State of California

M e m o r a n d u m

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

INTRODUCTION

The Aquatic Biodiversity Management Plan for the Desolation Wilderness Management Unit (CDFW 2012) identifies Clyde Lake (Figure 1) and two nearby sites as a Native Species Reserve (NSR) for the Sierra Nevada yellow-legged frog (*Rana sierrae*; SNYLF*).* Additionally, the outlet of Clyde Lake was identified as a fish removal site and supports a small self-sustaining golden trout population. The NSR consists of Clyde Lake (Site ID 14149), two unnamed outlet ponds (Site IDs 14142 and 14143), both of which support SNYLF and occasionally golden trout (Figure 2), and approximately one kilometer of stream habitat (Site IDs 50393, 51067, 66164 and 66165).

ENVIRONMENTAL SETTING

Clyde Lake is located in El Dorado Co., in the Desolation Wilderness, within the Lake Schmidell Planning Watershed (PWS) at approximately 8000' elevation. The outlet of Clyde Lake eventually becomes the Rubicon River and drains north from Desolation Wilderness to Hell Hole Reservoir and ultimately to the Middle Fork American River. Eldorado National Forest (ENF) manages the land.

Figure 1: Clyde Lake from the Rubicon Trail on 8/11/2003 (CDFW 2003).

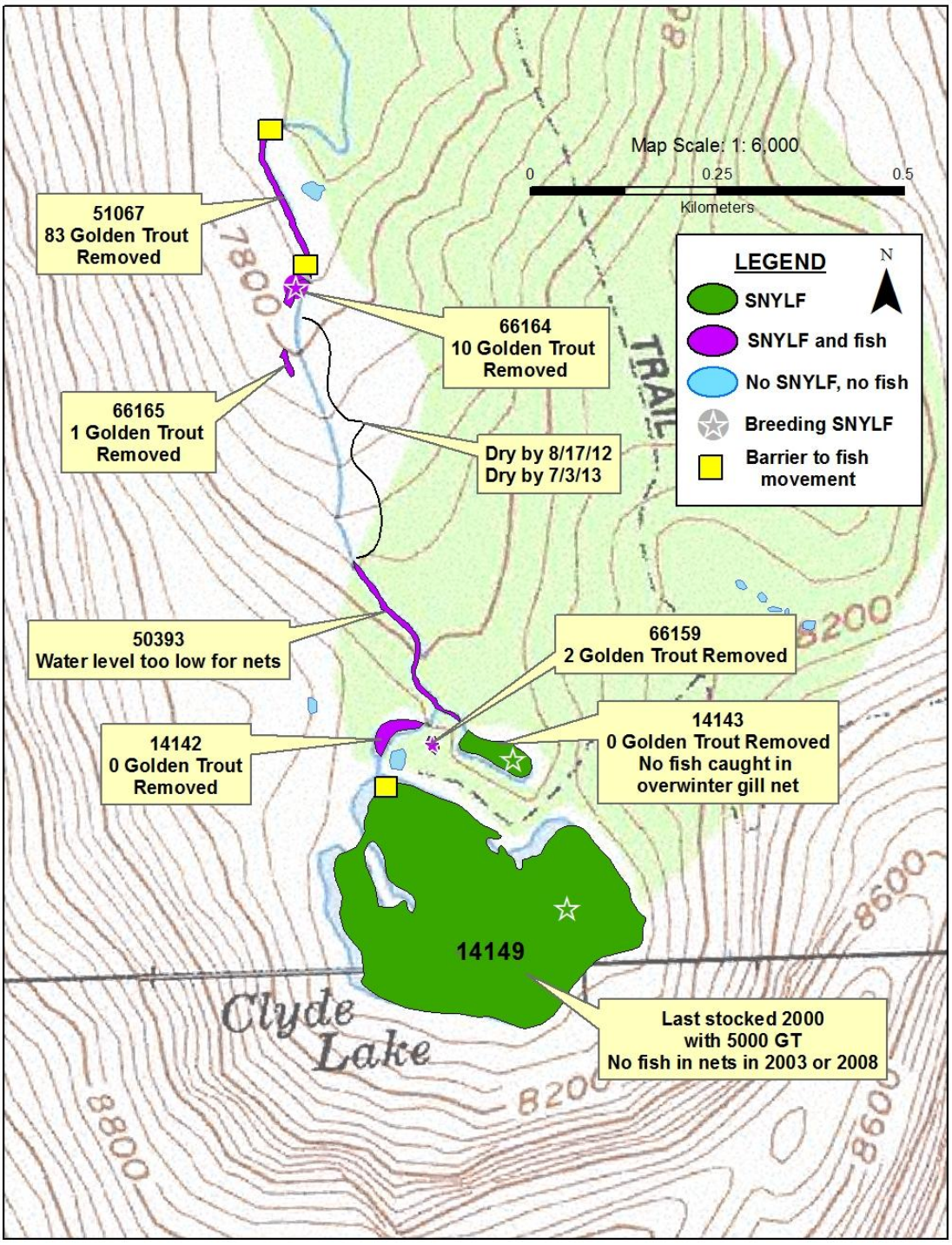


Figure 2: Locations of SNYLF, fish, barriers and site IDs in the Clyde Lake Native Species Reserve during the 2014 field season. Trout removals occurred from 2012 through 2014. No fish were captured or observed in 2015.

THREATS

- Introduced Fish – Clyde Lake is currently fishless, but golden trout are present in the stream below Clyde Lake (Site ID's 50393 and 51067), the three outlet ponds (Side ID's 14142, 14143 and 66164), and an associated off channel pond (Site ID 66165). Trout are excluded from moving from the stream into Clyde Lake by a man made dam immediately at the lake's outlet. SNYLF adults and juveniles are regularly seen throughout the NSR (Figure 2) and tadpoles are found in two outlet ponds (Site ID's 14142 and 66164) co-occurring with golden trout. The golden trout predate upon tadpoles and are a potential source of

predation and competition for adult and juvenile frogs. In addition, trout exist immediately adjacent to the two fish-free breeding habitats (Clyde Lake and Site ID 14143). Illegal or accidental movement of trout into the Clyde Lake or site 14143 is a potential extirpation risk.

- Disease - The Clyde Lake SNYLF population is chytrid fungus (*Batrachochytrium dendrobatidis,* Bd) positive. Nine epithelial swabs were collected and tested for the presence of Bd in 2008 and 2010; very light to moderate amounts of Bd DNA were detected on six swabs.

- Marginal Habitats – With the exception of Clyde Lake and site 14143 the SNYLF population is persisting in habitats with very little water. Any disturbance, natural or otherwise, that changes the hydrology or limnology of the two deep water habitats poses a potential extirpation risk to the population. Natural deterioration of the Clyde Lake dam, severe winter conditions, extended drought, or anthropogenic habitat disturbances are some of the potential risks.

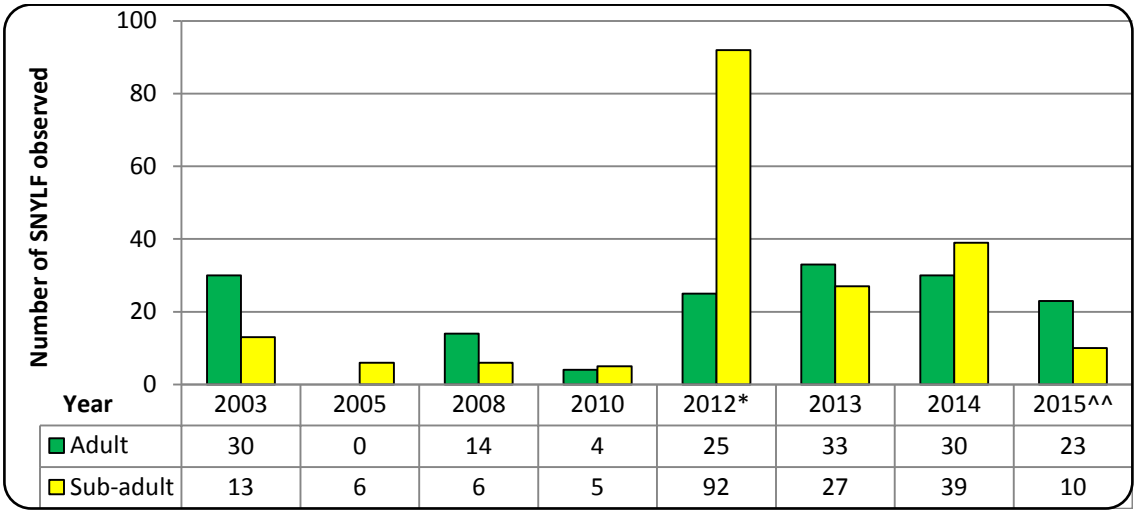
POPULATION STATUS

Nine years of monitoring data indicate the population is small but increasing slightly (Figure 5). It is difficult to derive trends due to the small number of adults observed in any given year. Large variation in the numbers of adults observed could be due to multiple factors: the extent of the site was increased in 2012 by including 1.5 kilometers of stream habitat and three downstream ponds; the habitat is complex and difficult to survey; and/or true variation in the population due to multiple stressors and impacts. In 2012, CDFW surveyed approximately 1.5 kilometers of Clyde Lake outlet for the first time, observing 6 SNYLF adults, 11 juveniles and 4 larvae. USFS crews surveyed the three largest ponds on the stream in 2008 and observed 3 adult SNYLF. Clyde Lake was fishless in 2003 and CDFW crews observed 140 SNYLF larvae in the lake during the baseline survey (Figure 6). Currently, the Clyde Lake SNYLF population is managed as an amphibian resource and monitored biennially for population status.

2013 Update: On July 3rd, 2013 Clyde Lake, 14142 and 14143 were surveyed for SNYLF. Results are displayed in figures 5 and 6. The stream reaches were not surveyed in 2013.

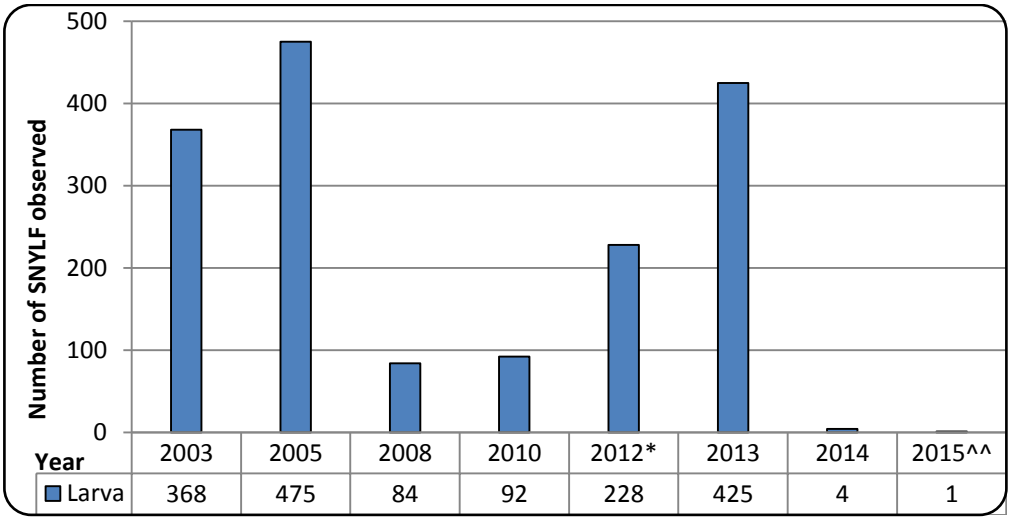
2014 Update: All sites in the NSR were surveyed for SNYLF on August 28th and 29th, 2014. Most of the surveys occurred on the 28th during good survey conditions, however Clyde Lake was surveyed on the 29th during poor survey conditions which may explain the low numbers of larvae observed (Figure 6).

2015 Update: Only the approximately 1 kilometer stream section where fish removal activities are taking place was surveyed in 2015. VESs were conducted at sites 50393, 51057, 66164 and 66165 on July 22-23, 2015. A large SNYLF larva was observed in site 66164; this is the first larva observed in the lower stream since 2012.



Year	2003	2005	2008	2010	2012*	2013	2014	2015^^
Adult	30	0	14	4	25	33	30	23
Sub-adult	13	6	6	5	92	27	39	10

Figure 5: VES Data by life stage at Clyde Lake and sites 14142 and 14143 from 2003 to 2014. All three sites were surveyed during each VES; the 2012 and 2014 surveys also include a 450 meter reach of Clyde Lake's outlet (*2012:1 adult, 17 subadults; 2014 9 adults, 6 subadults). ^^2015 surveys only include a 1 kilometer reach of Clyde Lake's outlet and related ponds. Counts were summed across all sites and the totals are displayed. USFS data is not displayed.



Year	2003	2005	2008	2010	2012*	2013	2014	2015^^
Larva	368	475	84	92	228	425	4	1

Figure 6: Larval SNYLF counts at Clyde Lake and sites 14142 and 14143 from 2003 to 2014. All three sites were surveyed during each VES; the 2012 and 2014 surveys also included a 450 meter reach of Clyde Lake's outlet (2012: 4 larvae; 2014: 0 larvae). ^^2015: Clyde, 14142 and 14143 were not surveyed. A single large larva was observed in site 66164. Counts were summed across all sites and the totals are displayed.

FISH REMOVAL IN THE CLYDE LAKE OUTLET

The Clyde Lake outlet (Site IDs 51067 and 50393) and two connected ponds (Site IDs 66164 and 66165) are active fish removal sites. Fish removal activities in Clyde Lake outlet will provide additional foraging and basking habitat, as well as access to two deep pools, and was initiated in October, 2012.

A large barrier (approximately 12 meter falls) is located about 1.5 kilometers below Clyde Lake (Figure 7). 2012 was an exceptionally low water year and much of the stream was already dry in August 2012. CDFW decided to implement fish removal in October due to favorable conditions and a total of 67 fish were removed. Only 2 fish were removed from the upper stretch of stream in Site ID 66159; gill nets were set in site 14142 and breeding SNYLF site 14143 and returned no fish. 65 fish were removed in the lower section

of stream consisting of three large ponds and a braided stream channel. The majority of fish were removed from a single pool incorporated into stream reach 51067 (Figure 8). Five large fish were removed from site 66164 where they were living alongside SNYLF larvae (Figure 9). Fry were seen in two separate pools below unnamed site 66164. A seasonal barrier is present on the outlet of 66164 (Figure 2).

2013 Update: On July 3rd, 2013 all gill nets were checked and reset and an additional 15 fish were captured.

2014 Update: On August 28th, 2014 all gill nets were checked and reset and 14 additional fish were removed from the lower stream section. Site 66165 had no fish and its net was removed. Currently overwinter nets are fishing 66164 and the largest pond in 51067. The whole stream section may be fishless but additional net sets with no fish captured are necessary and fish removal activities will continue in 2015.

2015 Update: On July 22, 2015, thirteen overwinter gill nets were checked and removed from the water. No fish were captured or observed therefore the nets were not reset. CDFW will set additional monitoring nets in 2016 to confirm the area is fishless.

Figure 7: Barrier at the bottom of stream reach 51067. The barrier is a 12 meter cascade with three large steps each of which is approximately 3 meters high (CFDW 2012).

Figure 8: Largest pool in the lower stream section (Site ID 51067) from the south. 83 golden trout were captured here between 2012 and 2014 and fry were seen in the shallow southern section in 2012 (CFDW 2012). No trout were observed or captured in 2015.


Figure 9: Site ID 66164 from the south: 4 large SNYLF larvae seen on 8/17/12; 1 large SNYLF larva seen on 7/32/2015. 5 golden trout removed October 2012; 2 golden trout removed in 2013; 3 golden trout removed in 2014; 0 golden trout removed 2015(CFDW 2012).

LITERATURE CITED

CDFW, 2012. *Aquatic Biodiversity Management Plan for the Desolation Wilderness*. California Department of Fish and Wildlife; 12/19/2012. Available from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=59961