

State of California

# Memorandum

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Cc: Region 2 Fish Files

**Subject: Native amphibian restoration and monitoring in Desolation Wilderness;  
Highland Lake fish removal and *Rana sierrae* monitoring.**

## INTRODUCTION

The Aquatic Biodiversity Management Plan for the Desolation Wilderness Management Unit (CDFW 2012) identifies Highland Lake (Site ID 13904) (Figure 1), approximately 500 meters of outlet stream (Site IDs 52648, 52649 and 52650), and two associated ponds (Site IDs 13903 and 13896) as a Native Species Reserve (NSR) for the Sierra Nevada yellow-legged frog, *Rana sierrae*, (SNYLF). The habitat supports a small SNYLF population co-occurring with rainbow trout, *Onchorynchus mykiss* (Figure 2). CDFW began removing rainbow trout from Highland Lake to benefit SNYLF in 2012. Fish removal activities continue to be implemented and CDFW estimates the project to be complete by 2016.

## ENVIRONMENTAL SETTING

Highland Lake is located in the Desolation Wilderness, El Dorado County at approximately 7,800' above mean sea level and is managed by the Eldorado National Forest. The lake sits within a granite cirque and drains northeast into the Rubicon River. No official trails access Highland Lake but a clearly marked user trail from nearby Forni Lake attests to regular human visitation.



Figure 1: Highland Lake looking east (CDFW 8/14/2014).

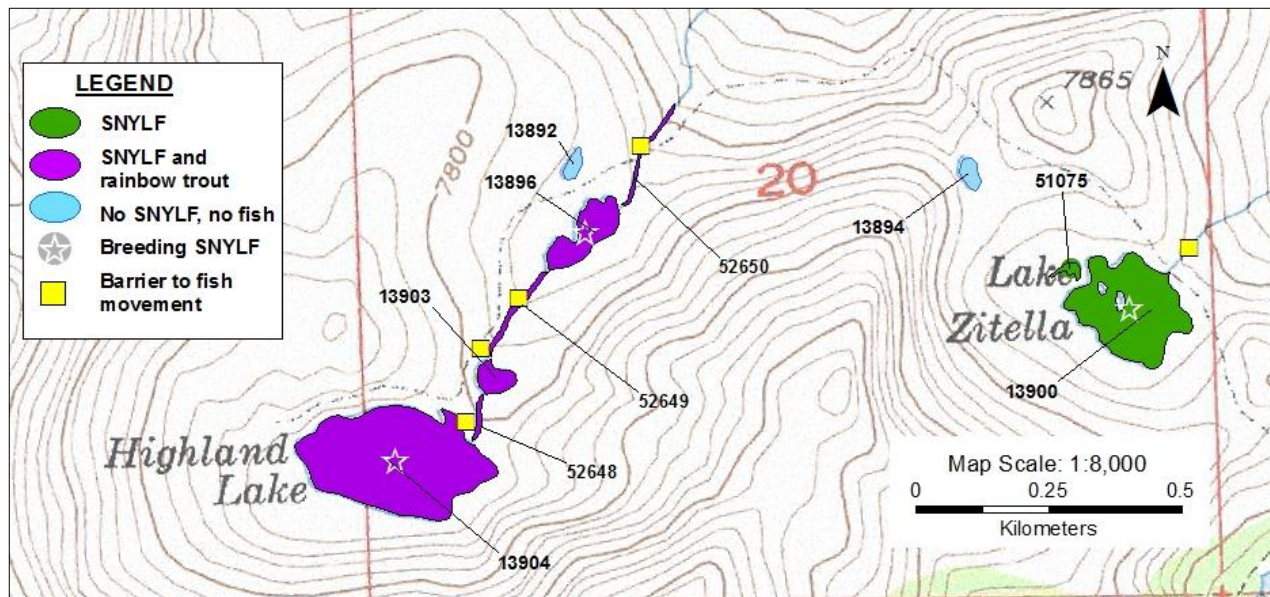


Figure 2: Highland Lake NSR: Purple and green denote waters currently occupied by SNYLF. Waters marked with stars indicate the presence of SNYLF tadpoles. Purple denotes waters currently occupied by rainbow trout. Fish barriers impeding upstream movement of fish are denoted by a yellow box. Lake Zitella and site IDs 51075 and 13894 are not part of the Highland Lake NSR but are included in this map for reference. All flowing waters drain north east into the Rubicon River (not shown).

#### THREATS

- Disease – All SNYLF populations in El Dorado County are positive for chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*). Site IDs 13903 and 13896 were sampled in 2009 and 2010 using epithelial swabs and screened for the presence of *Bd* dna using real-time qPCR analysis. Eight swabs were collected and results from both years detected very light to moderate *Bd* spore loads.
- Marginal Habitats – SNYLF are persisting in low numbers at a single large lake, two shallow ponds (Figure 3) and a small seasonal stream. Any disturbance, natural or otherwise, that results in changes to the hydrology or limnology of the deep water habitat poses a potential extirpation risk to the population. Potential risks include the natural deterioration of the Highland Lake dam, severe winter conditions, extended drought, or anthropogenic habitat disturbances.
- Introduced Fish – Highland Lake, its outlet and two small attached ponds support a small population of rainbow trout. CDFW planted Highland Lake with rainbow trout from 1935 to 2000. Trout abundance has declined in the absence of stocking but sufficient natural reproduction occurs in the inlet to Highland Lake and at Site 52649 to sustain the population. Fish barriers impede or exclude trout in the stream and ponds from moving into Highland Lake. Adult and juvenile SNYLF are regularly seen throughout the NSR and tadpoles are found in Highland Lake and site 13896. Rainbow trout predate upon tadpoles, juvenile and adult frogs and are a potential source of competition for food items for adult and juvenile frogs.



Figure 3: Site 13896 looking north east. A 1.5 meter deep pond that supports all life stages of SNYLF and low numbers of rainbow trout (CDFW 9/10/2013).

**POPULATION STATUS**

More monitoring data is required to derive population trends and quantify the SNYLF population at Highland Lake (Figure 4). However, data from 2012, 2013 and 2014 suggest the population may be increasing. Subjective observations by CDFW biologists suggest that SNYLF abundance has increased and animals have occupied new microhabitats within the NSR as the rainbow trout population has declined. Moreover, tadpoles have been observed within additional habitats suggesting SNYLF are utilizing additional breeding habitats compared to 2008 and earlier. Although no SNYLF were detected by CDFW crews prior to 2008, Eldorado National Forest has been monitoring this population since 1993 (CNDDDB, 2014). CDFW will continue to monitor this population annually while fish removal is occurring and biannually thereafter. Once fish removal is complete, all sites in the NSR will be managed as amphibian resources.

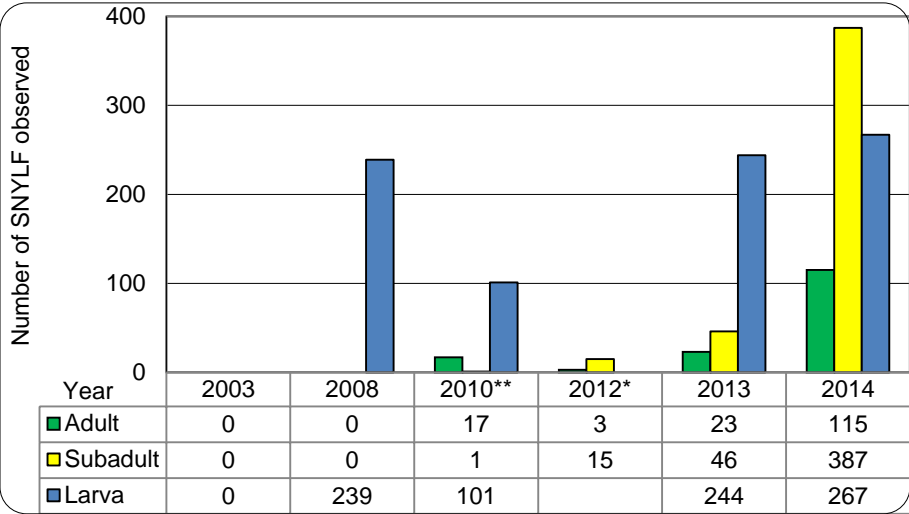


Figure 4: Survey data by life stage at Highland Lake and Site IDs 13896 and 13903 from 2003 to 2014. \*Formal surveys were not done in 2012; SNYLF were incidentally observed along the shores of Highland Lake while conducting fish removal activities. \*\*Highland Lake was not surveyed in 2010 although all other habitats within the NSR were surveyed.

**FISH REMOVAL**

Highland Lake, its outlet stream (site IDs 52648, 52649 and 52650) and associated ponds (Site IDs 13896 and 13903) are active fish removal sites.

Fish removal began at Highland Lake in 2012. Seven overwinter nets set on September 19, 2012 captured six large rainbow trout. Seven overwinter nets were re-set on September 10, 2013 and pulled in 2014. No

trout have been observed or captured in Highland Lake since June of 2014. As of September 2<sup>nd</sup> 2014 two overwinter gill nets are set in Highland Lake. Due to limited spawning habitat and low numbers of fish prior to fish removal, CDFW suspects the lake is currently fishless. CDFW will continue to set nets in Highland Lake through summer 2015 and winter of 2015/16 to confirm its fishless status.

Fish removal was implemented throughout the remainder of the NSR below Highland Lake in August 2014. The 2014 drought conditions created poor conditions for trout. For instance, by August the stream consisted of disconnected puddles and the ponds had drawn down to less than one meter in depth with water temps exceeding 18 C. Multiple gill nets were set in each pond and smaller gill net pieces were set in every wetted pool along the stream (Figure 5). A total of 25 rainbow trout were captured including four fry (<60mm total length) between August 12<sup>th</sup> and September 2<sup>nd</sup>. Fish removal activities continued from September 2<sup>nd</sup> until October 17 but no additional fish were seen or captured. All nets were pulled from stream sections on October 17<sup>th</sup> and will not be reset until summer of 2015. Three overwinter nets remain in the deepest pond habitat at sites 13896 and 14903. CDFW will continue to conduct fish removal activities in summer 2015 and summer 2016.



Figure 5: Gill net piece set in a small granite pool in ID 52650, the dry stream channel below site 13896.

#### LITERATURE CITED:

CDFW 2011. Report to the Fish and Game Commission: A status review of the mountain yellow-legged frog (*Rana sierrae* and *Rana muscosa*) . CA Fish and Game Commission. California Department of Fish and Game; 11/28/2011. Available from: <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=90162>

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CNDDB. December 17, 2014. Accessed by S. Mussulman, CDFW.