

## Memorandum

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### Subject: Native amphibian monitoring in Alpine County – Updated 2015.

#### INTRODUCTION

Sierra Nevada yellow-legged frogs, *Rana sierrae*, (SNYLF) are extant at twelve locations in Alpine County (Figure 1). This memorandum addresses nine small populations with limited restoration opportunities. Three populations are addressed in a separate document: Beebe Lake, Jeff Davis Creek and Little Indian Valley. California Department of Fish & Wildlife (CDFW) began monitoring the Alpine County SNYLF populations in 2001.

#### ENVIRONMENTAL SETTING

Alpine County is a small rural county in central Sierra Nevada. Elevations in Alpine County range from approximately 5,000' near its eastern and western borders to 10,381' at the summit of Round Top Peak. A chain of mountains runs generally north-south and bisects the county. Watersheds east of this chain drain into the Carson River and eventually Nevada, while watersheds to the west drain west into either the Mokelumne River or the North Fork Stanislaus River. SNYLF populations are clustered along the crest and distributed across the northwestern half of the county. Toiyabe, Eldorado and Stanislaus National Forest manage the majority of land in Alpine County.

#### THREATS

- Disease - All Alpine County SNYLF populations are chytrid fungus (*Batrachochytrium dendrobatidis*, Bd) positive. SNYLF were genetically sampled by epithelial swabs for the presence of Bd in 2008, 2010 and 2011. 125 swabs were collected and results from all years detected levels of Bd DNA ranging from very light to heavy.
- Marginal Habitats – Alpine County frog populations are mostly persisting in isolated habitats with very little water. Any disturbance, natural or otherwise, that changes the hydrology or limnology of the overwintering habitat poses a potential extirpation risk to the population. Severe winter conditions, extended drought, or anthropogenic habitat disturbances are some of the potential risks.
- Introduced Fish – Upper and Lower Kinney Lakes both contain populations of Lahontan reddsides (LRS) and Lahontan cutthroat trout (LCT) are present at Lower Kinney Lake. Little information is available regarding the impact of small fish like LRS on SNYLF but they may compete with or directly harm early life stages of SNYLF. Fish have not been observed in Stanislaus Meadow. However, two popular recreational lakes on

Highway 4, Mosquito Lakes, are stocked with catchable rainbow trout. Generally the Mosquito Lakes drain northeast – away from Stanislaus Meadow – but in a high water year the lakes may drain southwest and could potentially introduce trout into Stanislaus Meadow presenting an extirpation risk for the SNYLF population. Fish are present at Blue Lakes and may act as a sink for any SNYLF dispersing from Upper or Lower Blue Lakes Meadow.

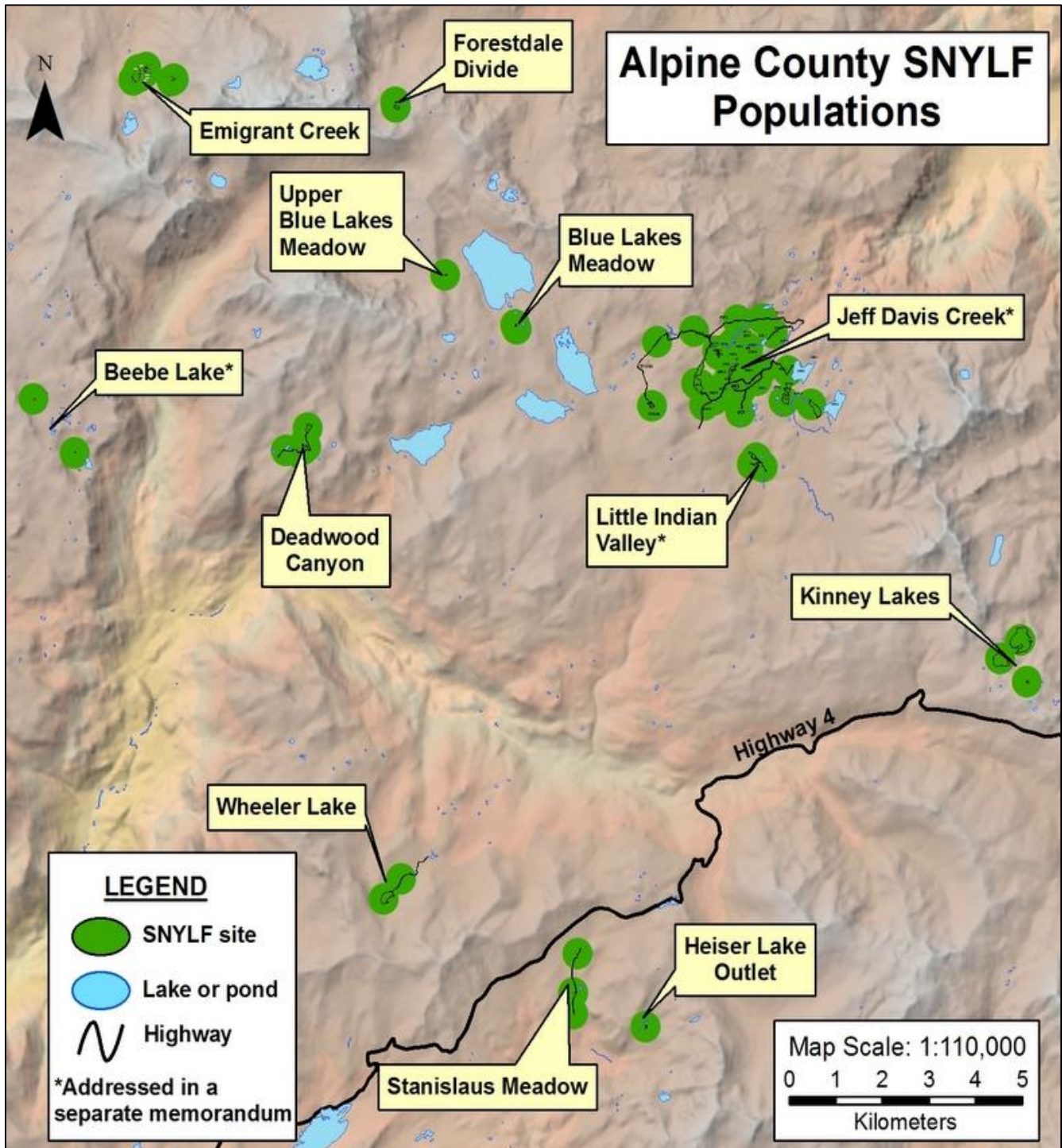


Figure 1: Map of Alpine County SNYLF populations, shown in green, that were extant as of 2010 or later.

## POPULATION STATUS AND DISCUSSION

### Emigrant Creek – Updated 2014

A small population of 20-40 adult SNYLF is extant at a cluster of ponds and streams 800 meters north of Emigrant Lake at approximately 8,400 feet elevation in the Mokelumne Wilderness. There are two main reproduction ponds (Sites 14590 and 14584), and both are shallow and may be ephemeral in a very dry year. Adult and juvenile frogs disperse into many small ponds and ephemeral creeks making it difficult to monitor effectively. CDFW began monitoring this area in 2002 and ten years of data indicate the population is slowly increasing (Figure 2, Figure 3). Thirty epithelial swabs were collected in 2008 and 2010 and analyzed for Bd DNA. The results indicate the population is Bd positive.

2014 Update: All sites were surveyed on July 2, 2014 and results suggest the adult SNYLF population remains stable despite extreme drought conditions. However, no larvae were observed at the main breeding site (CA Lakes ID 14584) and only small SNYLF and AMMA larvae were observed at the second breeding pond (CA Lakes ID 14590) suggesting that larvae did not successfully overwinter at either site.

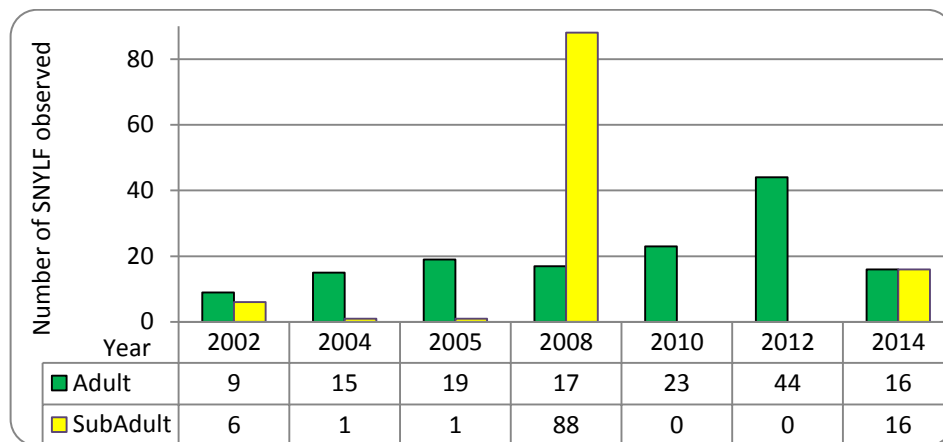


Figure 2: VES data displayed by life stage in Emigrant Lake area from 2002 to 2012. The number of surveyed sites ranges from five in 2002 to fifteen in 2012.

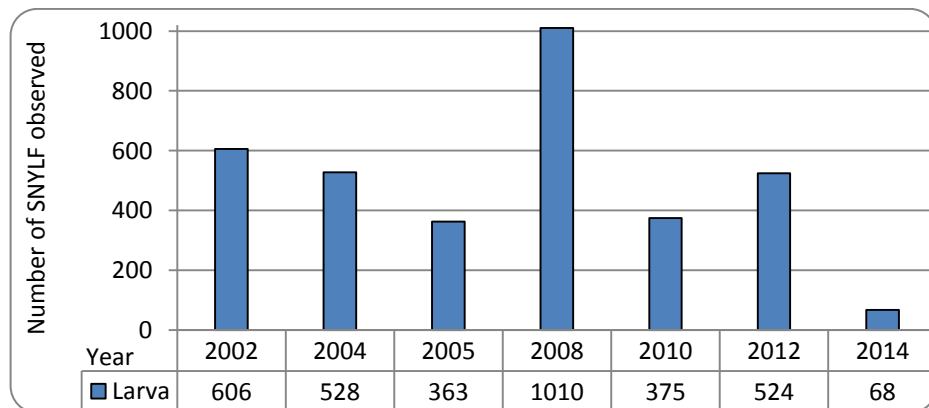


Figure 3: Larval SNYLF observed during VES in the Emigrant Lake area from 2002 to 2012. The number of surveyed sites ranges from five in 2002 to fifteen in 2012.

### Forestdale Divide

This area consists of two small shallow ponds on the eastern edge of Mokelumne Wilderness at 8,500' elevation. The ponds are part of the headwaters of Forestdale Creek. Fish are present lower in the watershed although no fish have been observed near the ponds. Both ponds have a recorded maximum

depth of less than one meter yet SNYLF larvae are consistently seen in them and survey data indicate the population is stable (Figure 4). Thirteen epithelial swabs were collected in 2008 and 2010 and only four returned measurable Bd DNA; however, the population is considered Bd positive.

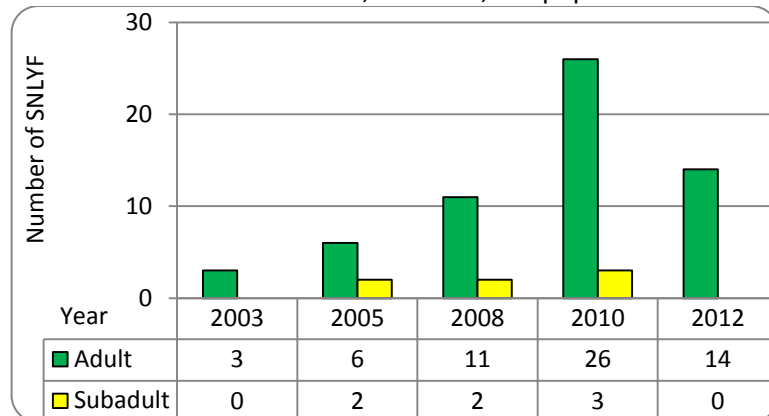


Figure 4: VES data displayed by life stage at Forestdale Divide from 2003 to 2012.

### Upper Blue Lakes Meadow

This group occupies a single site in a meadow above Upper Blue Lake at 8,300' near the Mokelumne Wilderness boundary (Figure 5). CDFW has been monitoring this site since 2008 and additional data is necessary to determine the status of this group of SNYLF (Figure 6).



Figure 5: Upper Blue Lakes Meadow (Site 51000) during a VES on 7/1/2010 (CDFW 2010).

CA Lakes ID	Survey Date	Species	Adult	Sub-adult	Meta-morph	Larva	Egg mass
50100	7/11/2008	RASI	1	0	1	0	0
50100	7/23/2009	RASI	0	0	0	58	0
50100	7/1/2010	RASI	1	0	0	0	0
50100	7/17/2012	None					

Figure 6: VES data collected at Upper Blue Lakes Meadow between 2008- and 2012.

### Blue Lakes Meadow

This group of SNYLF occupies one pond and a small stream in a meadow just south of Lower Blue Lake at 8,200' elevation (Figure 7). Ten years of monitoring data indicate persistent use of the site by 2 or 3 adult SNYLF (Figure 8). Additional information is needed to assess the Bd status of this population.



Figure 7: Site 14722, Blue Lakes Meadow, during a VES on 7/1/2010 (CDFW 2010).

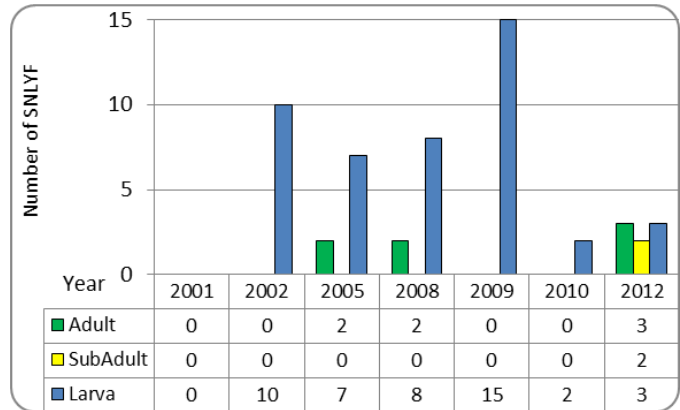


Figure 8: VES data displayed by life stage at Blue Lakes Meadow from 2001 to 2012.

### Deadwood Canyon

This population is persisting at six unnamed ponds and 1.6 kilometers of stream in the Mokelumne Wilderness at elevations between 8,200' and 8,600'. It was first surveyed in 1995 by USFS and CDFW began monitoring the population in 2002. Ten years of monitoring data suggest this population is declining although small population size and plentiful habitat make it difficult to derive trends (Figure 2). Deadwood Creek is ephemeral most years and the creek often consists of pools between dry sections of steam bed with SNYLF clustered at the wetted habitat. The ponds in the area are all less than three meters deep. Because of the intermittent nature of the stream, CDFW considers this population at risk of extirpation and will continue to closely monitor the population.

A few SNYLF were observed at nearby Deadwood Lake in 2002 and 2008. Deadwood Lake is not hydrologically connected to Deadwood Canyon and additional data is required to assess the population status in the area. Twenty-four epithelial swabs were collected in 2008 and 2010 and data indicate the population is Bd positive.

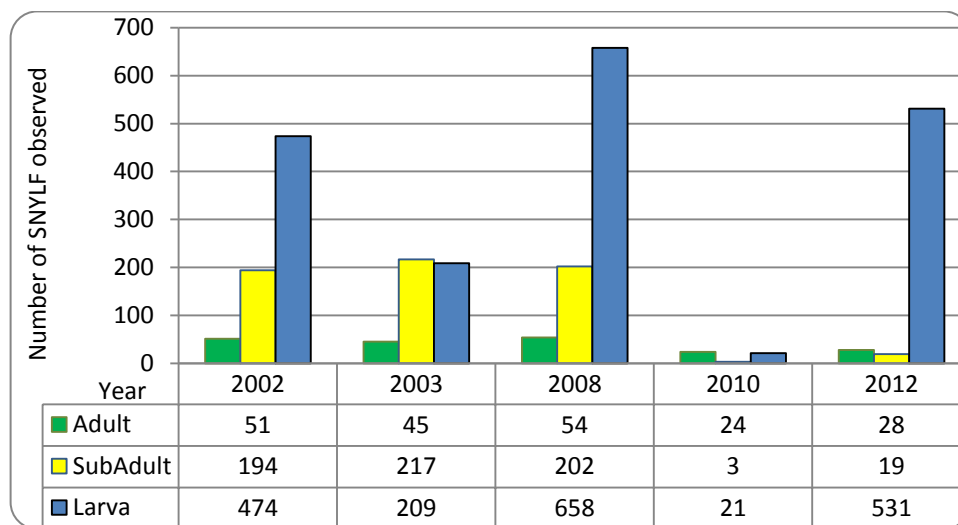


Figure 9: VES data by life stage in Deadwood Canyon from 2002 to 2012. Two of the six ponds were not surveyed in 2003.



## Kinney Lakes

A small population of SNYLF persists at unnamed pond 15019 (Figure 10) near Upper and Lower Kinney Lakes. Epithelial swabs collected here tested positive for Bd. It is difficult to assess the status of this population but based on the number of adult SNYLF observed over the past decade it appears to be in decline (Figure 11). CDFW will continue regularly monitoring this population.

One or two adult SNYLF are regularly seen at Lower Kinney Lake and a SNYLF tadpole was observed at Upper Kinney Lake for the first time in 2012, suggesting that SNYLF may be expanding into new deep water habitat (Figure 12). However, Lahontan reddsides persist at Upper Kinney and may negatively affect the SNYLF population by competing with or directly harming eggs and larvae. Upper Kinney Lake was stocked with Lahontan cutthroat trout until 2000 although the lake is currently troutless. Lower Kinney still has a small population of cutthroat trout and plentiful Lahontan reddsides.

Incidentally, site 15019 supports long toed salamander (*Ambystoma macrodactylum*) and Yosemite toad (*Bufo canorus*) larvae in addition to SNYLF.



Figure 10: Breeding SNYLF site 15019 during a VES on 6/20/2012.

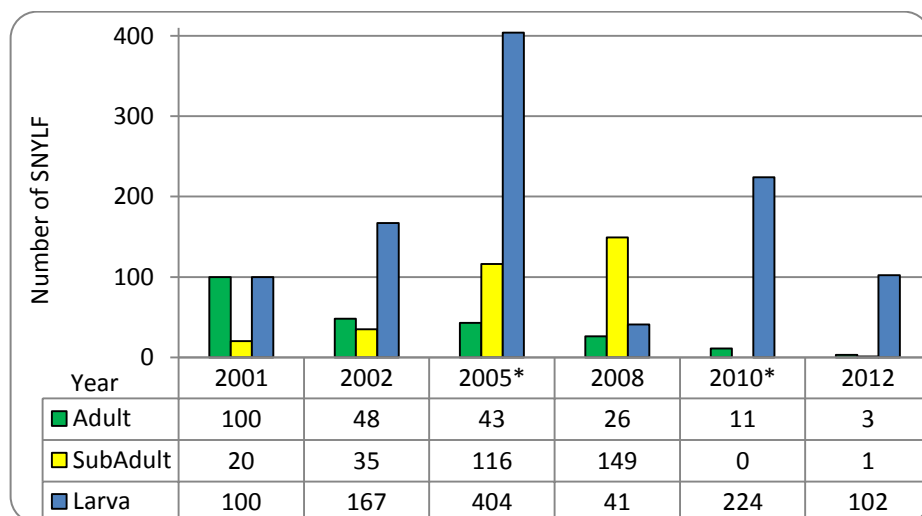


Figure 11: VES data displayed by life stage from site 15019 between 2002 and 2012. \*30 egg masses were observed during 2010 surveys; 26 egg masses were observed during 2005 surveys.

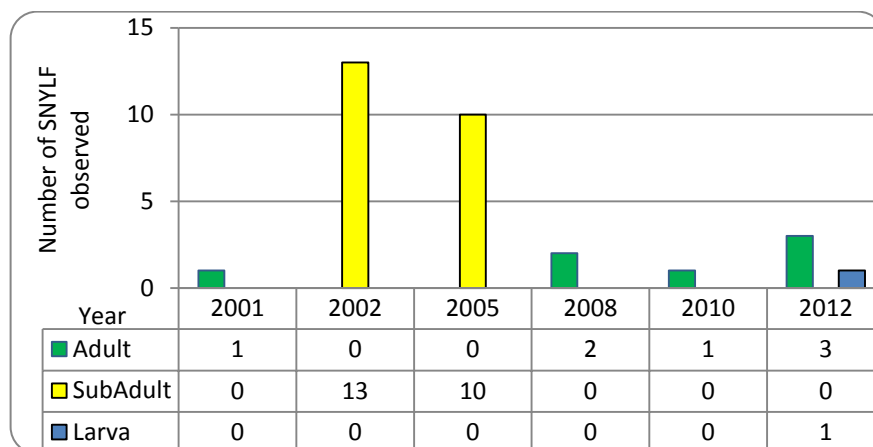


Figure 12: VES displayed by life stage data from Upper and Lower Kinney Lakes between 2002 and 2012.

### Wheeler Lake – Updated 2013

A small population of breeding SNLYF persists in Wheeler Lake and its tributaries at approximately 7,800' elevation. Additional data is necessary in order to determine the status of this population but it appears to be stable or increasing slightly (Figure 12). Brook trout were present in a 2001 CDFW gill net survey, but CDFW believes Wheeler Lake has since gone fishless. CDFW will sample in 2013 to confirm this. Epithelial swabs collected here returned little to no Bd DNA; CDFW suspects Bd is present in this area will collect additional samples.

2013 Update: Juvenile SNLYF were observed in the area by CDFW for the first time in 2013 and the past two years of survey data suggest that this population may be increasing. Two standard 6-panel variable mesh gill nets were set overnight in Wheeler Lake for a total of 38.5 hours and returned no fish. Due to the small size of the lake and lack of accessible tributaries for breeding fish CDFW believes Wheeler Lake is fishless.

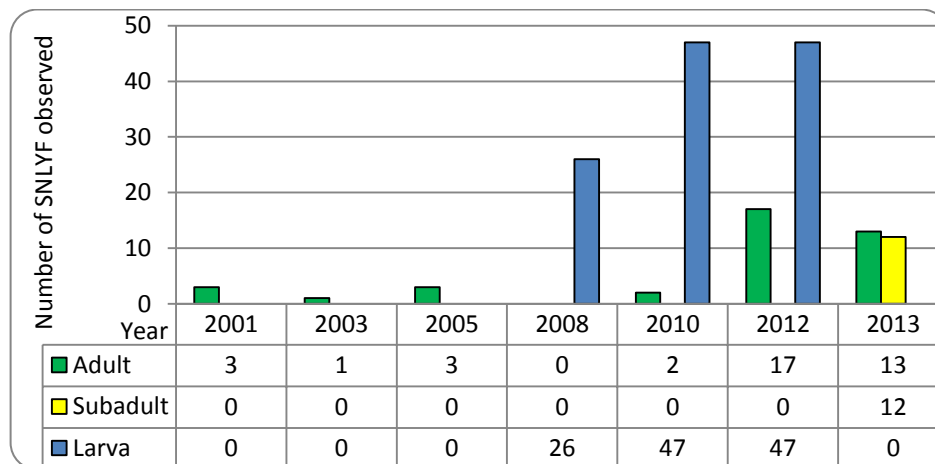


Figure 12: CDFW SNLYF monitoring data at Wheeler Lake and its tributaries. The surveys conducted in 2005, 2008, 2012 and 2013 include a 1.2 km section of outlet stream that was not surveyed in other years. Juvenile SNLYF have not been observed at the Wheeler Lake population.

### Stanislaus Meadow – Updated 2013

Stanislaus Meadow is located south of Highway 4 at approximately 7,700' elevation. CDFW has been monitoring this population since 2005 and survey data suggest a small but stable population consisting of 30-40 breeding adults (Figure 13). Twenty epithelial swabs collected in 2008 and 2010 indicate the population is Bd positive. The north fork of the Stanislaus River flows through the meadow (Figure 14). Fish have not been observed in Stanislaus Meadow, although Mosquito Lakes seasonally flow into the Stanislaus River upstream of the meadow and contain brook trout and rainbow trout.

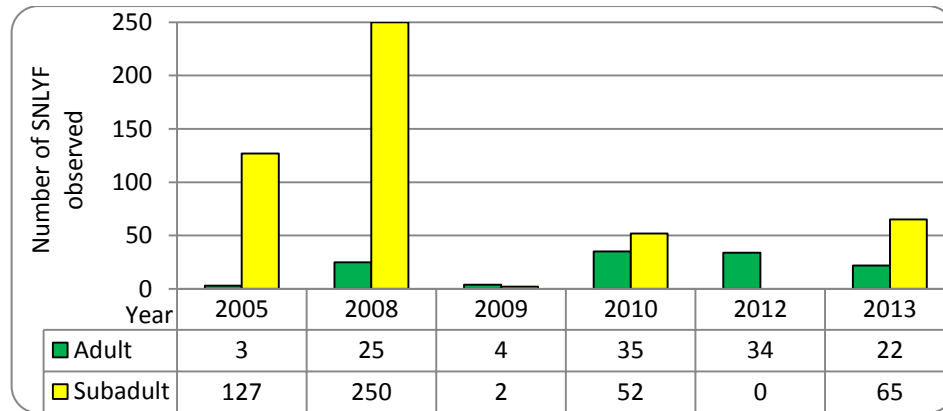


Figure 13: VES data by displayed by life stage in Stanislaus Meadow from 2005 to 2013. All sites within the Stanislaus Meadow were surveyed during each VES; counts were summed across all sites and the totals are displayed. Note that the 2009 survey took place on May 26 while snow was still present in the meadow.

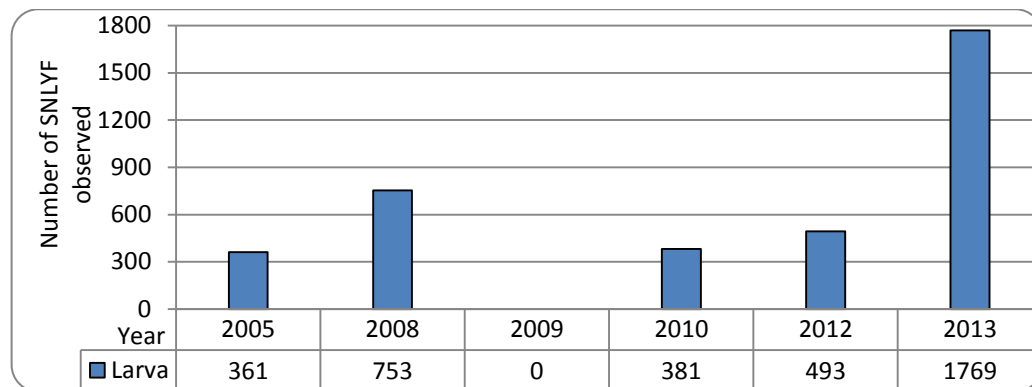


Figure 14: Larvae observed at all sites within Stanislaus Meadow from 2005 through 2013. Note that the 2009 survey took place on May 26 while snow was still present in the meadow.



Figure 14: Two examples of the north fork of the Stanislaus River flowing through Stanislaus Meadow (CDFW 2010).



### Heiser Lake Outlet – Updated 2015

This group of SNYLF is persisting at one small pond (site 15193, Figure 15) and in a section of the Heiser Lake outlet at approximately 7,900' elevation. Additional information is needed to assess the status of this population (Figure 16). These two sites are separated from Stanislaus Meadow by approximately 2.5 kilometers of stream. In 2008 CDFW crews surveyed 500 meters of stream in a meadow between Stanislaus Meadow and site 15193 and did not observe any SNYLF. Nine epithelial swabs collected in 2008 and 2010 indicate the population is Bd positive. These sites are within Carson-Iceberg Wilderness Area.

2015 Update: Although the Heiser lake outlet had dried to a few small pools when it was surveyed on 9/3/2015 a total of four SNYLF were observed in the stream. Site 15193 contained seven large larvae and it is likely based on their size that they successfully overwintered. While this population remains in danger of extirpation due to its very small size it seems to be persisting during drought conditions. Incidentally, a single adult SNYLF was observed in the 500 meter stream reach between Stanislaus Meadow and site 15193 mentioned above.



Figure 15: Site 15193 near Heiser Lake outlet stream where five SNYLF egg masses were observed in 2012 (CDFW 2010).

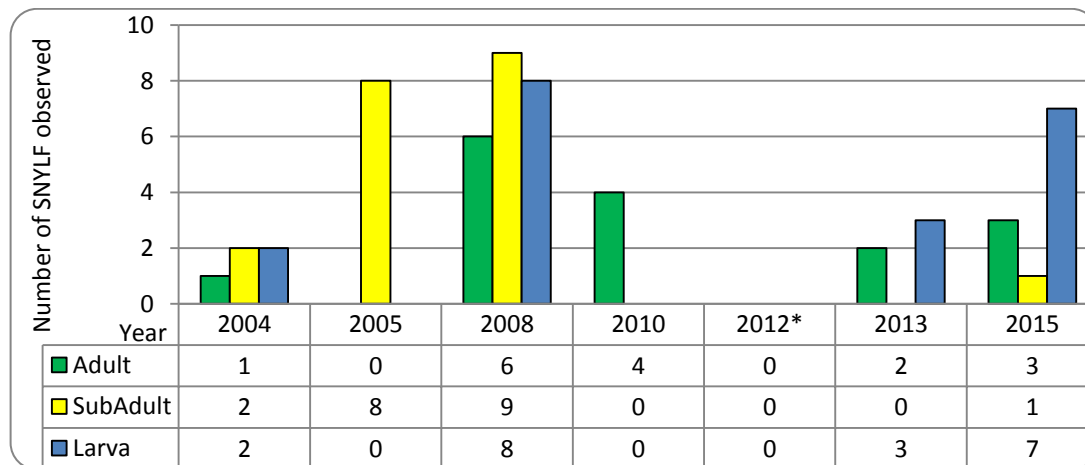


Figure 16: VES data by life stage at Heiser Lake and site 15193. \*Note: 5 SNYLF egg masses were observed in 2012.