State of California
Department of Fish and Wildlife

Memorandum

Date: 8 August 2022

To: Leslie Alber,
Senior Environmental Scientist;
Sierra District Supervisor;
North Central Region Fisheries

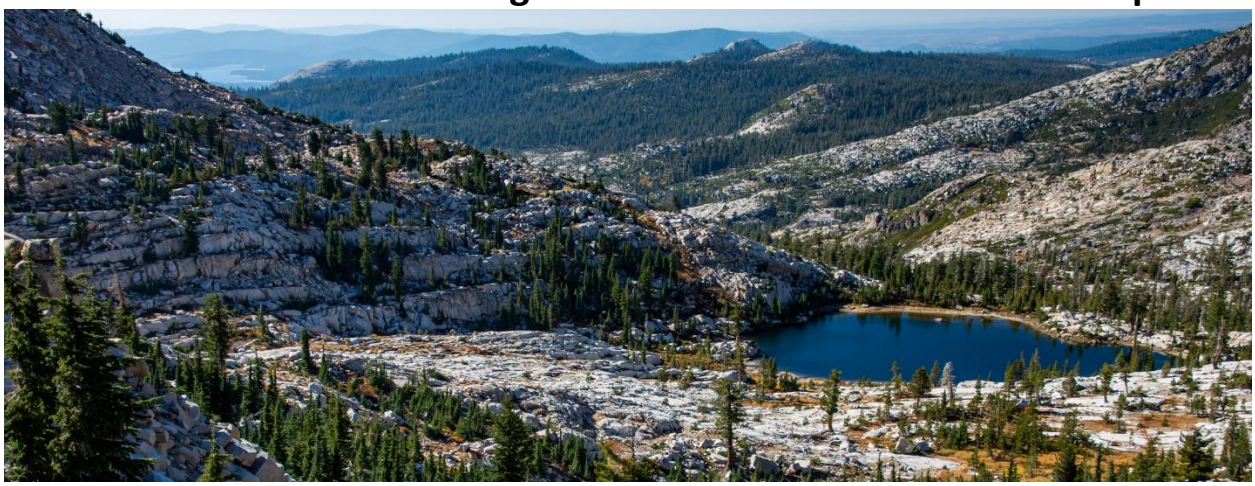
From: Isaac Chellman, Environmental Scientist;
High Mountain Lakes;
North Central Region Fisheries

Cc: Region 2 Fish Files

Ec: CDFW Document Library

Subject: Native amphibian monitoring in Desolation Wilderness;

- ***Rana sierrae* monitoring in the Gertrude Lake area: 2021 update.**



SUMMARY

The Gertrude Lake area (**Figure 1**), which includes Tyler Lake, contains a very small population of Sierra Nevada Yellow-legged Frogs (SNYLF; *Rana sierrae*). California Department of Fish and Wildlife (CDFW) and U.S. Forest Service (USFS) staff have detected SNYLF in the area since the mid 1990's. The small population size, isolation, and potential for extirpation make the Gertrude/Tyler Lakes basin SNYLF population of interest to CDFW. In July 2021, CDFW staff visited the area to conduct visual encounter surveys (VES) for SNYLF and other amphibians. During the surveys, staff observed SNYLF subadults at Gertrude Lake. CDFW plans to continue periodic surveys of the area to monitor SNYLF population trends.

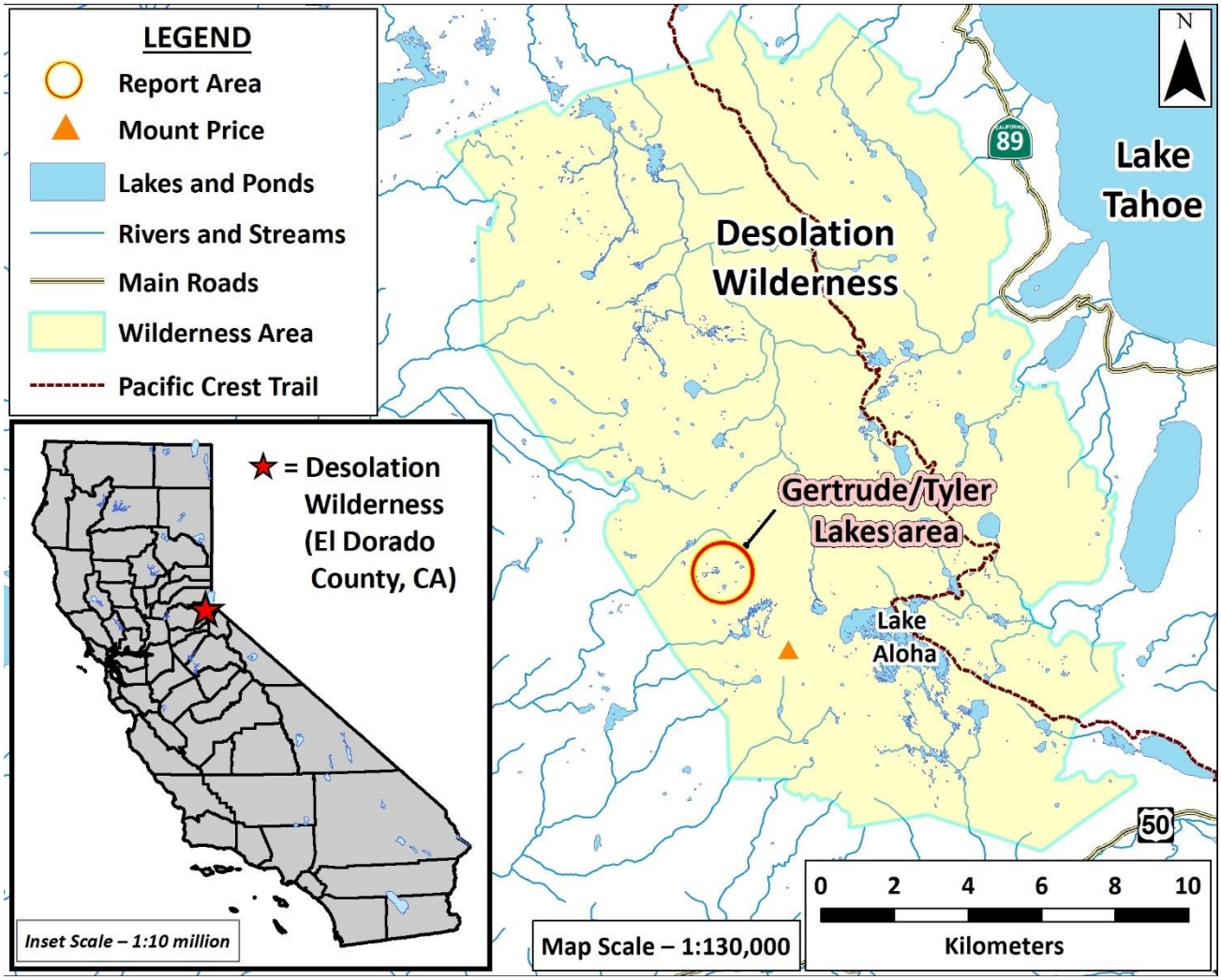


Figure 1. Desolation Wilderness, El Dorado County, CA. The area discussed in this memorandum is circled.

ENVIRONMENTAL SETTING

Gertrude/Tyler Lakes area is located in Desolation Wilderness, El Dorado County (**Figure 1**). The lake sits within a granite basin at approximately 8,000 feet (2,438 meters) above mean sea level and drains west into Jones Fork Silver Creek. Eldorado National Forest (ENF) manages this section of Desolation Wilderness and the surrounding land. Gertrude and Tyler Lakes are accessed via the Rockbound Trailhead, which is located off the northwest side of Wrights Lake.

During baseline lake surveys for the High Mountain Lakes project in 2002, CDFW staff observed one adult SNYLF in Gertrude Lake. The Aquatic Biodiversity Management Plan (ABMP) for the Desolation Wilderness Management Unit (CDFW 2012) identifies Gertrude Lake (Site ID 14121; **Figure 2**), a portion of the Gertrude Lake outlet stream (**Figures 3**), Tyler Lake (Site ID 14136; **Figures 4a and 4b**), and numerous small, fishless ponds in the surrounding area as a Native Species Reserve (NSR) for SNYLF. The larger waterbodies in the basin were formerly stocked by CDFW with Golden Trout (*Oncorhynchus aguabonita*; GT) and Brook Trout (*Salvelinus fontinalis*; BK). However, the Gertrude and Tyler Lakes trout populations were not self-sustaining.

Figure 2. Gertrude Lake (Site ID 14121) on 28 July 2021, looking northwest. (CDFW)

Figure 3. Panorama showing a portion of the Gertrude Lake outlet stream on 28 July 2021. During this survey day, the outlet was almost completely dry; only a few, isolated pools remained. (CDFW)

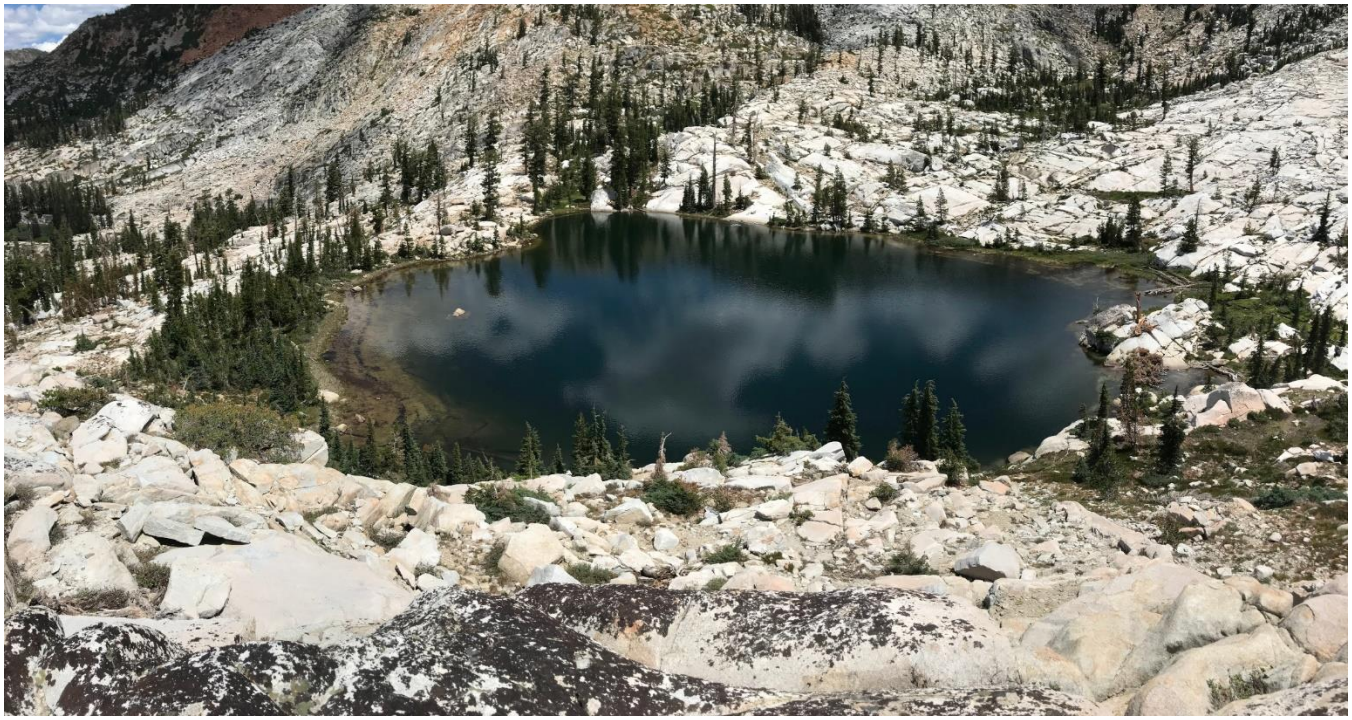


Figure 4a. Tyler Lake (Site ID 14136) on 28 July 2021, looking northeast. (CDFW)

Figure 4b. Tyler Lake (Site ID 14136) on 17 October 2020, looking west. This photograph shows that Tyler Lake still retains deep water during autumn in a dry water year. (I. Chellman)

THREATS

Introduced Fish

CDFW initially stocked Gertrude Lake with BK from 1950 until 1965, then CDFW switched to stocking GT between 1968 and 2000. Overnight gill net surveys in 2002 retrieved both BK and GT. The last fish detected during gill netting surveys was a single BK captured in July 2004. CDFW field crews did not capture any fish during an overnight gill net survey in July 2008. Although CDFW has not set overnight gill nets into Gertrude Lake since 2008, no fish have been observed during VES in 2012, 2017, and 2021. Based on these data, trout populations were likely not self-sustaining, and there are likely no longer fish in Gertrude Lake. Additionally, between 2002 and 2006, CDFW and ENF staff removed trout from the two small ponds upslope from Gertrude Lake (Site IDs 14109 and 14115; **Figures 5 and 6**). CDFW does not know the definitive origin of the trout stocked in these two unnamed ponds: CDFW does not have records of aerial stocking occurring at these two locations. Therefore, the fish were likely planted many years ago by private entities using horses and/or pack mules. CDFW stocked Tyler Lake with BK from 1950 until 2000. Later, in 2007 and 2008, CDFW stocked GT into Tyler Lake to help offset the loss of fishing opportunities at Gertrude Lake. However, following a change in USFS wilderness management objectives, CDFW ceased fish stocking at Tyler Lake, which has subsequently become fishless due to a lack of spawning habitat. Although trout are likely no longer present in Gertrude Lake basin, introduced fish were likely preventing SNYLF from successfully reproducing in the area for many decades. Trout prey on SNYLF and are a potential source of competition for food (e.g., benthic macroinvertebrates).

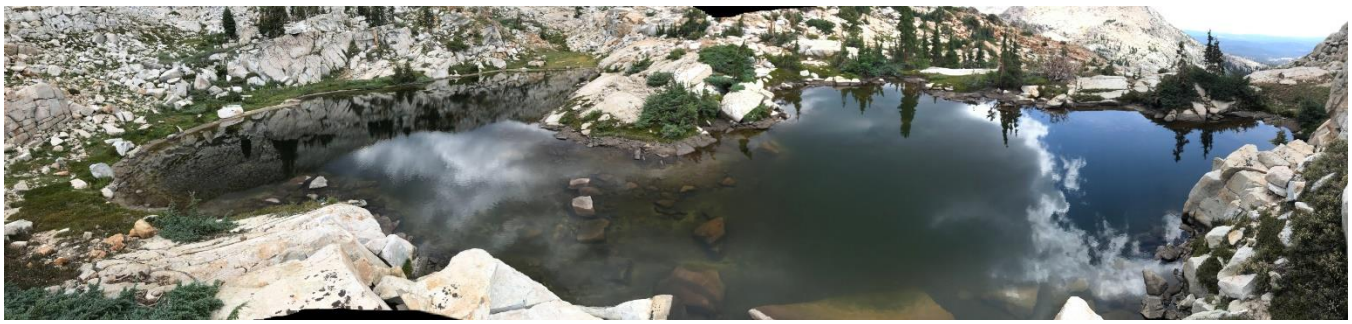


Figure 5. Panorama of Site ID 14109 on 28 July 2021, looking east. (CDFW)

Figure 6. Panorama of Site ID 14115 on 28 July 2021, looking north. (CDFW)

Disease

All SNYLF populations in El Dorado County from which field crews have collected epithelial swabs are positive for chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*). Given extremely low detection rates, CDFW field crews have not collected epithelial swabs from SNYLF in the Gertrude and Tyler Lakes area. However, given the widespread distribution of *Bd* in the northern Sierra Nevada, CDFW assumes the population is likely *Bd* positive.

Loss of Genetic Diversity

Like many SNYLF populations in the northern Sierra Nevada, the population in Gertrude Lake basin is very small and isolated. Although there is a SNYLF population in relatively close proximity (i.e., Twin/Island Lakes basin; CDFW 2022), the rugged landscape of Desolation Wilderness likely precludes most gene flow from outside of Gertrude Lakes. The ABMP (CDFG 2012) noted that SNYLF population supplementation may be necessary to increase the colonization rate of SNYLF into restored habitat (e.g., Tyler Lake, and Site IDs 14109 and 14115) and minimize the potential for genetic bottlenecking. VES for SNYLF since that time only reinforces this conclusion. Although SNYLF are still present in the Gertrude Lake area, current survey data suggest that the population is extremely small and at high risk of extirpation. The nearest location with widespread SNYLF occupancy is Desolation Valley, which is about four kilometers to the east, on the opposite side of the Crystal Range. In addition to the threats presented by stochastic environmental events when a population is geographically isolated (e.g., drought or especially harsh winter), genetic isolation can lead to factors such as inbreeding depression, genetic drift, fixation of deleterious alleles, and loss of genetic diversity, all of which are population genetic factors exacerbated in small populations like those in the Gertrude Lake area (Frankham et al. 2009).

Marginal Habitats

SNYLF are persisting in extremely low numbers at several small ponds in the Gertrude Lake area (**Figures 7 and 8**). Any disturbance, natural or otherwise, that results in changes to the hydrology or limnology of the habitat poses a potential extirpation risk to the population. Potential risks include extended drought, severe winter conditions, or anthropogenic habitat disturbances. A majority of water years in California since 2012 have been drier than the 1991–2020 average (i.e., below average water years occurred in 2012–2015, 2018, and 2020–2022; while 2016 was near normal, and only 2017 and 2019 were well above average water years; CDEC 2022), which demonstrates that prolonged drought is a clear and present threat to many SNYLF populations, particularly those occupying small, shallow, and/or ephemeral waterbodies.

POPULATION STATUS

The ABMP noted that the Gertrude Lake basin SNYLF population may be on a trajectory toward extirpation, despite fish removal efforts via gill netting (2002–2006) and the absence of trout stocking (CDFG 2012). During the past decade, CDFW field crews have only observed a few SNYLF individuals in Gertrude Lake basin (**Figure 8**). Therefore, all current survey results suggest the SNYLF population is likely tiny and, therefore, highly susceptible to extirpation. Given few detections, little can be determined about the population trends in the Gertrude Lake basin, but continued monitoring may allow CDFW to better assess the long-term status and trends of the SNYLF population.

The absence of trout may now allow the SNYLF population in the Gertrude Lake area to begin slowly expanding. However, as discussed in the ABMP (CDFW 2012), SNYLF reintroductions may eventually be necessary to reestablish the SNYLF population. The nearest extant SNYLF population to the Gertrude Lake basin is found in the Island/Twin Lakes drainage, which is located just over the ridgeline southeast of Gertrude Lake basin (CDFW 2022). In 2020, CDFW completed fish removal efforts in Island Lake to improve habitat for SNYLF and other native species. The goal is to restore an interconnected network of high quality aquatic habitat and provide a better chance for long term persistence of a robust SNYLF population. If these efforts result in sufficient SNYLF population growth during the next several years, the Island Lake basin SNYLF population may serve as a future source for translocating frogs to Gertrude Lake basin. Other potential source populations in the nearby proximity include the Clyde Lake drainage and Desolation Valley, the latter of which currently contains a relatively large SNYLF population. These methods, including fish removal efforts, translocations, and reintroductions, are all actions specifically recommended by the Interagency Conservation Strategy for Mountain Yellow-legged Frogs in the Sierra Nevada (MYLF ITT 2018) for restoring SNYLF populations.

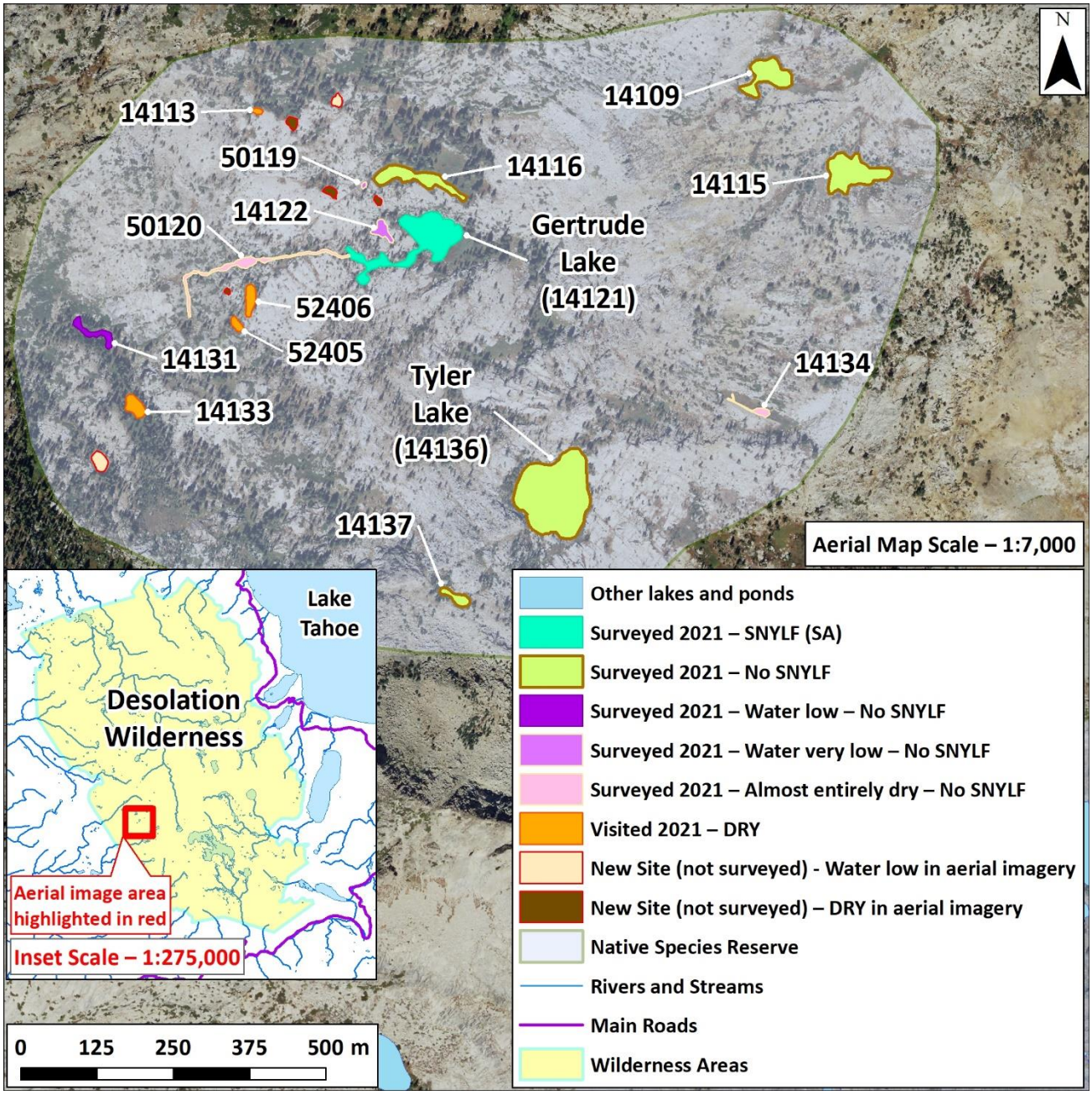
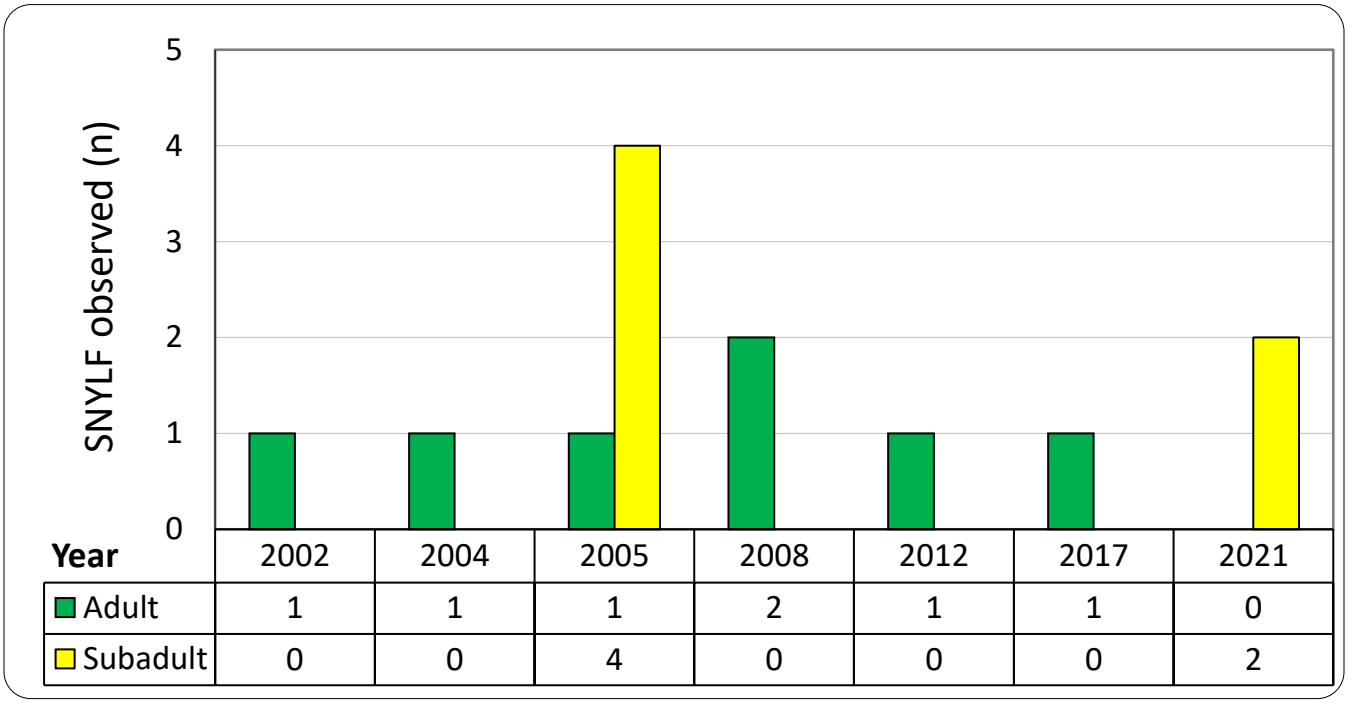


Figure 7. Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) observations and surface water status during visual encounter surveys (VES) in the Gertrude and Tyler Lakes area, Desolation Wilderness, CA, in late July 2021. Since 2002, California Department of Fish and Wildlife (CDFW) staff have observed very few SNYLF in Gertrude Lake, the Gertrude Lake outlet stream (Site ID 50120), and two adjacent ponds (Site IDs 14116 and 14122). The SNYLF letter code "SA" in the legend indicates that staff only detected subadults during the VES in 2021. Number labels shown are unique site identification codes that CDFW uses for data collection. All flowing waters drain southwest into Jones Fork Silver Creek. Following VES in 2021, CDFW staff used aerial imagery to identify several additional ephemeral ponds that were not formerly included on the lakes layer displayed. Although staff did not survey these new sites in 2021, CDFW was able to determine their surface water status in late summer 2021 via aerial imagery available through Google Earth.



Year	2002	2004	2005	2008	2012	2017	2021
Adult	1	1	1	2	1	1	0
Subadult	0	0	4	0	0	0	2

Figure 8. Number of adult and subadult Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF) detected during visual encounter surveys (VES) in the Gertrude Lake drainage. CDFW field crews have detected very few SNYLF in the basin. Field crews have also occasionally detected a small number of SNYLF tadpoles in Gertrude Lake and two adjacent ponds (Site IDs 14116 and 14122). Non-native trout were present in the basin until recent years. Trout presence likely prevented any successful SNYLF recruitment.

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