

# **Kern River 2009 Summary Report**

***October 6-8, 2009***

**State of California**

**Natural Resources Agency**

**Department of Fish and Game**

**Heritage and Wild Trout Program**



Prepared by Jeff Weaver and Stephanie Mehalick

## Introduction:

The Kern River (Tulare County) drains the east slope of the Great Western Divide and the west slope of the Whitney Crest in Sequoia National Park. The Kern River flows south into Isabella Lake approximately 50 miles to the northeast of Bakersfield, CA (Figure 1). Kern River rainbow trout (*Oncorhynchus mykiss gilberti*), native to the Kern River drainage, are a California Species of Special Concern. The Upper Kern River, from the Forks of the Kern upstream to Tyndall Creek is designated by the California Fish and Game Commission (CFGC) as both a Heritage and Wild Trout Water and is managed by the California Department of Fish and Game's (DFG) Heritage and Wild Trout Program (HWTP). This includes approximately 41 miles of stream habitat, based on GIS analysis (Figure 3). Wild Trout Waters are those that support self-sustaining 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. Wild Trout Waters may not be stocked with catchable-sized hatchery trout (Bloom and Weaver 2008). Heritage Trout Waters are a subset of Wild Trout Waters and highlight wild populations of California's native trout that are found within their historic drainages.

In 2009, the HWTP conducted Phase 4 surveys (ongoing monitoring of CFGC-designated waters) on the Upper Kern River to aid in the management of this wild trout fishery. Surveys were conducted using direct observation snorkel surveys at four locations (Figure 4). Direct observation is an effective survey technique in many small streams and creeks in California and the Pacific Northwest and yields information on species composition, size class structure, and estimates of abundance (Hankin and Reeves 1988). To compare fish densities and size class structure, both within and outside of the designated portions of the Kern River, as well as to gain further insight into the recreational fishery potential outside of the designated section, the HTWP conducted an additional five Phase 2 direct observation snorkel surveys between Johnsondale Bridge and the Forks of the Kern (downstream of the Heritage and Wild Trout-designated portion of the Kern River; Figures 6 and 7). Phase 2 candidate water assessments provide a comprehensive evaluation of the fishery, habitat, and angler use, including estimates of trout abundance and delineation of species distribution.

Data from two angler survey boxes (ASB) located within the 2009 study reach at Johnsondale Bridge and the Forks of the Kern were examined to provide further insight into this fishery from an angler perspective including catch rates, catch sizes, and angler satisfaction (Figure 2). Data from these boxes were analyzed and incorporated into this report for the years 2004 through 2009 (Tables 5 and 6).

Figure 1. Vicinity map of 2009 Kern River survey location.

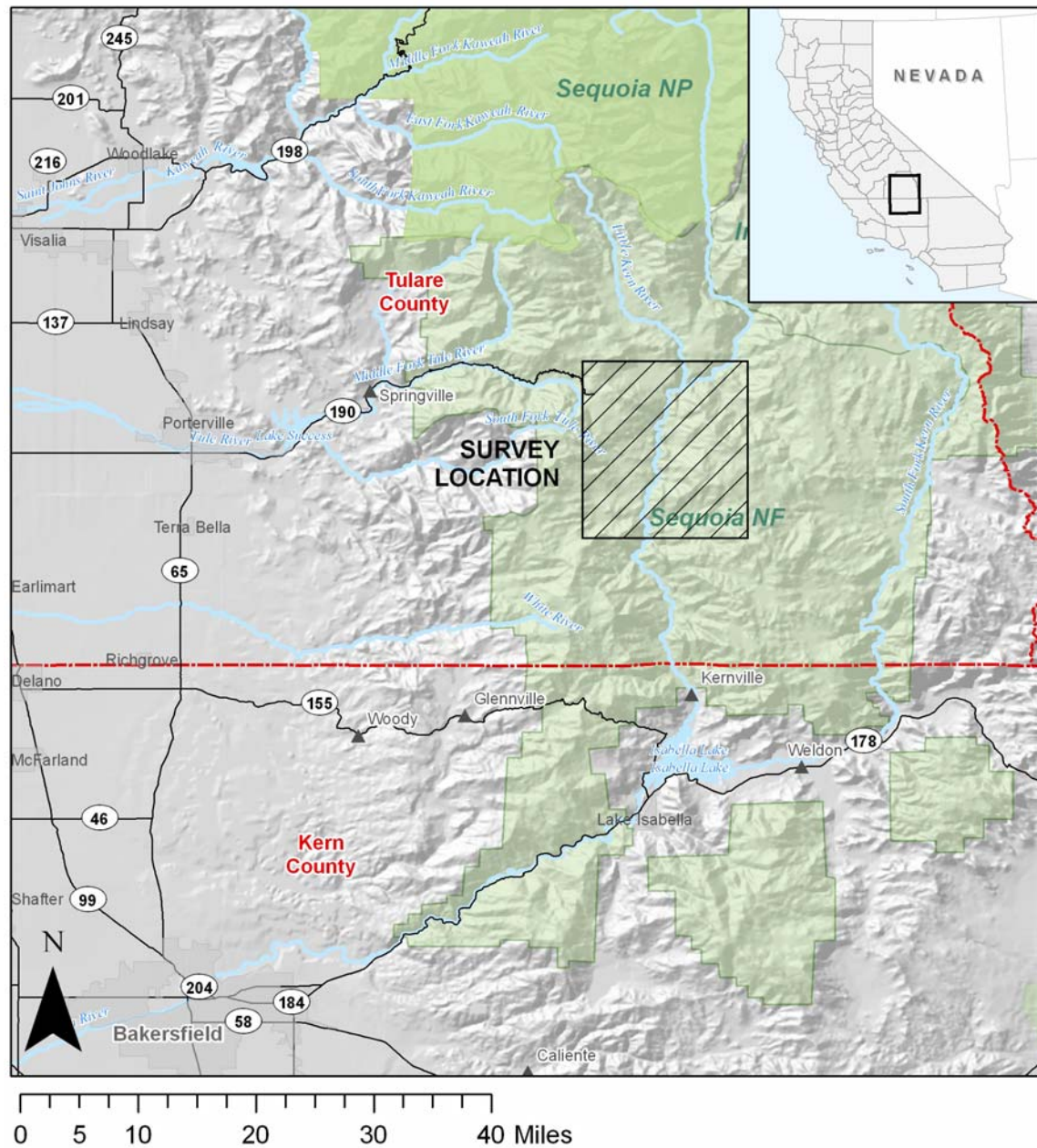




Figure 2. Detail map of 2009 Kern River survey sites and Angler Survey Box locations.

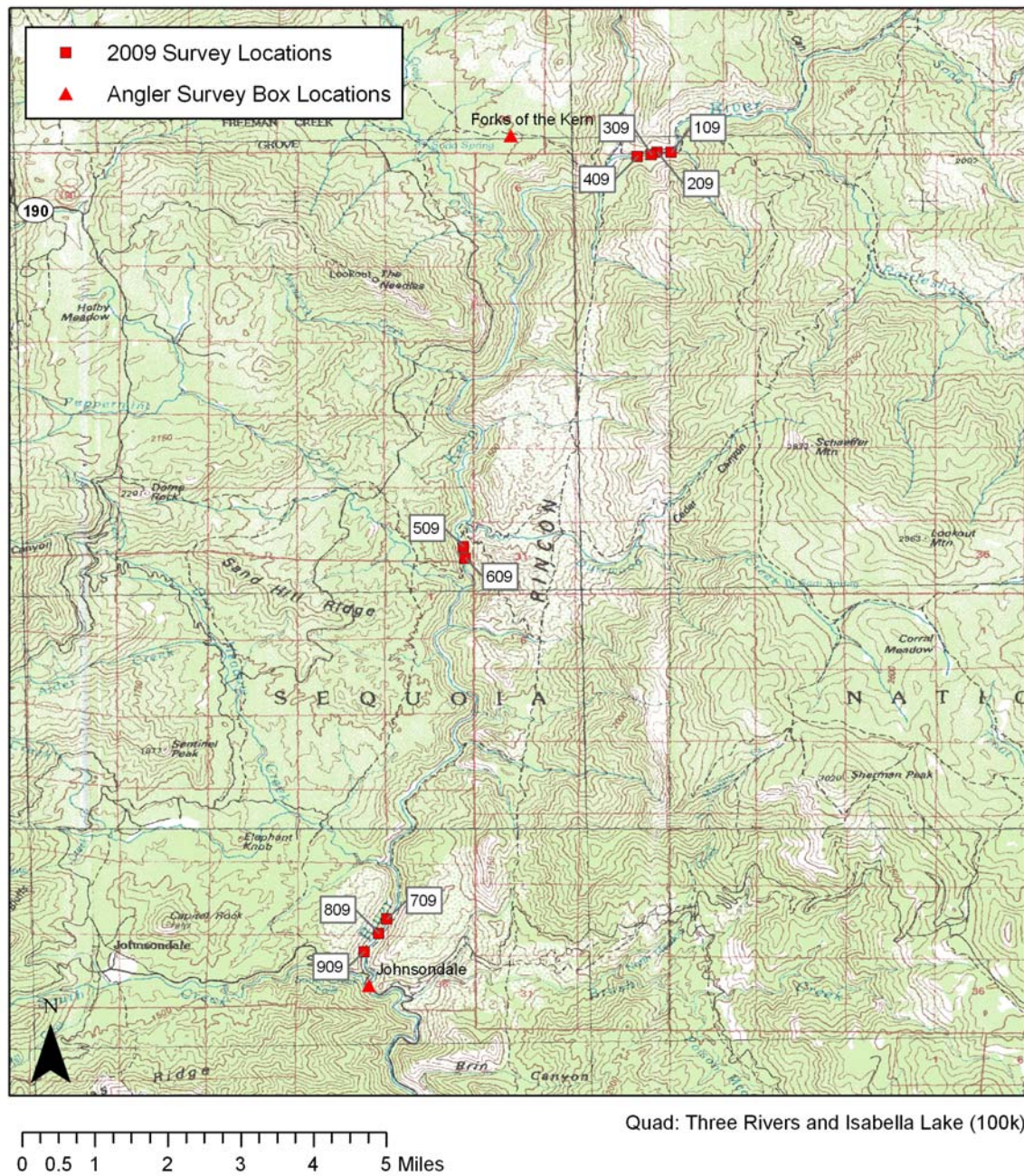




Figure 3. Map of Kern River Heritage and Wild Trout-designated reach.



## Methods:

Direct observation surveys were conducted at nine locations on the Kern River from October 6-8, 2009 (Figure 2). This reach of river is confined within steep canyon walls with road access limited to one location at Johnsondale Bridge. The entire Heritage and Wild Trout-designated reach is remote, difficult to access, and requires extensive hiking. Sections were spaced apart to the greatest geographic extent possible given the constraints of lengthy hiking distances, time required to access survey locations, and limited daylight hours in October. Sections were selected to represent the different habitat types available at each access location and included flatwater, riffle, and pool (different areas of the river were surveyed on each of the three survey days, including Forks of the Kern, Johnsondale Bridge, and an unnamed location between the two, near the confluence with Peppermint Creek). Habitat typing followed Level 2 protocol as defined in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1988). Specific section boundaries were located at distinct breaks between habitat types and/or stream gradient.

Due to high water velocities, surveys were conducted in a downstream direction. The number of divers was determined based upon wetted width, water visibility, habitat complexity, and the availability of divers trained in snorkel techniques and underwater fish identification. Six divers, maintaining an evenly-spaced line perpendicular to the current, 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 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.

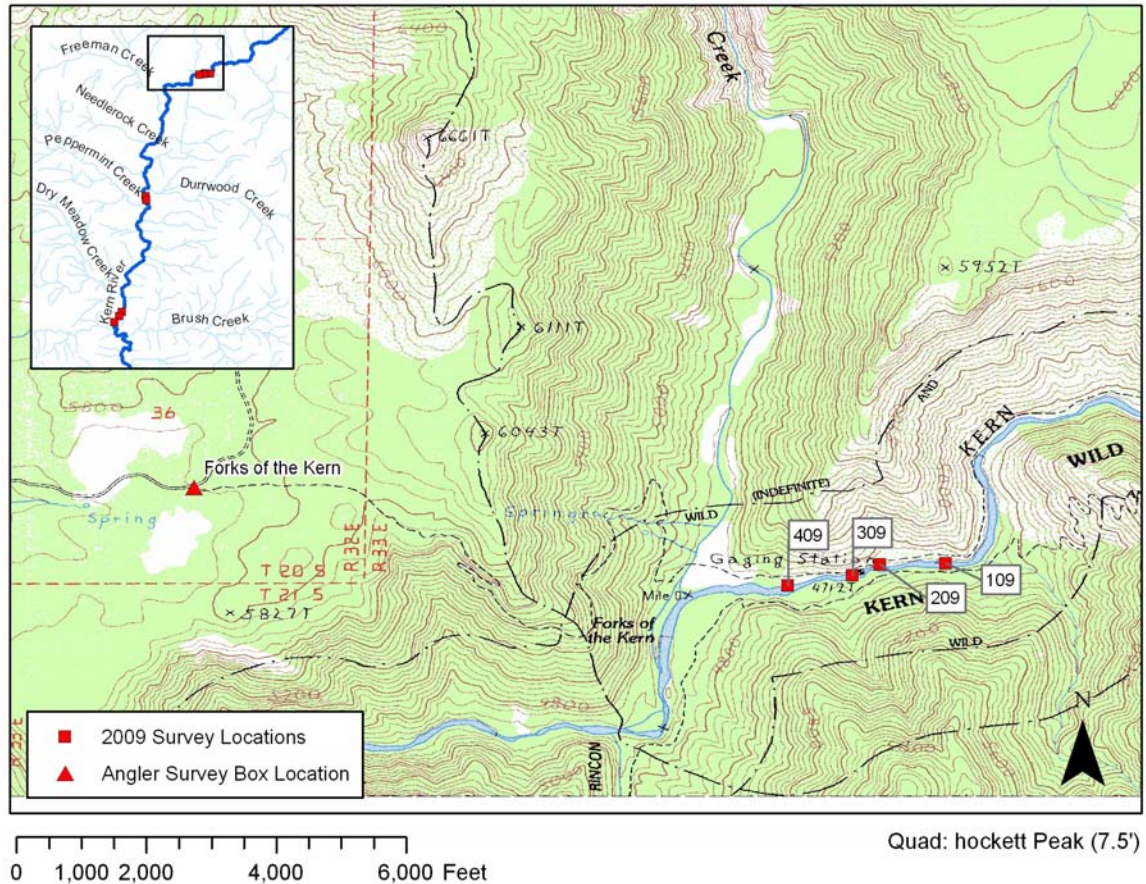
Divers were instructed in both visual size class estimation and proper snorkel survey techniques prior to starting the survey (establishing diver lanes, determining the extent of their visual survey area, how and when to count (or not count) fish observed, safety considerations, etc.). For each section, surveyors measured section length along the thalweg, water and air temperature (in the shade), average wetted width and water depth, and water visibility. Habitat type (flatwater, riffle, or pool) was identified and GPS coordinates were recorded for the section boundaries. Representative photographs were taken.

Data from the ASBs located at Johnsondale Bridge and the trailhead to the Forks of the Kern were extracted from the DFG Fisheries Information Sharing Host (FISH) database to better understand angling pressure and catch rates for the years 2004 through 2009 (Tables 5 and 6). Historic HWTP survey data from the



FISH database were also examined to compare fish densities across time (Table 7).

Figure 4. Detail map of 2009 Kern River Sections 109-409.



## Results:

Sections 109 through 409, located within the Heritage and Wild Trout-designated portion of the Kern River, were surveyed on October 6, 2009; this area of the river was accessed via the Forks of the Kern trailhead (Figure 4). The weather was sunny with a slight breeze, the air temperature fluctuated between 15 °C and 34 °C depending on location, and the water temperature was, on average, 7.5 °C. Habitat types included two flatwater sections, a riffle, and a pool (Table 1 and Figure 5). The average wetted width of these four sections was 62.8 feet and the average water depth was 2.5 feet. A total of 84 Kern River rainbow trout and 27 Sacramento suckers (*Catostomus occidentalis*) were observed in 1188.5 feet of stream habitat (Table 2). Abundance estimates were 373 Kern River rainbow trout per mile and 120 Sacramento suckers per mile in this area. The observed Kern River rainbow trout ranged in size from small to large, with the majority

falling in the small size class (56%). Due to the timing of the survey (fall), it was difficult to differentiate YOY from small fish; all trout smaller than six inches were classified as small.

Table 1. Summary of 2009 direct observation habitat data for Kern River Sections 109-409.

Section number	Section length (ft)	Water visibility (ft)	Habitat type percentage			Average water depth (ft)	Average wetted width (ft)
			Flatwater	Pool	Riffle		
109	224.0	8	0%	0%	100%	1.7	70.3
209	290.0	10	100%	0%	0%	1.8	56.1
309	241.0	15	0%	100%	0%	4.5	56.4
409	433.5	10	100%	0%	0%	2.1	68.2
<b>Average</b>		<b>10.75</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.5</b>	<b>62.8</b>

Table 2. Summary of 2009 direct observation fish data for Kern River Sections 109-409.

Section	Section length (ft)	Species	YOY	Number of fish observed				Total	Estimated density (fish/mi)
				Small 0"- 5.9"	Medium 6"- 11.9"	Large 12"- 17.9"	XLarge >18"		
109	224.0	Kern River rainbow trout	0	2	3	0	0	5	118
		Sacramento sucker			-			2	47
209	290.0	Kern River rainbow trout	0	2	6	0	0	8	146
309	241.0	Kern River rainbow trout	0	42	22	2	0	66	1446
		Sacramento sucker			-			25	548
409	433.5	Kern River rainbow trout	0	1	4	0	0	5	61
<b>Total</b>	<b>1188.5</b>	<b>Kern River rainbow trout</b>	<b>0</b>	<b>47</b>	<b>35</b>	<b>2</b>	<b>0</b>	<b>84</b>	<b>373</b>
		<b>Sacramento sucker</b>			-			<b>27</b>	<b>120</b>



Figure 5. Site photographs of 2009 Kern River survey sites (Starting from top left and rotating clockwise: Sections 109, 209, 309, and 409).



Sections 509 through 909 were surveyed on October 7 and 8, 2009 and were located downstream of the Heritage and Wild Trout-designated area (Figures 6-8). An unnamed trailhead provided access to the Kern River in the vicinity of Peppermint Creek and Durrwood Camp (Sections 509 and 609). Sections 709 through 909 were surveyed upstream from Johnsondale Bridge. The weather was sunny and clear with a slight breeze at times, the air temperature ranged between 15 °C and 18 °C, and the water temperature was measured at 9 °C and 10 °C. The combined survey length of these five sections was 1741.0 feet and averaged 72.4 feet in wetted width and 3.4 feet in water depth (Table 3). Habitat surveyed included two flatwater sections, one riffle, one pool, and one section comprised of both flatwater (35%) and pool (65%) habitat. A total of 203 Kern River rainbow trout and 285 Sacramento suckers were observed (Table 4). The Kern River rainbow trout ranged in size from small to extra-large fish; 61% were



in the small size class. Abundance estimates were 616 Kern River rainbow trout per mile and 864 Sacramento suckers per mile in this portion of the river.

Figure 6. Detail map of 2009 Kern River Sections 509-609.

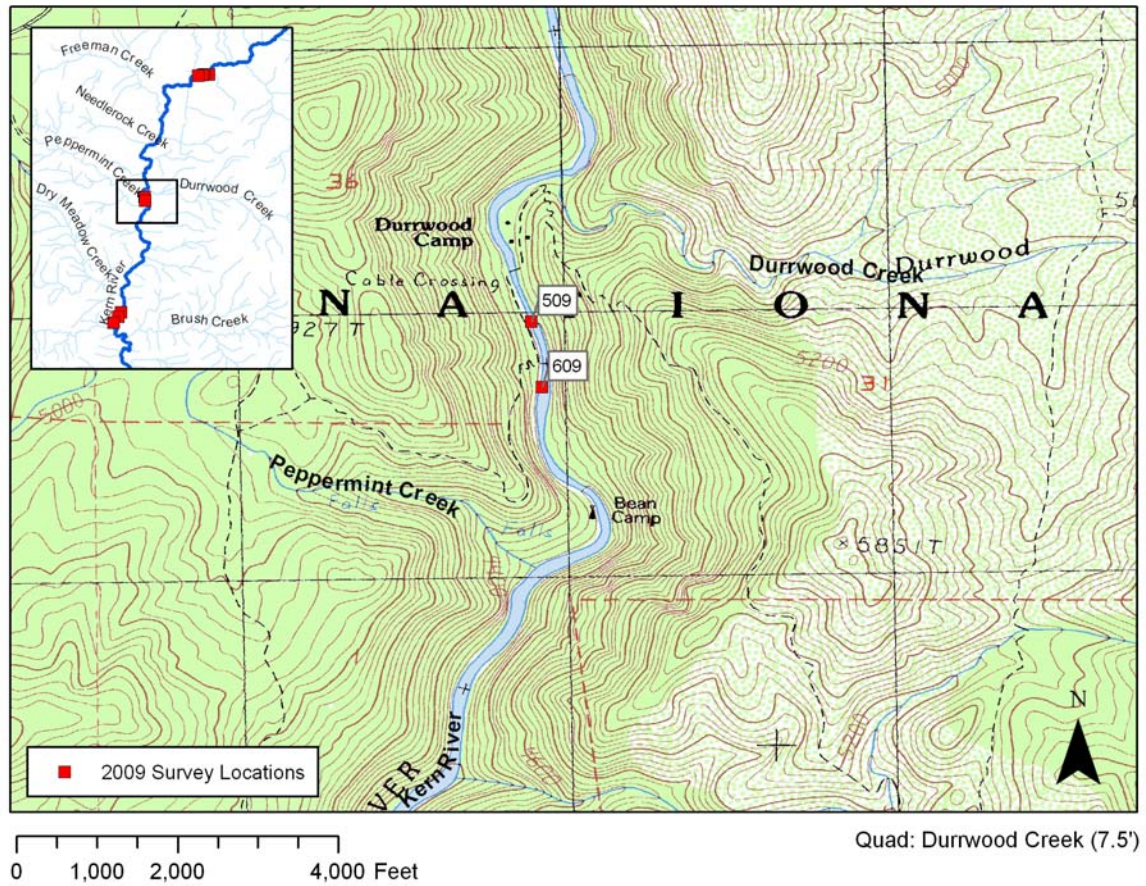




Figure 7. Detail map of 2009 Kern River Sections 709-909 including the Angler Survey Box location at Johnsondale Bridge.

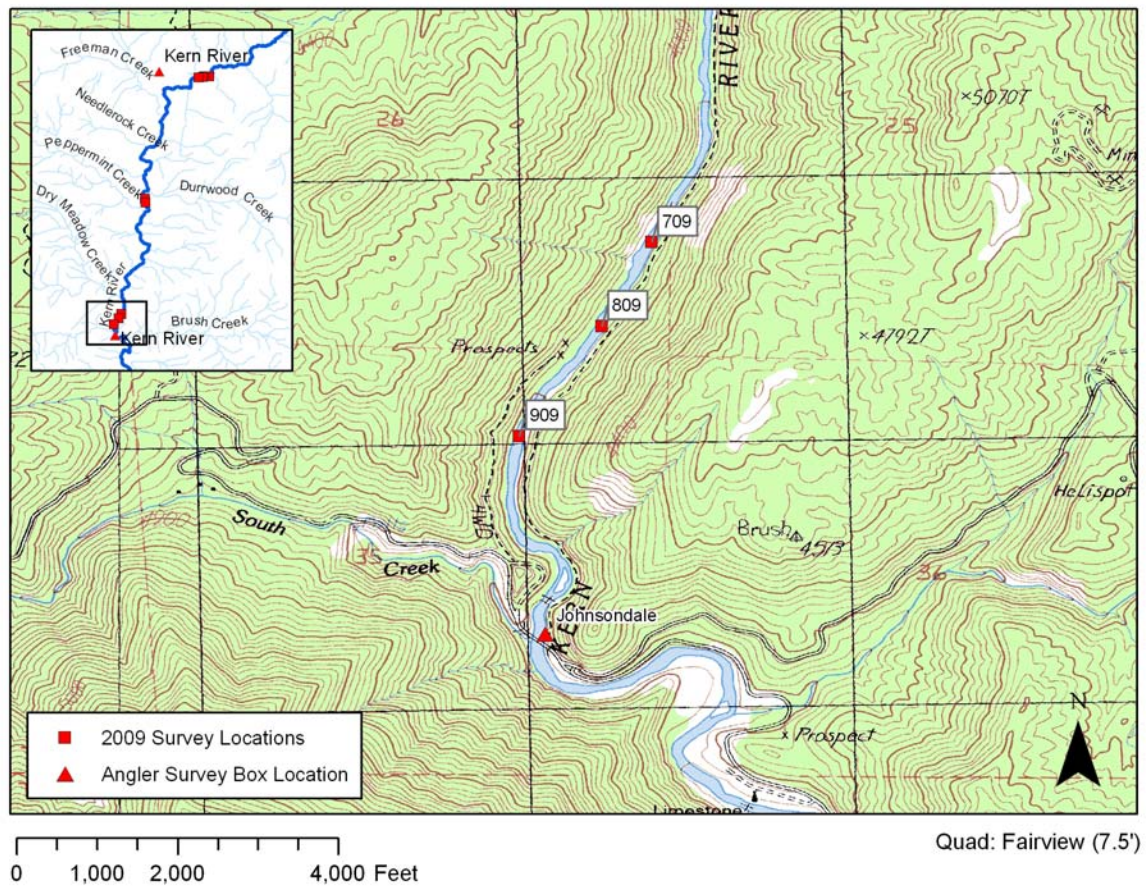


Table 3. Summary of 2009 direct observation habitat data for Kern River Sections 509-909.

Section number	Section length (ft)	Water visibility (ft)	Habitat type percentage			Average water depth (ft)	Average wetted width (ft)
			Flatwater	Pool	Riffle		
509	444.0	10	100%	0%	0%	3.0	69.8
609	416.0	8	35%	65%	0%	4.5	85.2
709	380.0	10	100%	0%	0%	2.4	84.7
809	345.0	6	0%	0%	100%	1.4	71.1
909	156.0	12	0%	100%	0%	5.5	51.1
<b>Average</b>		<b>9</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3.4</b>	<b>72.4</b>

Table 4. Summary of 2009 direct observation fish data for Kern River Sections 509-909.

Section	Section length (ft)	Species	Number of fish observed					Total	Estimated density (fish/mi)
			YOY	Small 0"- 5.9"	Medium 6"- 11.9"	Large 12"- 17.9"	XLarge >18"		
509	444.0	Kern River rainbow trout	0	6	2	0	0	8	95
		Sacramento sucker			-			34	404
609	416.0	Kern River rainbow trout	0	0	3	1	0	4	51
		Sacramento sucker			-			64	812
709	380.0	Kern River rainbow trout	0	18	16	0	0	34	472
		Sacramento sucker			-			21	292
809	345.0	Kern River rainbow trout	0	35	19	1	0	55	842
		Sacramento sucker			-			93	1423
909	156.0	Kern River rainbow trout	0	64	31	6	1	102	3452
		Sacramento sucker			-			73	2471
<b>Total</b>	<b>1741.0</b>	<b>Kern River rainbow trout</b>	<b>0</b>	<b>123</b>	<b>71</b>	<b>8</b>	<b>1</b>	<b>203</b>	<b>616</b>
		<b>Sacramento sucker</b>						<b>285</b>	<b>864</b>



Figure 8. Site photographs of 2009 Kern River survey sites (Starting from top left and rotating clockwise: Sections 509, 609, 709, 809, and 909).



Data from the two ASBs located on the Kern River within the study reach show that twice as many anglers filled out voluntary survey forms at the Johnsondale Bridge location than at Forks of the Kern from 2004 through 2009 (Tables 5 and 6). The Johnsondale Bridge area can be accessed via paved road and includes a large parking area for anglers. Both the total number of hours fished and the total number of trout captured correlated directly to the number of anglers who completed ASB forms (i.e., both values are approximately twice as high at Johnsondale Bridge). Catch per hour (2004 through 2009) was averaged at both ASB locations; catch rates were similar for both Johnsondale Bridge and Forks of the Kern. A higher percentage of trout were kept (rather than released) at the Forks of the Kern (11%) compared to at Johnsondale Bridge (3%), but both were relatively low.

Table 5. ASB data from the Kern River at the Forks of the Kern for the years 2004 through 2009 (trout reported includes both rainbow and brown trout).

<b>Year</b>	<b>Total anglers</b>	<b>Total hours</b>	<b>Number of trout kept</b>	<b>Number of trout released</b>	<b>Total number of trout</b>	<b>Catch per hour</b>
2004	20	84	2	45	47	0.6
2005	23	111.5	46	84	130	1.2
2006	25	111	7	75	82	0.7
2007	19	76	11	126	137	1.8
2008	30	160	16	317	333	2.1
2009	8	39	6	48	54	1.4

Table 6. ASB data from the Kern River at Johnsondale Bridge for the years 2004 through 2009 (trout reported includes both rainbow and brown trout).

<b>Year</b>	<b>Total anglers</b>	<b>Total hours</b>	<b>Number of trout kept</b>	<b>Number of trout released</b>	<b>Total number of trout</b>	<b>Catch per hour</b>
2004	61	252.75	1	205	206	0.8
2005	50	196.5	9	133	142	0.7
2006	13	38.5	1	19	20	0.5
2007	31	134	19	182	201	1.5
2008	66	270	5	417	422	1.6
2009	62	279.5	14	583	597	2.1



A comparison of abundance estimates for Kern River rainbow trout and Sacramento suckers between the Heritage and Wild Trout-designated and non-designated reaches shows the non-designated reach had higher densities of both Kern River rainbow trout and Sacramento suckers. In total, among all nine sections surveyed in 2009, 287 Kern River rainbow trout were observed in 2929.5 feet of stream habitat, yielding a density estimate of approximately 517 fish per mile.

The 2009 direct observation abundance estimates were compared with historic survey data to better understand how the abundance of Kern River rainbow trout observed in 2009 compares to previous estimates. The only historic data available were generated from multiple-pass electrofishing surveys that occurred in 1988 (one section located approximately 0.8 miles upstream of Johnsondale Bridge) and 1992 (three sections located in the vicinity of Funston Meadow in Sequoia National Park approximately 40 miles upstream from Johnsondale Bridge). In 1988, the estimated density of Kern River rainbow trout in the vicinity of Johnsondale Bridge was 2,462 fish per mile (Table 7). In 1992, the average estimated density of Kern River rainbow trout from the three sections near Funston Meadow was 1,027 fish per mile (Table 7). Comparatively, these values are much higher than the densities observed in 2009.

Biomass estimates from historic electrofishing data were included in Table 7; however, biomass was not estimated from the 2009 direct observation surveys (fish were visually observed and not captured). Overall, biomass estimates for Kern River rainbow trout in both 1988 and 1992 were relatively low.

Table 7. Multiple-pass electrofishing data for the Kern River by species and section from 1988-1992.

Year	Section number	Section location	Section length (ft)	Kern river rainbow trout		brown trout	
				Estimated density (fish/mi)	Estimated biomass (lb/acre)	Estimated density (fish/mi)	Estimated biomass (lb/acre)
1988	4	Johnsondale Bridge	148	2462	10.54	143	0.53
1992	1	Upper Funston Campground	248	1405	34.01	255	0.29
1992	2	Upper Funston Meadow	371	1053	16.57	28	0.75
1992	3	Big Arroyo Creek	475	622	8.2	55	0.7
<b>1992 Average (Sections 1-3)</b>				<b>1026.67</b>	<b>17.33</b>	<b>120.25</b>	<b>0.57</b>

## Discussion:

Zero brown trout were observed in 2009; however, brown trout were captured in all four of the historic electrofishing sections and anglers reported catching them in 2009. This may be explained by the fact that areas with abundant cover, such as boulder-dominated substrate, may bias the detectability of different trout species during direct observation surveys (Pert et al. 1997). As such, the combination of high flow velocities and abundant large boulders in the Kern River may have decreased brown trout detectability during our 2009 surveys. In 2007, brook trout (*Salvelinus fontinalis*), California golden trout (*O. mykiss aguabonita*), and brown trout were captured via hook and line in the Kern River within the Wild Trout-designated area at the confluence with the Kern-Kaweah River downstream of Tyndall Creek (Tracy Purpuro, personal communication 2010).

The relatively low fish counts in 2009 warrant a concerted effort to gain more population-level data on the Kern River rainbow trout population; in general, there is little historic data available on the Kern River upstream of Johnsondale Bridge. Historic density estimates are higher than that observed in 2009. It is difficult to ascertain whether these values reflect a change in the population or are due to differences in survey methodology and/or location (especially the 1992 surveys, which were performed much farther upstream than the 2009 surveys). It is also important to note that the 1988 survey section was short in length (148 feet) and may not be representative of the river in general; the capture probability generated from the three passes was low (36%), and the confidence interval was high ( $2,462 \pm 1,011$ ). Direct observation Section 909 was located in the same area as the 1988 multiple-pass electrofishing section; the estimated density of Section 909 was the highest observed of all sections surveyed in 2009. It is unclear how the 1988 electrofishing section was selected and it may represent a discrete habitat unit with high densities of trout that is atypical of the overall habitat of the river.

The HWTP recommends conducting a more comprehensive survey of the Kern River, using multiple survey techniques (direct observation, electrofishing, and/or hook and line) to better understand population structure (including distribution and abundance of all trout species). Sample design should focus on increasing the spatial distribution of survey sites to include a greater portion of the Heritage and Wild Trout-designated reach, which includes approximately 40 remote miles of the Kern River. However, survey design and sampling methods may be limited by logistical challenges due to the remoteness of the upper Kern River. Survey crews would need packer assistance to bring necessary equipment and supplies and an extended period of time would be required to perform a comprehensive assessment of the entire upper Kern River.

The limited scope of the 2009 surveys in the Heritage and Wild Trout-designated area may not be representative of the Kern River rainbow trout population as a whole. The four survey sites within the designated area in 2009 were restricted to one mile of stream habitat from the Forks of the Kern (lowest extent of the



designated area) upstream. Angler survey box data show neither a high number of anglers per year utilizing the Kern River fishery, nor a high percentage of fish kept. However, completion of ASB forms is voluntary, the ASBs on the Kern River are limited to two discrete locations, and the data may not represent the true numbers of anglers or their catch.

The HWTP recommends re-evaluating the current fishing regulations on the Kern River. From Johnsondale Bridge upstream to the point where the United States Forest Service (USFS) Trail 33E30 heads east to join the Rincon Trail (approximately four river miles upstream of Johnsondale Bridge), the fishing regulations are split by season. From the last Saturday in April through November 15 there is a bag limit of two fish with a minimum size limit of 14 inches total length. Less than five percent of the trout observed in 2009 in Sections 709 through 909 were greater than 14 inches. For the remainder of the year, there is a zero-bag limit in this area. From the point where the USFS trail heads east to join the Rincon Trail upstream to the mouth of Tyndall Creek, the open fishing season is from the last Saturday in April through November 15 with a bag limit of two fish. The maximum size limit is 10 inches in total length. Direct observation survey results show that 97% of the trout observed in Sections 109 through 609 were less than 12 inches in total length. For both of these areas, from Johnsondale Bridge upstream to Tyndall Creek, only artificial lures with barbless hooks may be used.

There is a long-standing stocking history in the Kern River. Previously, hatchery-reared rainbow trout were stocked immediately below Johnsondale Bridge. However, it was observed that, in low water years, hatchery trout moved upstream from the bridge and possibly into the designated Heritage and Wild Trout portion of the river (Ken Johnson, personal communication 2010). As a consequence, the hatchery allotment at Johnsondale Bridge was eliminated and currently Brush Creek, located approximately a half mile downstream of the bridge, is the uppermost plant site. Beginning in 2010, all future stocking in this section of the Kern River will be with triploid rainbow trout to limit possible hybridization of hatchery-stocked trout with the native Kern River rainbow trout. Triploid trout will be utilized in the interim until an approved genetic strain of Kern River rainbow trout is available for hatchery production. Little is known about the reproductive influence and spatial distribution of hatchery fish in the system. If the Kern River, between Johnsondale Bridge and the Forks of the Kern is pursued as an addition to the Heritage and Wild Trout designation, the HWTP recommends assessing the physical distribution of hatchery trout in this section of the river. Genetic analyses may also be useful in determining if, and to what extent, hybridization has occurred between hatchery rainbow trout and wild Kern River rainbow trout in this portion of the drainage.

## **Conclusion:**

Population-level data on Kern River rainbow trout (and other trout species) in the Upper Kern River are limited. This is, in part, due to the remote nature of the river

and difficulties involved in surveying this area. It is unclear whether the densities observed in 2009 are truly reflective of natural population levels or are biased by survey technique and/or the limited geographic scope of these surveys. As previously stated, the HTWP recommends conducting a comprehensive assessment of the Upper Kern River in future years to better understand trout distribution, population dynamics, abundance, and size class structure. These assessments should include greater distribution of sampling and evaluations of current fishing regulations, angling pressure, and the influence of hatchery fish in the system.

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