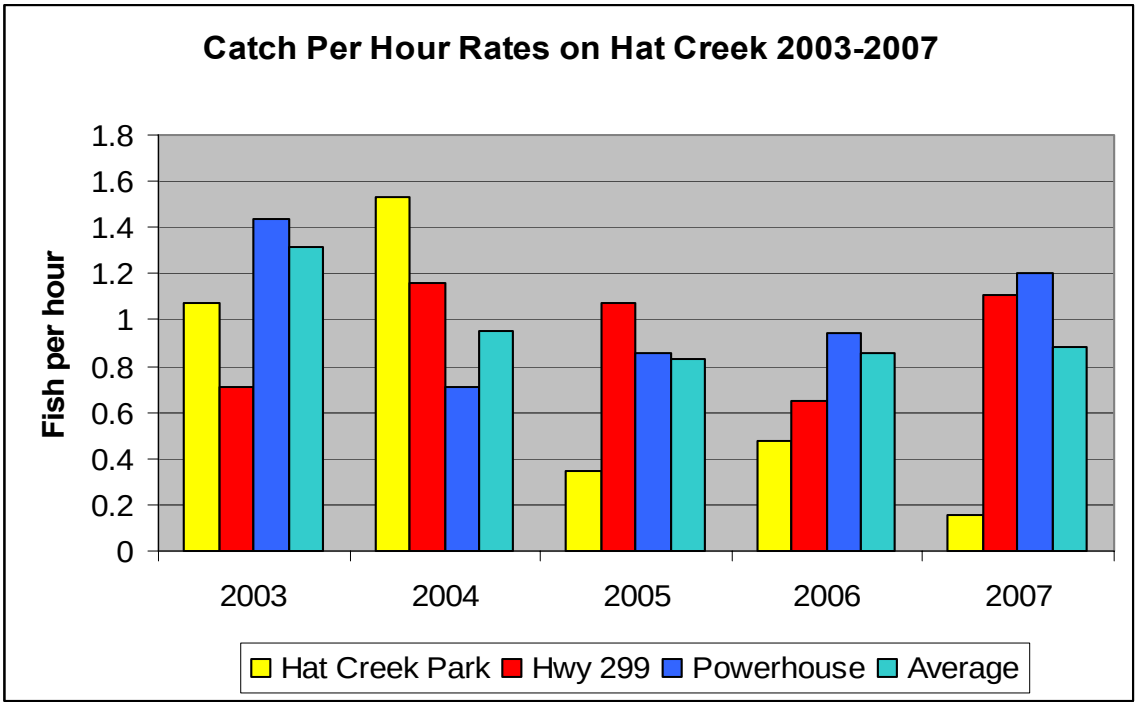


Figure 4. Catch rates (2003-2007) from angler survey box data in the Wild Trout section of Hat Creek.



Discussion:

Based on section length and the number of trout observed, it is estimated that there are 1665 coastal rainbow trout per mile and 27 brown trout per mile in the Wild Trout-designated area of Hat Creek (Table 1). All size classes of trout were represented with the majority classified as small (Table 1). Sacramento pikeminnow, rough sculpin, and speckled dace were observed in small numbers; however, there were over 2000 Sacramento suckers observed.

This section of Hat Creek was last surveyed in July, 2007. Based on recommendations from the 2007 survey, the HWTP increased the number of divers in 2008 and conducted the survey in the afternoon (as opposed to earlier in the morning in 2007) when light conditions were betted suited to observing fish. In addition, two boaters were used to keep divers in even lanes and to provide safety. As compared to 2007, water clarity was better (six feet versus three feet) and there appeared to be less aquatic vegetation in 2008. Overall, greater numbers of fish were observed in 2008 than in 2007 (the 2007 fish counts are considerably lower than all previous years' counts as well, dating back to 1993). These higher counts may be due to improved detection in 2008 (due to having more divers and/or improved visibility), or they may be reflective of an actual increase in fish numbers from one year to the next. Another year of survey with the same level of effort (and hopefully similar visibility and other habitat conditions) will aid in

determining whether the increase in fish counts is due to sampling variability or fish population fluctuations.

Voluntary angler reports from three angler survey boxes located within the Wild Trout-designated section (at Hat Creek Park, Highway 299, and Powerhouse #2) provide insights on this fishery from an angler perspective, including catch rates, catch sizes, and angler satisfaction. Data from these boxes were examined for the years 2003 through 2007. Due to the substantial decrease in total trout observed in the 2007 direct observation survey as compared to previous years' surveys, these angler survey box data were examined to see if catch rates paralleled this presumed population decrease. In 2007, anglers reported catching a total of 385 trout; of these, 95 percent were coastal rainbow trout and five percent were brown trout. Based on the 2007 direct observation surveys, 98 percent of the trout observed were coastal rainbow (2% brown). Based on angler data for the same year, the majority of both coastal rainbow and brown trout captured were medium-sized (52% and 43% respectively). According to the 2007 dive data, the majority of trout observed were in the small size class.

An examination of the angler data over time shows the Powerhouse angler survey box to have the highest number of voluntary angler survey forms submitted annually and the highest number of fish caught. However, the catch rates at Powerhouse were not consistently higher than at the other two boxes. Overall, catch rates were higher in 2007 than in 2006, with the exception of Hat Creek Park. The reported average catch rate from the three boxes was similar for each year 2004 through 2007. Based on the angler survey data from all three boxes, there does not appear to be a significant decrease in catch rates in 2007 as compared to other years.

Conclusion:

Hat Creek receives considerable fishing pressure, both within and outside of the Wild Trout-designated area. There is easy road access to the water and, during the course of the survey, there were numerous anglers on the water. The 2008 direct observation survey revealed an increase in trout numbers as compared to 2007 direct observation survey efforts. However, long-term monitoring shows a steady decline in trout numbers in this very high profile fishery. In addition, there was an increase in counts of Sacramento suckers and Sacramento pikeminnow. This was the first year that Sacramento pikeminnow were observed (or counted and recorded) during the direct observation surveys. As such, this fishery should continue to be closely monitored. Due to presumed poor detection rates in recent years, an electrofishing effort might be useful to compare direct observation results with electrofishing capture rates in order to calibrate direct observation detection on this river.

References:

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.