

Heenan Creek 2009 Summary Report

July 13-16, 2009

October 26-28, 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 California Department of Fish and Game (DFG) Heenan Lake Wildlife Area is southeast of Markleeville in Alpine County, CA and contains Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*), a listed species (threatened) under the Federal Endangered Species Act (Figure 1). Heenan Lake was designated by the California Fish and Game Commission (CFGC) as a Wild Trout Water in 1983 and was further designated as a Heritage Trout Water in 1999 for the population of lake-form Lahontan cutthroat trout within their native drainage. Wild Trout Waters are those that support a self-sustaining wild trout fishery, are aesthetically pleasing and environmentally productive, provide adequate catch rates in terms of numbers, size, or species of trout, and are open to public angling. Wild Trout Waters may not be stocked with catchable-sized hatchery trout. Heritage Trout Waters are a sub-set of Wild Trout Waters that highlight wild populations of California's native trout within their historic drainages (Bloom and Weaver 2008).

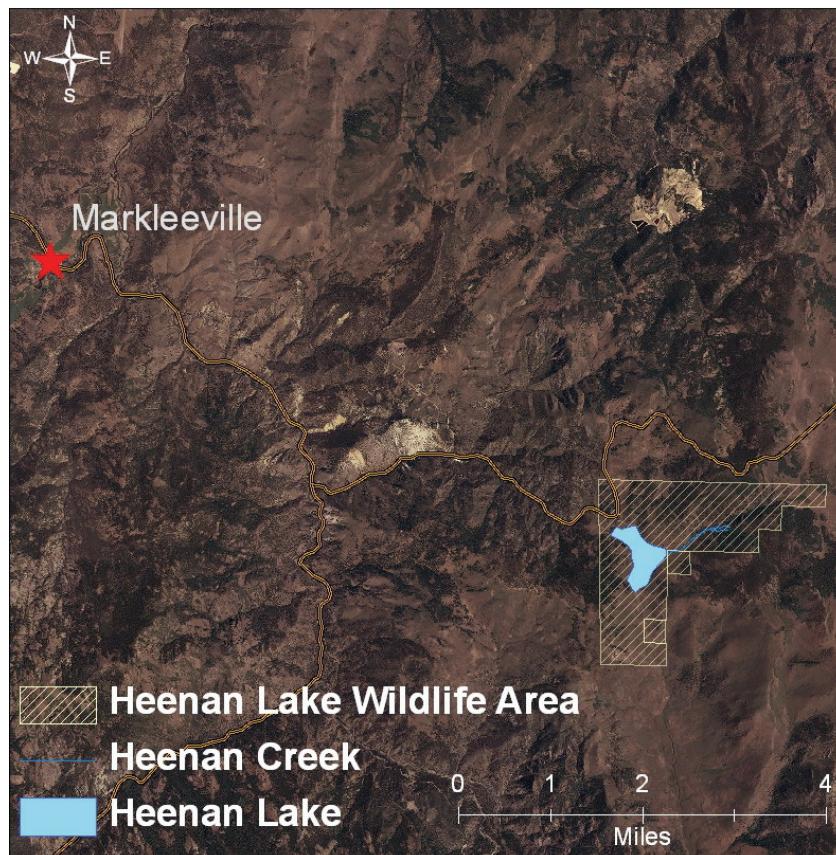
There are two strains of Lahontan cutthroat trout in the lake. One strain, originally from Independence Lake, near Truckee, CA, is believed to be of pure genetic stock; these fish are marked with an adipose fin clip and are an important brood-stock source used to support hatchery stocking efforts throughout California. The Heenan Lake-strain, originally from the West Fork Carson River, was translocated into nearby Blue Lakes in 1864 and, from there, into Heenan Lake in 1935 (Somer 2008). This population is hybridized with rainbow trout (*Oncorhynchus mykiss spp.*) of unknown origin. These fish are identified by the presence of an adipose fin and are not used in brood stock management (naturally spawning Independence Lake-strain Lahontan cutthroat trout may also have an intact adipose fin; however, no trout with an adipose fin are used in brood stock management).

Heenan Creek is the only perennial tributary to Heenan Lake and supports limited spawning of both strains of trout. DFG has constructed a spawning shed, fish ladder, and fish weir on Heenan Creek. The fish weir prevents the upstream movement of fish into Heenan Creek and, during the spring spawning season, the fish ladder allows the movement of fish into the spawning shed. Each fish that enters the shed is examined for the presence or absence of an adipose fin and only Independence-strain Lahontan cutthroat trout with a clipped adipose fin are selected for spawning (fish with an intact adipose fin are removed from Heenan Lake and stocked in other local waters). The eggs and milt of Independence-strain fish are collected onsite and are hatched and reared in DFG hatcheries (including Hot Creek Hatchery). A short section of Heenan Creek downstream of the fish weir provides habitat for intermittent natural spawning, depending on lake level during spawning periods in a given year. Hybridized Heenan Lake-strain Lahontan cutthroat trout are present in Heenan Creek (Somer, personal communication 2008). It is unknown how or when these fish moved upstream of the weir and colonized Heenan Creek.

As outlined in the draft DFG Heenan Lake Fishery Management Plan (Somer 2008), one goal is to remove introgressed Heenan Lake-strain Lahontan cutthroat trout in Heenan Creek to avoid potential hybridization with Independence-strain brood stock. This population of introgressed fish poses an ongoing threat to the genetic integrity of Independence-strain Lahontan cutthroat trout in Heenan Lake. It is possible for these hybridized fish to move downstream from Heenan Creek into the lake and spawn with lake-dwelling fish in the inlet below the fish weir. Although these offspring would have an intact adipose fin and, therefore, would not be spawned in subsequent years at the egg-take facility, the continual influx of rainbow trout alleles into the lake population should be minimized or, if possible, eliminated.

In 2008, the DFG Heritage and Wild Trout Program (HWTP) staff conducted manual removal of fish in Heenan Creek using backpack electrofishers and captured a total of 740 fish. In an effort to continue to deplete the stream population and possibly break the spawning cycle, the HWTP again removed fish using backpack electrofishers in Heenan Creek in both July and October, 2009 and this report summarizes the methods and results.

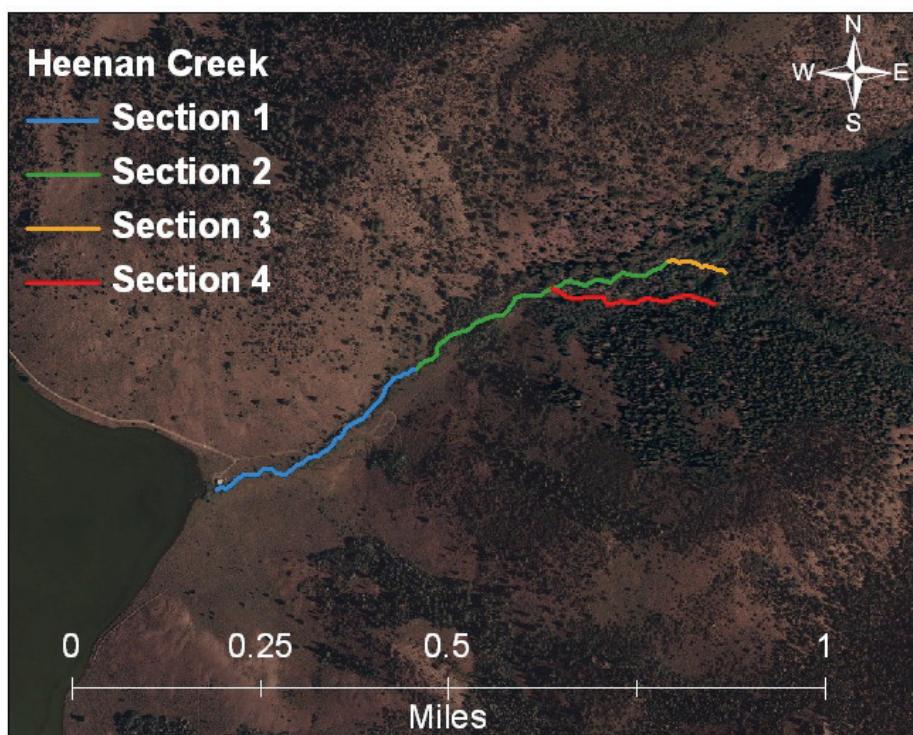
Figure 1. Map of Heenan Lake Wildlife Area including Heenan Lake and Heenan Creek.



Methods:

In 2008, Heenan Creek was subdivided into four sections from the fish weir (located adjacent to the egg-taking facility) upstream approximately one mile (Sections 1-4) for the purpose of determining the distribution and density of fish throughout this system (Figure 2). Based on electrofishing surveys conducted in 2008, the distribution of fish was determined to be limited to Sections 1 and 2; therefore, removal efforts were discontinued in Sections 3 and 4 (Weaver and Mehalick 2008). On July 13 through 16, 2009, HWTP staff continued electrofishing removal efforts in Sections 1 and 2. Three passes were performed in both sections (Table 1). On October 26 and 28, 2009, the HWTP conducted an additional two passes on Sections 1 and 2 (Table 2). However, due to time constraints, the second pass of Section 2 was not completed (less than 100 meters of the section remained). All fish were captured with Smith Root backpack electroshockers, totals lengths were approximated to the nearest inch using a calibrated landing net, and all captured fish were euthanized and dispatched (buried or dispersed in dense vegetation).

Figure 2. Map of 2008 Heenan Creek Section locations (Sections 3 and 4 were not surveyed in 2009).



Results:

A total of 214 fish were captured in 2009 (Tables 1 and 2). The majority of fish were captured in Section 2. This portion of Heenan Creek is steeper in gradient and has greater habitat diversity than Section 1 (which may account for reduced capture efficiency in Section 2 using backpack electrofishers in previous removal efforts and/or this portion of the stream may be preferred trout spawning and rearing habitat). Section 1 flowed predominantly through meadow habitat surrounded by thick willows (*Salix* spp.), included areas that were very difficult to access and shock, and was dominated by silt substrates. Section 2 flowed through both meadow and higher gradient forested habitat and there was more gravel substrate than in Section 1.

Table 1. Summary of fish captured in July, 2009 in Heenan Creek by size, section, and pass.

Total Length (in)	Section 1				Section 2				Totals
	Pass 1	Pass 2	Pass 3	Total	Pass 1	Pass 2	Pass 3	Total	
1	0	0	0	0	0	0	0	0	0
2	1	0	0	1	1	1	0	2	3
3	0	1	0	1	20	5	3	28	29
4	3	5	2	10	9	2	6	17	27
5	2	3	3	8	7	4	1	12	20
6	2	2	0	4	22	8	3	33	37
7	5	6	1	12	13	4	1	18	30
8	7	4	0	11	6	1	1	8	19
9	1	0	0	1	1	0	0	1	2
10	0	0	0	0	0	0	0	0	0
Total	21	21	6	48	79	25	15	119	167

Table 2. Summary of fish captured in October, 2009 in Heenan Creek by size, section, and pass.

Total Length (in)	Section 1			Section 2			Totals
	Pass 1	Pass 2	Total	Pass 1	Pass 2	Total	
1	0	0	0	3	0	3	3
2	0	0	0	18	11	29	29
3	0	0	0	4	1	5	5
4	0	0	0	3	0	3	3
5	0	0	0	0	0	0	0
6	2	1	3	0	0	0	3
7	0	0	0	0	0	0	0
8	3	0	3	0	0	0	3
9	0	1	1	0	0	0	1
10	0	0	0	0	0	0	0
Total	5	2	7	28	12	40	47

Figure 3. Photographs of Heenan Creek Section 2.



There was a notable decrease in the number of fish captured from July to October, 2009 (167 and 47, respectively; Tables 1 and 2). During the October survey, it was noted that a shift in the channel occurred in the upper reach of Section 2, moving the streambed approximately 50 to 100 meters to the south.

Further examination revealed a debris blockage in the original channel, which most likely caused scour and relocation of the channel. Numerous old channel beds were found in this area and it is likely that high flow events have repeatedly caused shifts in the stream channel in this portion of the drainage over time.

To date, the HWTP has performed four separate removal efforts in Heenan Creek: September 2008; November 2008; July 2009; and October 2009. A comparison of length frequencies shows a shift in the dominant size class captured over this two year period (Figures 4 and 5). In 2008, the dominant size class was five inches in September and six inches in November. In 2009, the dominant size class shifted from six inches in July to two inches in October. Lahontan cutthroat trout spawn in the spring and the two-inch fish captured in October of 2009 were likely young of year. Given that electrofisher capture efficiency is generally reduced with smaller fish and that smaller fish are harder to visually detect and net (especially in the vegetation-dense conditions found throughout much of Heenan Creek) the majority of fish recently hatched in the spring of 2009 may not have been detected or captured until the October removal effort when their size had increased.

Figure 4. Comparison of the number of fish captured by size (total length in inches) in Heenan Creek between September and November, 2008 removal efforts.

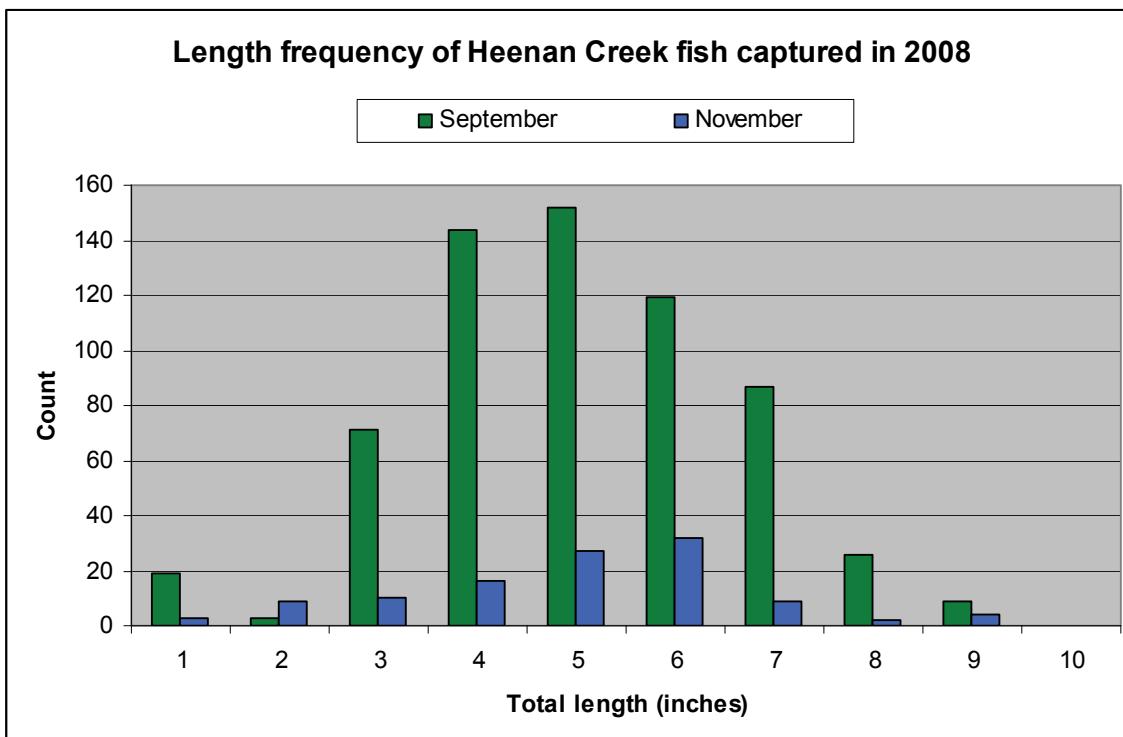
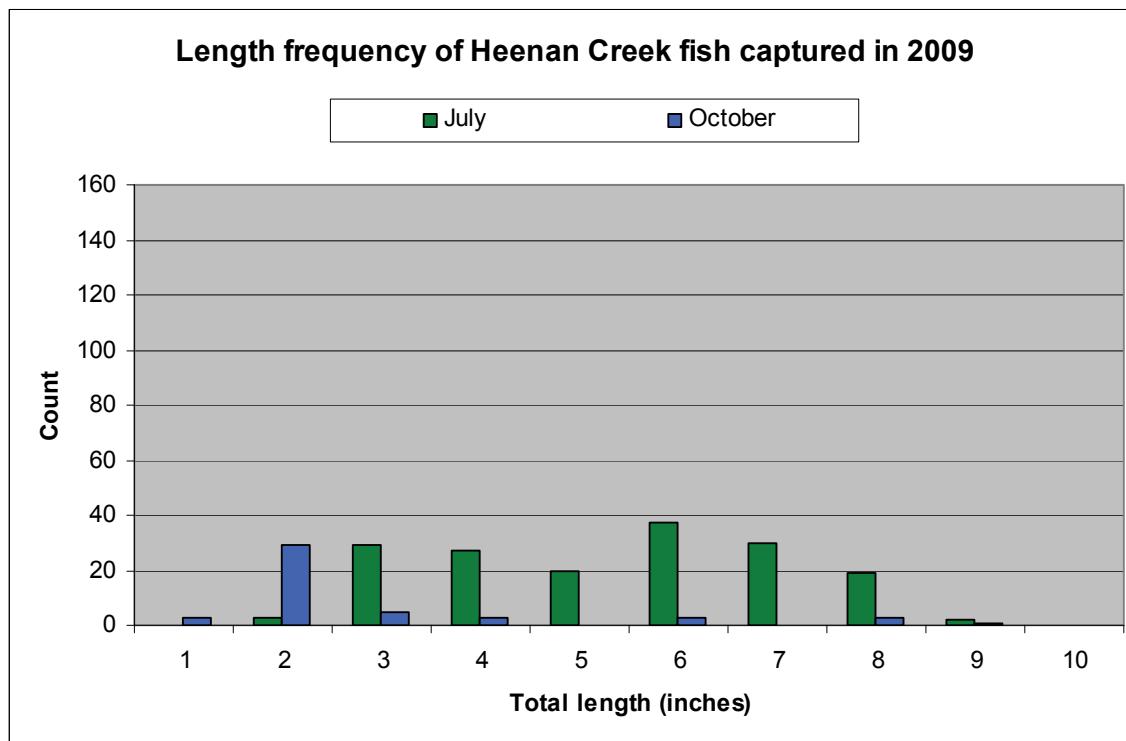


Figure 5. Comparison of the number of fish captured by size (total length in inches) in Heenan Creek between July and October, 2009 removal efforts.



In 2009, fish of various sizes were dissected to observe reproductive organs and to make inferences about the size at which trout in Heenan Creek reach sexual maturity. Reproductive organs, both egg skeins in various stages of development and testes, were observed in four, five, eight, and nine inch fish (total length). No three inch fish had visible gonads; however, only a few were examined.

On July 14 and 15, 2009 three HWTP personnel conducted a hook and line assessment in Heenan Lake in the vicinity of the Heenan Creek outlet to determine whether wild rainbow trout could be captured. Among three anglers, four fish were landed. Two of these fish did not have an adipose fin and were presumably hatchery-reared Independence-strain Lahontan cutthroat trout and two fish had an adipose fin and were of wild origin. These latter fish appeared to have characteristics of rainbow trout including heavy spotting on the dorsum; one of these fish did not have cutthroat slash marks (Figure 6).

Figure 6. Photographs of fish captured with intact adipose fins in Heenan Lake 2009.



Discussion:

Heenan Creek flows through montane chaparral, aspen groves, wet meadow complexes, and coniferous forest habitats. The meadow sections are densely vegetated with willows and physical access to the stream was quite limited in these areas, making electrofishing difficult. Conductivity in Heenan Creek was relatively low (measured at 128 μS in 2008). Due to the nature of this stream system, use of backpack electrofishers for manual fish removal is challenging and time-consuming and fish are likely missed with each pass. For continued success, it is necessary to repeat this sampling effort in 2010 and beyond. The short-term goal is to remove enough adults to break the spawning cycle of these hybridized fish. Given the substantial depletion rate of fish greater than four inches from 2008 to 2009, it appears that larger fish are being effectively removed from the population. Although we have likely limited reproduction in this stream, the spawning cycle does not yet appear to be broken. Based on the higher proportion of two-inch fish captured in October, spawning likely occurred in 2009, although numbers of fish captured across all size classes are considerably lower than in 2008. In order to maximize the chances of halting spawning in this population, it is recommended that a removal effort be conducted as early as possible in the spring of 2010 before spawning occurs. However, due to high elevation, possibility of snow, and corresponding road

closures in the area, access may be limited during the ideal timeframe (April to May, 2010).

In addition, the upper portion of Section 2 (in the vicinity of a natural barrier that appears to prevent upstream movement of fish into Section 3) should be re-examined due to the movement of the streambed that was observed in October of this year. A side-channel enters the main-stem in this area and fish passage may have been affected by the change in channel morphology. This side-channel was surveyed in 2008 and zero fish were captured. The HWTP recommends re-examining this side-channel in 2010 to ensure zero fish occupancy.

Anglers occasionally report catching rainbow trout (or trout with rainbow trout-like morphological characteristics) in Heenan Lake. It is believed these fish originated in Heenan Creek and out-migrated to the lake. The fish weir and its integrity as a fish barrier should be reevaluated. In addition, it would be of value to better understand species composition and the proportion of hybrid fish found within the lake in order to gauge how much influence the Heenan Creek population has had on the lake's trout population assemblage. Long-term project success will be accomplished with the removal of all hybridized fish (in both Heenan Creek and Heenan Lake) and removal of the fish weir to allow fish passage and natural spawning of pure-strain Lahontan cutthroat trout in Heenan Creek. Due to the presence of hybridized fish in both parts of this system, these objectives are not likely to be met until a chemical treatment of both the creek and lake can be performed. However, since a chemical treatment is unlikely to occur in the near future, the HWTP recommends continuing multiple (spring and fall) annual electrofishing removal efforts in 2010 and beyond to minimize genetic threats to the Independence Lake-strain population.

References:

- Bloom, R., and J. Weaver. 2008. The California Heritage and Wild Trout Program Handbook (Draft). State of California Natural Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program.
- Somer, W. 2008. Heenan Lake Fishery Management Plan (Draft). State of California, The Resources Agency, Department of Fish and Game, North Central Region, Rancho Cordova, CA.
- Weaver, J., and S. Mehalick. 2008. Heenan Creek 2008 Summary Report. State of California. Natural Resources Agency. Department of Fish and Game. Heritage and Wild Trout Program. Rancho Cordova, CA.