

# **Yellow Creek 2011 Summary Report**

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State of California

Natural Resources Agency

Department of Fish and Game

Heritage and Wild Trout Program



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## Introduction

Yellow Creek (Plumas County), tributary to the North Fork Feather River near Belden, CA (Figure 1), is a west-slope Sierra Nevada stream supporting wild populations of coastal rainbow trout (*Oncorhynchus mykiss irideus*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*). It is located on both public (Plumas National Forest) and private lands (Pacific Gas and Electric and private landowners). Fifteen miles of Yellow Creek is designated as a Wild Trout Water by the California Fish and Game Commission from Big Springs (in Humbug Valley) downstream to the confluence with the North Fork Feather River (Figure 2). Wild Trout Waters are those that support self-sustaining (wild) populations of trout, 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).

The California Department of Fish and Wildlife (CDFW) Heritage and Wild Trout Program (HWTP) is responsible for managing this fishery. In the 1990s, the HWTP detected the presence of whirling disease in Yellow Creek. Whirling disease is caused by the parasite *Myxobolus cerebralis* and affects trout populations by damaging fish cartilage, directly killing juvenile fish, and causing infected fish to swim in an uncontrolled manner. Once present in a system, whirling disease cannot be eradicated without significant environmental damage.

The Plumas Corporation has proposed a Humbug Valley-Yellow Creek Meadow Restoration Project to restore Yellow Creek and associated floodplain habitat utilizing a pond and plug technique. CDFW recommended the Plumas Corporation analyze potential impacts of the proposed meadow restoration project on whirling disease in Yellow Creek.

In 2011, the HWTP conducted an analysis of the trout population in Yellow Creek to better understand the presence and location of fish infected with whirling disease. Goals of the survey were to:

- delineate the presence or absence of trout infected with whirling disease
- determine which trout species are affected
- quantify incidence of infection (number of fish infected)
- determine the relative intensity of infection (based on a qualitative score).

This report summarizes the results of the 2011 Yellow Creek whirling disease assessment.

## Methods

Surveys were conducted by HWTP staff at six locations (Sections F0-F5) throughout Yellow Creek from October 11-13, 2012. Sections were selected by

HWTP staff (North Coast Region) based on the location of the proposed restoration project, including:

- one section upstream of the proposed project area (F0)
- one section within the project area (F1)
- three sections within Humbug Meadow downstream of the project area (F2-4)
- one section downstream of the project area in the canyon near Belden (F5).

Trout were captured with Smith Root backpack electrofishers. Prior to electrofishing, physical measurements of the stream and environmental conditions were taken, including air and water temperature (°C, in the shade) and conductivity (both specific and ambient in microsiemens). These factors were used to determine appropriate electroshocker settings.

Sections F0-F4 were located within a five-mile reach of Yellow Creek and 30 trout were captured and processed in each of these sections (150 trout total). Section F5 was located approximately 11 miles downstream of Humbug Valley near Belden, CA. Due to limited access in the middle and lower portions of the creek, the HWTP collected 60 samples from Section F5. Fish were processed, preserved, and shipped following protocol defined by Pisces Molecular LLC (Pullman, Washington).

All processed trout were identified to species, measured for total length (mm), and examined for outward signs of whirling disease, including skeletal deformation, blackened tails, and whirling or erratic swimming behavior. The head of each trout was removed using a sterilized knife, clean working surface, and clean gloves. Knives were sterilized between samples by immersing in ethanol (100% alcohol diluted with deionized water), followed by flaming (to burn off residual ethanol).

Individual head samples were placed in a sterilized whirlpak and labeled with section number, species, and total length. Samples were stored in a cooler on ice until transported to a freezer. A sub-set of 120 samples (20 per section) were selected for analysis; samples were selected to maximize species diversity and minimize costs (the cost per head was more expensive in samples larger than  $\frac{3}{4}$  inch in length). Samples were shipped overnight to Pisces Molecular LLC in a Styrofoam cooler with dry ice.

Pisces Molecular LLC extracted DNA from all samples and assayed for the presence of the *M. cerebralis* Hsp70 gene segment using a single-round polymerase chain reaction (PCR) amplification process. The number of samples testing positive and negative for the *M. cerebralis* Hsp70 gene segment was provided and individual samples were scored qualitatively based on the categories:

- +++ = very strong positive signal
- ++ = strong positive signal
- + = positive signal
- w+ = weak positive signal
- vw+ = very weak positive signal
- = no signal/below limit of detection

## Results

Among the six sections, 120 trout were analyzed for the presence of the *M. cerebralis* Hsp70 gene segment. No overt signs of the disease were identified during fish capture. The total length of trout analyzed ranged from 62 to 195 mm with a mean of 127 mm. A total of 46% coastal rainbow trout, 58% brown trout, and 78% brook trout tested positive for whirling disease (Table 1). The qualitative score results showed 40% had no signal and were below the limit of detection (-) and 47% had a very strong positive signal (+++; Table 2).

A comparison among sections showed some level of infection throughout the study area, with the lowest incidence above the proposed project area (Section F0; 5% infection rate). Ninety-five percent of the samples collected within the proposed project area (Section F1) tested positive for whirling disease. Based on the capture phase of this survey, it appeared brown trout were the most abundant species in Humbug Valley whereas coastal rainbow trout were the most abundant species farther downstream in the watershed, near the confluence with the North Fork Feather River.

In addition to the whirling disease assessment, the HWTP also conducted a single-pass electrofish effort in an unnamed tributary to Yellow Creek in Miller Ravine (Section 111; Figure 3). The intent was to determine species composition. A total of seven brook trout and three brown trout were captured in 334 feet of stream habitat. Streamflow was estimated at approximately three cubic feet per second and overall instream fish cover was rated as excellent. The survey area consisted of flatwater habitat with abundant overhanging vegetation and substrate dominated by sand, cobble, and gravel. Two brook trout were observed that appeared to be spawning and a few of the captured brook trout released eggs and milt when handled.

## Discussion

The presence of *M. cerebralis* was identified both within and outside of the proposed restoration area and appears to be present in all three species of trout, with brook trout having the highest infection rate. A mark-recapture assessment conducted by the HWTP in 2008 indicated that Yellow Creek is a brown trout-

dominated fishery in the vicinity of Humbug Valley, with coastal rainbow and brook trout occurring in considerably lower numbers (Mehalick and Weaver 2008). The capture phase of the 2012 whirling disease assessment corroborated these results. Conversely, it appears the lower portion of the watershed is dominated by coastal rainbow trout. Fish capture was difficult in this area of the watershed and may have been due to low fish densities and/or higher flows with deeper water habitat that decreased capture efficiency.

## **Conclusion**

The results of this assessment show that *M. cerebralis* is present in both the upper and lower portions of Yellow Creek; however, sampling did not occur in the higher-gradient canyon reach in the middle portion of the river. The HWTP recommends expanding the geographic extent of sampling to determine the presence or absence of whirling disease throughout the watershed, including the North Fork Feather River.

Access to the middle portion of the river may be difficult or impossible based on the steep canyon side slopes and the absence of a trail or road system. In July, 2012, a wildfire ignited near Belden and burned over 75,000 acres in the Plumas and Lassen National forests including the portion of Yellow Creek downstream of Humbug Valley. The HWTP recommends continued assessments throughout the drainage (where feasible) to monitor potential effects to the fishery and habitat. The HWTP recommends the Plumas Corporation assess potential impacts of the proposed restoration project on whirling disease and the wild trout fishery, evaluate mitigation options, and conduct pre- and post-project monitoring.

## **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.

# Appendices

Figure 1. Vicinity map of Yellow Creek 2011 survey location

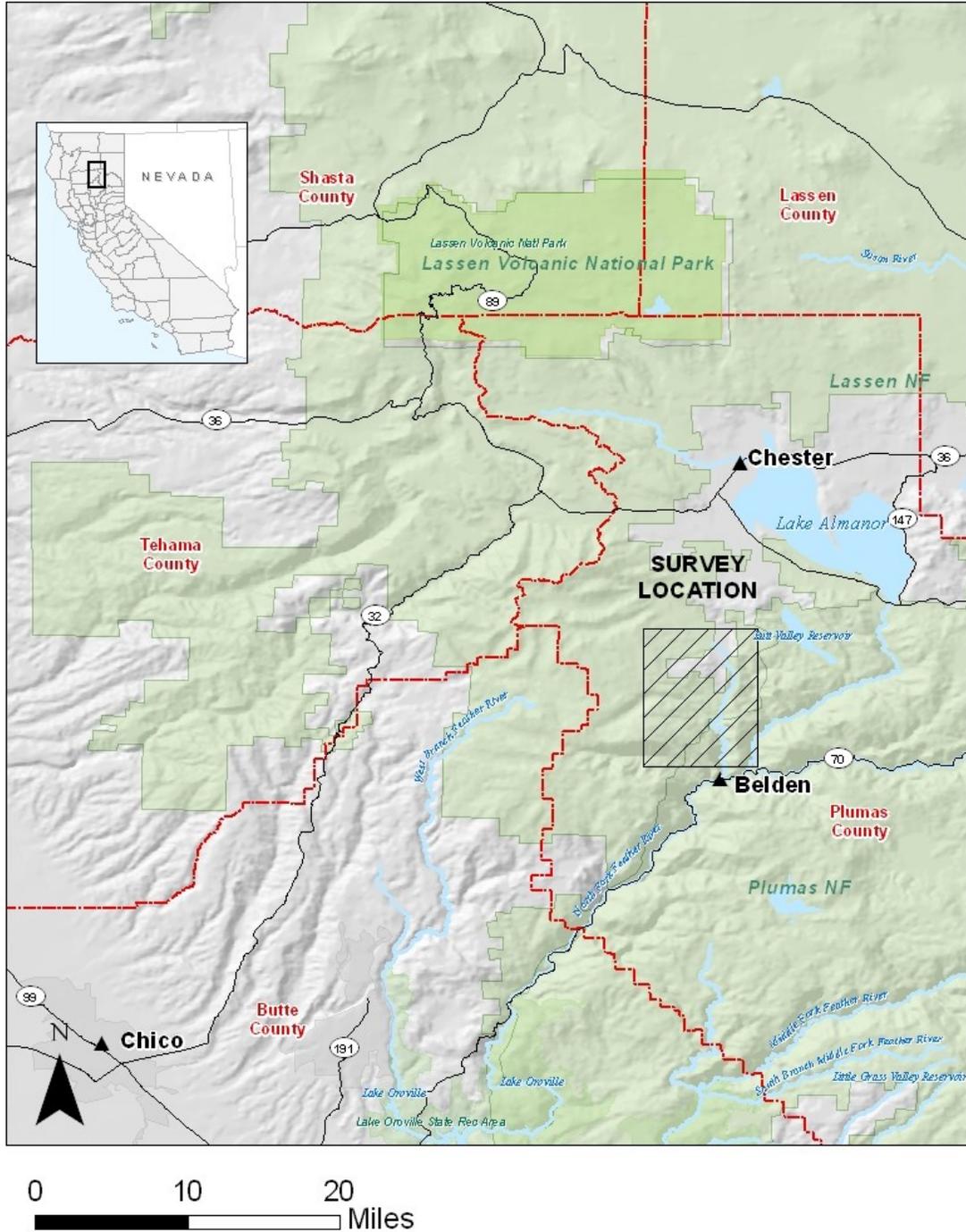
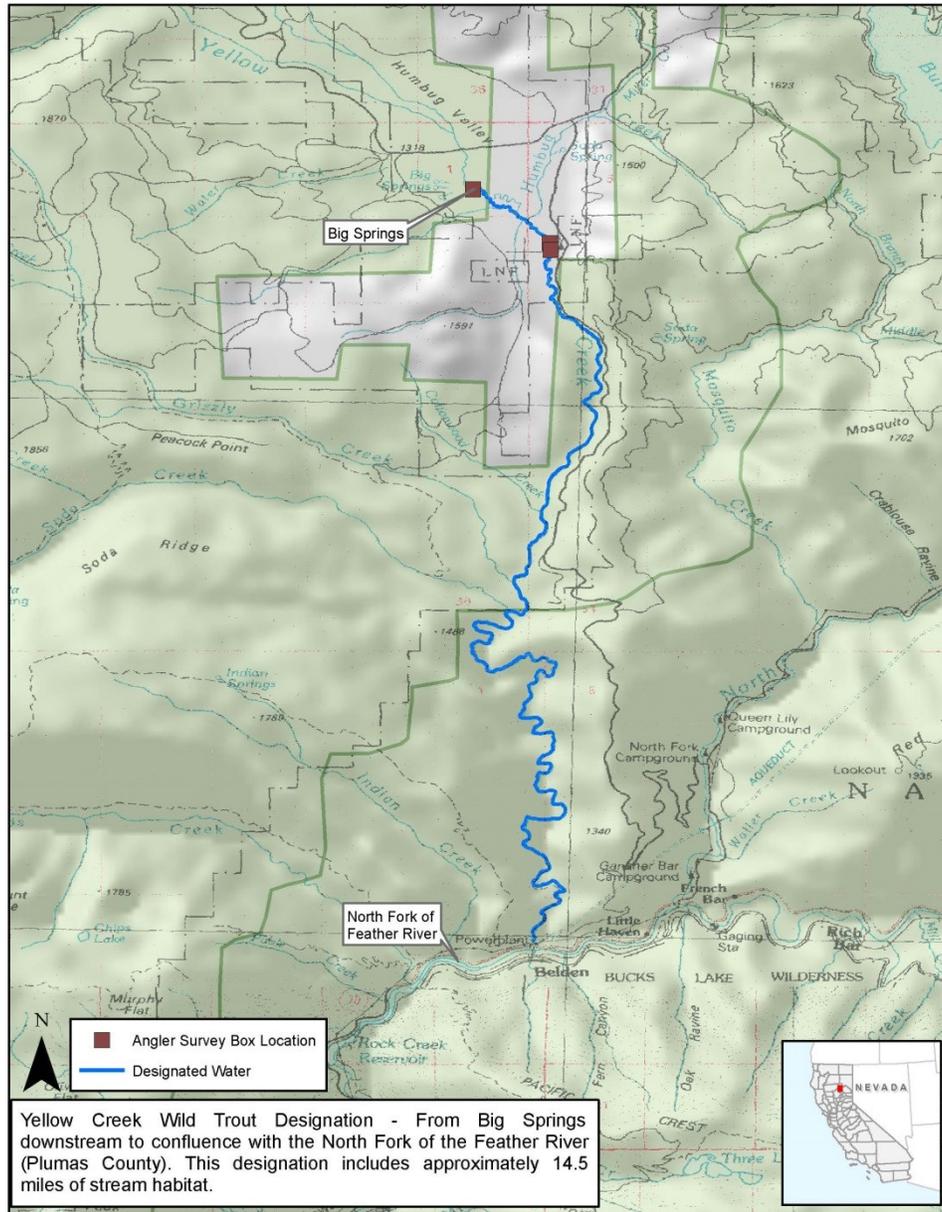


Figure 2. Map of Yellow Creek Wild Trout Designation



0 1 2 4 Miles

Yellow Creek Designated Wild Trout Water

Figure 3. Detail map of Yellow Creek 2011 section locations

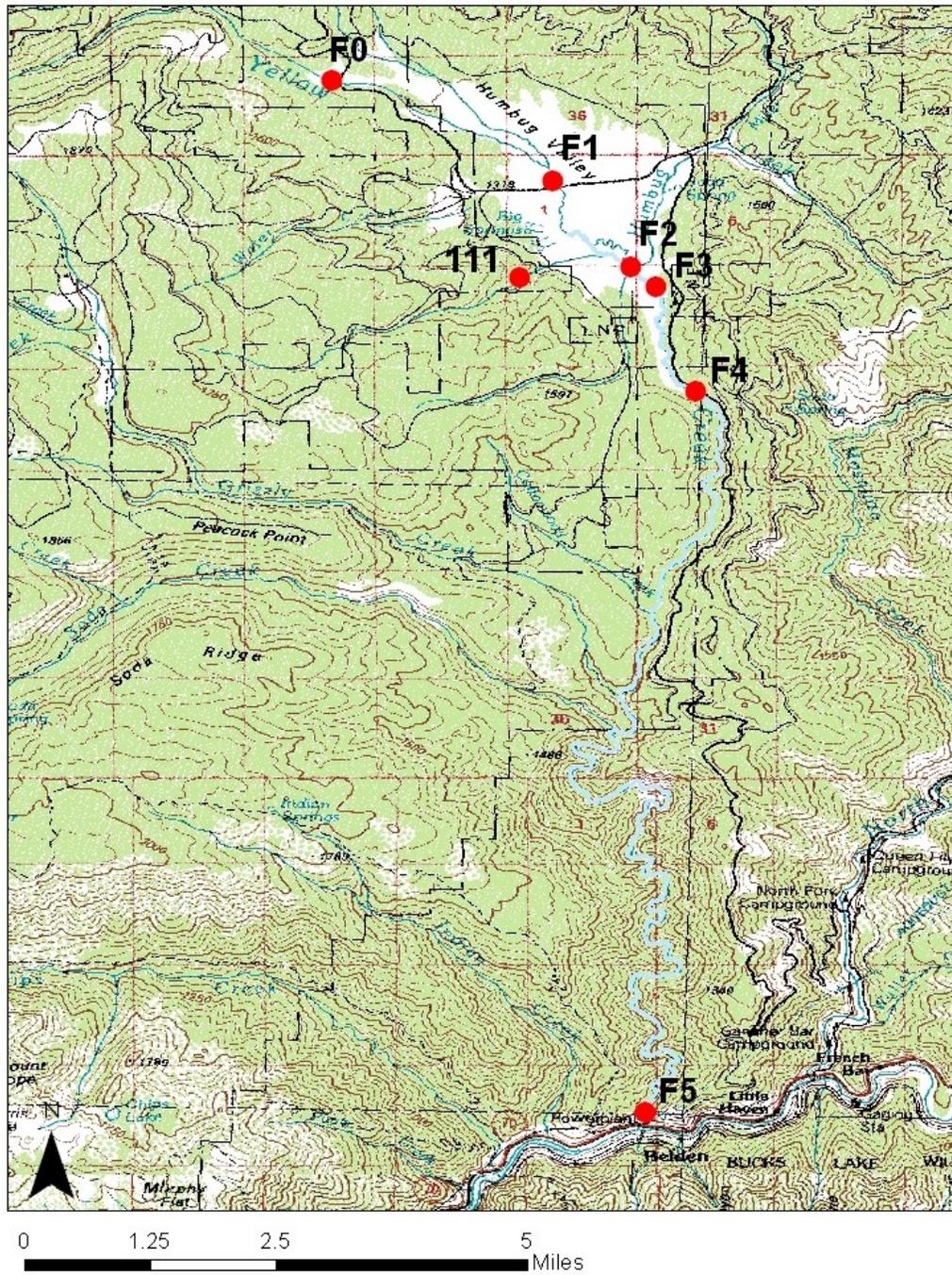


Table 1. 2011 Yellow Creek survey results: number of fish analyzed for *M. cerebralis* and the percent incidence of whirling disease positive fish (WD+) by species and section

Section	Location	Coastal rainbow trout		Brown trout		Brook trout		Total trout	
		Sample size	Percent WD+	Sample size	Percent WD+	Sample size	Percent WD+	Sample size	Percent WD+
F0	Above meadow	1	0%	17	6%	2	0%	20	5%
F1	Project area	0	n/a	13	92%	7	100%	20	95%
F2	Big Springs confluence	0	n/a	8	75%	12	67%	20	70%
F3	Humbug Creek confluence	3	33%	11	64%	6	100%	20	70%
F4	Campground	3	0%	17	76%	0	n/a	20	65%
F5	Belden	19	58%	1	0%	0	n/a	20	55%
	Total	26	46%	67	58%	27	78%	120	60%

Table 2. 2011 Yellow Creek qualitative score results for all species by section

Section	Location	No signal/below limit of detection	Very weak positive signal	Weak positive signal	Positive signal	Strong positive signal	Very strong positive signal
		-	vw+	w+	+	++	+++
F0	Above meadow	95%	0%	0%	0%	5%	0%
F1	Project area	5%	5%	0%	5%	10%	75%
F2	Big Springs	30%	0%	0%	0%	20%	50%
F3	Humbug Creek	30%	0%	5%	15%	0%	50%
F4	Campground	35%	0%	0%	5%	10%	50%
F5	Belden	45%	0%	0%	0%	0%	55%
	Total	40%	1%	1%	4%	8%	47%