State of California Department of Fish and Wildlife

Memorandum

Date: 7 March 2023

- 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 restoration in Five Lakes Basin (Grouse Ridge Non-Motorized Area, Tahoe National Forest, Nevada County)

• Five Lakes Basin fish removal



SUMMARY

Between July 2020 and September 2022, CDFW staff used monofilament gill nets to remove introduced Brook Trout (*Salvelinus fontinalis*; BK) and Rainbow Trout (*Oncorhynchus mykiss*; RT) from Five Lakes Basin. Since inception of the project, staff have continuously gillnetted five formerly fish-containing waterbodies. Staff also gillnetted five additional small ponds for shorter periods of time, none of which resulted in fish captures. The last fish captures occurred in Glacier Lake on 12 July 2021, when staff captured two BK. With no additional fish captures during continuous gillnetting from July 2021 to September 2022, CDFW has determined that available evidence suggests Five Lakes Basin is now fishless. Therefore, in late September 2022, staff removed all gill nets from the site. In 2023, CDFW plans to reintroduce Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF) into Five Lakes Basin, using frogs translocated from the nearby Mossy Pond and/or Rattlesnake Creek areas.

ENVIRONMENTAL SETTING

The Grouse Ridge Non-Motorized Area contains hundreds of small lakes and ponds, roughly bounded by Lake Spaulding, Bowman Lake, and Fordyce Lake (**Figure 1**). Elevations in the Five Lakes Basin area range between about 8,000 feet (ft; 2,483 meters [m]) at the summit of Black Buttes to 6,140 ft (1,872 m) at Faucherie Lake. Most visitors access the area via Forest Road 14 (off Bowman Lake Road), which leads to the trailhead near Grouse Ridge Campground. Tahoe National Forest (TNF) manages the surrounding land.

BACKGROUND

The California Department of Fish and Wildlife (CDFW) manages fish and wildlife resources in Five Lakes Basin as part of the Aquatic Biodiversity Management Plan for the South Yuba River Management Unit (ABMP; CDFW 2014). Within the ABMP, CDFW identifies Five Lakes Basin as a Native Species Reserve (NSR) and highlights the basin as a priority area for non-native fish removal to help reestablish SNYLF (CDFW 2014, pgs. 58–60). Five Lakes Basin is also highlighted as a "frog conservation area" (FCA) in the Conservation Strategy for Mountain Yellow-legged Frogs (*R. sierrae* and *R. muscosa*) in the Sierra Nevada (Strategy; MYLF ITT 2018). The Strategy is an adaptive plan that sets the management framework and conservation priorities for SNYLF. The Strategy lists non-native fish removal and SNYLF translocations to Five Lakes Basin as part of the frog conservation area descriptions and species conservation plan (MYLF ITT 2018; Attachments 1 and 2, respectively).

In summer 2018, CDFW staff conducted visual encounter surveys (VES) for amphibians throughout most of the Five Lakes Basin and French Lake FCAs. During the same trip, CDFW also conducted overnight gill net fish sampling and a site assessment to inform proposed fish removal work. For details on those VES, pre-fish removal surveys, and Five Lakes Basin site assessment, please consult the memorandum "Five Lakes Basin Rana sierrae and fish monitoring; Site assessment to determine feasibility of non-native trout removal for Rana sierrae restoration" (CDFW 2019b). In brief, current VES data suggest that very few—if any— SNYLF remain in the greater Five Lakes area. Therefore, reestablishing a SNYLF population will require translocations from a suitable donor population. The ABMP and Strategy both propose using SNYLF translocated from the Mossy Pond area as a potential source for reestablishing SNYLF in Five Lakes Basin.

Given these considerations, CDFW collaborated with TNF partners in spring 2018 and drafted a grant proposal to conduct the fish removal work and future translocation of SNYLF from the Mossy Pond population. This proposal was selected for funding consideration in spring 2019. In December 2019, U.S. Fish and Wildlife Service (USFWS) awarded CDFW funds through the endangered species recovery grant program (Section 6 of the U.S. Endangered Species Act of 1973; Federal Grant Award #F19AP00750) to carry out non-native trout removal in Five Lakes Basin and conduct the frog translocation once fish removal is completed. CDFW field staff began fish removal work in July 2020 (**Figure 2**).

CDFW has completed a capture-mark-recapture (CMR) study of the Mossy Pond SNYLF population, which is located about 8 kilometers (km) southeast of the Black Buttes Area and <u>discussed in a separate memorandum</u> (CDFW 2019a; **Figure 1**). The CMR study occurred from 2014–2018 and preliminary data suggest that the Mossy Pond SNYLF population is large enough to provide adult frogs for translocation to nearby sites. These results, combined with more recent VES of the greater Mossy Pond area SNYLF metapopulation (discussed briefly below), will allow CDFW to estimate the number of post-metamorphic frogs to remove during future translocation efforts, per recommendations of the Strategy (MYLF ITT 2018).



Figure 1. Grouse Ridge Non-Motorized Area, Nevada County, CA. Five Lakes Basin, where the California Department of Fish and Wildlife (CDFW) began removing non-native trout in 2020, is outlined in red. The Mossy Pond area, in part of which CDFW conducted a five-year capture-mark-recapture (CMR) study of Sierra Nevada yellow-legged frogs (*Rana sierrae*; SNYLF), is outlined in green. The Rattlesnake Creek area, which may serve as a source for translocating early life stage SNYLF into Five Lakes Basin, is outlined in purple. CDFW anticipates that the Mossy Pond metapopulation and/or Rattlesnake Creek will serve as a source to reestablish SNYLF in Five Lakes Basin.



Figure 2. [See figure caption at the beginning of the next page.]

Figure 2 (continued). Five Lakes Basin, Nevada County, CA. Between July 2020 and September 2022, California Department of Fish and Wildlife (CDFW) staff removed non-native trout from Elaine Lake (Site ID 12713), Blacks Lake (Site ID 12727), Meyers Lake (Site ID 12735), Glacier Lake (Site ID 12808), and an unnamed, connected pond (Site IDs 12742) using monofilament gill nets. Additionally, staff set gill nets for shorter periods of time (length of time shown parenthetically after each Site ID) to spot check for fish the following five locations: Site IDs 12658 and 12675 (three months in 2020, respectively), Helen Lake (Site ID 12729; two nights in 2022), Site ID 12779 (one night in 2021), and Site ID 52886 (two months in 2021). Staff captured zero fish during net sets at each of these additional five locations spot-checked via gill net. As of fall 2022, CDFW has removed all trout from the basin. Natural barriers to upstream fish movement—shown as pink X's—will prevent fish from regaining entry into Five Lakes Basin. CDFW restored aquatic habitat to benefit Sierra Nevada Yellow-legged Frogs (Rana sierrae; SNYLF), a federally endangered and state threatened species. CDFW uses the five-digit Site IDs to partition waterbodies for data collection. During most water year types, all streams in Five Lakes Basin stop flowing by mid-summer, leaving small, intermittent pools between the larger lakes and ponds. During particularly dry water years, such as 2020–2022, nearly all intermittent stream pools dry entirely by early fall. The only known exception is a small section at the upstream end of the Site ID 12742 outlet stream, which appears to receive a small amount of groundwater flow (Figure 2a). Although this section may desiccate completely by mid-autumn during dry water years, CDFW has not yet observed the section completely dry.



Figure 2a. Location that retains water at the upstream end of the Site ID 12742 outlet stream, on 2 September 2021. (CDFW)

FISH REMOVAL

Background

CDFW stocked Blacks Lake, Meyers Lake, and Helen Lake with BK from about 1938 until 2000. Additionally, CDFW stocked Blacks Lake and Meyers Lake with Lahontan Cutthroat Trout (*Oncorhynchus clarkii henshawi*; LCT) in 1969 and 1970. CDFW stocked Elaine Lake with BK from 1941 until 1967, and subsequently stocked the lake with only RT from 1968 until 2000. CDFW stocked Glacier Lake with BK until 1965 and later stocked only California Golden Trout (*Oncorhynchus aguabonita*; GT) from 1968 until 2008. Finally, CDFW conducted single year stocking of RT at three sites: Helen Lake in 1996, and Site IDs 12704 and 12742 in 1997 (**Figure 2**).

Overnight gill net surveys conducted by CDFW occasionally between 2001 and 2019 revealed self-sustaining trout presence in Elaine Lake (RT), Blacks Lake (BK and RT), Site ID 12742 (BK and RT), and Glacier Lake (BK and GT). CDFW field staff also observed two adult BK in the small pond (Site ID 12805) below Glacier Lake, and one BK in a small pond along the outlet stream of Elaine Lake (Site ID 12658). Trout prey on SNYLF and are a potential source of competition for food (e.g., benthic macroinvertebrates). The presence of self-sustaining trout was a threat to SNYLF reintroduction. Therefore, CDFW began implementing physical trout removal prior to SNYLF reintroduction efforts.

CDFW initiated fish removal in Five Lakes Basin (Figure 3) in early July 2020. Fish removal areas include Elaine Lake (Site ID 12713; Figure 4), Blacks Lake (Site ID 12727; Figure 5, Meyers Lake (Site ID 12735; Figure 6), a stream widening that seasonally floods into a shallow pond (Site ID 12742; Figures 7 and 8), two ponds on Elaine Lake's outlet stream (Site IDs 12675 and 12658; Figures 9 and 10, respectively), Glacier Lake (Site ID 12808, Figure 11), a pond on Glacier Lake's outlet stream (Site ID 12805; Figure 12), a small pond west of Glacier Lake (Site ID 52886; Figure 13), and any pools that may remain during summer in the stream sections that connect these waterbodies. In late September 2020, CDFW removed the nets set in Site IDs 12675 and 12658, after zero fish captures at these locations all summer. These two ponds become very small and shallow by late summer, so continued gill net sets would have likely resulted in excessive bycatch, which CDFW did not deem worthwhile, given the lack of any fish caught after 2.5 months of gill net presence. In early October 2020, CDFW staff set 20 gill nets (six in Glacier, five in Meyers, five in Elaine, three in Blacks, and one in Site ID 12742) to remain in Five Lakes Basin overwinter. Gill net set and check dates, along with associated fish captures, are displayed in Table 1.

Table 1. Summary information for gill net sets and fish captures in Five Lakes Basin (Grouse Ridge Non-motorized Area, Tahoe National Forest) during summer and early fall 2020.

Site ID	Name	Summer nets (n)	Date of original net set	Date of last net pull	Net check events (n)	BK Total	RT Total	Over- winter nets (n)
12658	None	1	7 Jul '20	24 Sept '20	3	0	0	0
12675	None	2	7 Jul '20	23 Sept '20	3	0	0	0
12713	Elaine Lake	12	7 Jul '20	6 Oct '20	4	0	6	5
12727	Blacks Lake	6	8 Jul '20	5 Oct '20	5	0	10	3
12735	Meyers Lake	10	7 Jul '20	6 Oct '20	4	0	0	5
12742	None	4	7 Jul '20	5 Oct '20	5	24	0	1
12808	Glacier Lake	12	22 Sept '20	7 Oct '20	4	103	0	6
TOTALS		47				127	16	20



Figure 3. The core of Five Lakes Basin (excluding Glacier Lake) on 8 July 2020, looking north. (CDFW)



Figure 4. Elaine Lake (Site ID 12713) on 4 June 2021, looking north. (CDFW)



Figure 5. Blacks Lake (Site ID 12727) on 4 June 2021, looking southeast. (CDFW)



Figure 6. Meyers Lake (Site ID 12735) on 8 July 2020, looking northeast. Although California Department of Fish and Wildlife (CDFW) stocked Brook Trout (*Salvelinus fontinalis*; BK) into this site from 1938–2000, CDFW staff did not capture any fish at this location during a two-night gill net set in 2018 or during all fish removal work from July 2020 through September 2022, during which CDFW had up to 10 gill nets set in the lake. It appears that trout extirpated from this site in the absence of stocking. (CDFW)



Figure 7. Site ID 12742 on 8 July 2020, looking down from southwest of the pond. Although this site is a shallow pond following snowmelt in spring and early summer, the site often dries to a narrow channel by late summer (see **Figure 8**). (CDFW)



Figure 8. Site ID 12742 on 2 September 2021, looking north. This location had retained selfsustaining Brook Trout (*Salvelinus fontinalis*; BK), despite becoming a shallow, narrow channel by late summer during dry years. California Department of Fish and Wildlife (CDFW) only has a single Rainbow Trout (*Oncorhynchus mykiss*; RT) stocking record from 1997 for this location, so BK likely originally entered this site by swimming up the ephemeral outlet stream, which connects directly to Blacks Lake (Site ID 12727) during high water. (CDFW)



Figure 9. Site ID 12675 in June 2019, looking east. This is a large stream pool below Elaine Lake that becomes small and shallow by late summer. This photo was taken early in the summer following a wet winter. (CDFW)



Figure 10. Site ID 12658 in June 2019, looking east. This is a large stream pool below Elaine Lake that becomes small and shallow by late summer. This photo was taken early in the summer following a wet winter. (CDFW)



Figure 11. Glacier Lake (Site ID 12808) on 8 July 2020, looking north. Glacier Lake is a site into which the California Department of Fish and Wildlife (CDFW) formerly stocked Brook Trout (*Salvelinus fontinalis*; BK) from at least 1938 until 1965, and then California Golden Trout (*Oncorhynchus aguabonita*; GT) from 1968 to 2008. During sampling in late July 2018, CDFW captured one GT and 12 BK from a single overnight gill net. However, during fish removal work from September 2020 to September 2022, CDFW only captured BK in Glacier Lake. Given that only BK were captured during fish removal work (captures occurring fall 2020 through early summer 2021), CDFW suspects that GT were likely extirpated from the site before fish removal began. The last trout that CDFW caught in Glacier Lake were two BK removed from nets on 12 July 2021. From October 2021 to July 2022, CDFW had six overwinter gill nets set into Glacier Lake, and from late July through late September 2022, staff had ten gill nets set in Glacier Lake. Staff caught no fish from either the 2021–2022 overwinter gill net sets or summer 2022 gill net sets in Glacier Lake. (CDFW)



Figure 12. Pond 12805 on 25 September 2020, looking northeast. During high water, this small pond is directly connected to the outlet of Glacier Lake (Site ID 12808) and will occasionally hold Brook Trout (*Salvelinus fontinalis*). However, this site becomes disconnected from the outlet stream in early summer. During 2020–2022, this site was completely dry by early autumn. (CDFW)



Figure 13. Site ID 52886 on 15 June 2021. This is a small, unmapped pond located approximately 40 m west of the southern end of Glacier Lake (*see Figure 2*). During snowmelt, this pond is connected to Glacier Lake via a short stream channel. From mid-June to early August 2021 (the time period when the pond was deep enough to retain a gill net), CDFW staff set one monofilament gill net at this location to check for presence of Brook Trout (*Salvelinus fontinalis*). The net set resulted in zero fish captures. (CDFW)

2021 Updates

CDFW staff returned to Five Lakes Basin in mid-June 2021 to pull overwinter nets and set summer nets. During the initial visit in mid-June, CDFW removed 29 BK carcasses from the overwinter gill nets in Glacier Lake. These BK captures were the only fish caught in overwinter gill nets set in Five Lakes Basin from October 2020 to June 2021. After cleaning and repairing winter nets, staff set summer gill nets into each of following waterbodies: Meyers Lake (n = 7), Blacks Lake (n = 5), Elaine Lake (n = 11), Site ID 12742 (n = 3), Glacier Lake (n = 10), and Site ID 52886 (n = 1) (**Figure 2**). Gill net set and check dates, along with associated fish captures, are displayed in **Table 2**.

Site ID	Name	Summer nets (n)	Date of first net check	Date of last net pull	Net check events (n)	BK Total	RT Total	Over- winter nets (n)
12713	Elaine Lake	11	16 Jun '21	12 Oct '21	8	0	0	6
12727	Blacks Lake	5	16 Jun '21	12 Oct '21	8	0	0	3
12735	Meyers Lake	7	15 Jun '21	12 Oct '21	8	0	0	4
12742	None	3	16 Jun '21	12 Oct '21	8	0	0	1
12779	None	1	4 Aug '21	5 Aug '21	1	0	0	0
12808	Glacier Lake	10	15 Jun '21	12 Oct '21	8	31	0	6
52886	None	1	15 Jun '21	4 Aug '21	2	0	0	0
TOTALS		37				31	0	20

Table 2. Summary information for gill net sets and fish captures in Five Lakes Basin (Grouse

 Ridge Non-motorized Area, Tahoe National Forest) during summer and early fall 2021.

During summer and fall 2021, CDFW staff visited Five Lakes Basin to check gill nets eight times (mid-June, mid-July, early August, early September, mid-September, late September, early October, and mid-October). During each site visit, staff checked all gill nets set in the basin and cleaned the nets of algae and fish. In total, CDFW captured two BK from summer gill nets set from mid-June to mid-October, both of which were caught in Glacier Lake during the first summer net set period (mid-June to mid-July) (**Table 2**).

In early August 2021, CDFW staff also visually surveyed 11 small ponds adjacent to the Five Lakes Basin fish removal area (**Figure 15**). The primary purpose of these surveys was to determine if the ponds would be capable of sustaining any previously undetected non-native fish. These ponds were never historically stocked with trout. However, given proximity to lakes that had been stocked with fish, and short term, seasonal connectivity to formerly fish-

containing lakes, CDFW suspected there was a small probability that trout could occupy some of these ponds.

During late spring and early summer, as the snow is melting, brief hydrologic connectivity exists between these small ponds and Site ID 12742. This connectivity is highly ephemeral and usually dries up by early summer. Additionally, during surveys in early August, most of the ponds were very shallow, and two of the ponds were dry (Site IDs 12784 and 12733; **Figure 15**). However, one of the ponds (Site ID 12779; **Figure 14**) was deeper than the others, and likely perennial. Although there is no permanent connectivity between Site ID 12779 (**Figure 14**) and waterbodies known to have previously contained fish, staff set a gill net in this pond overnight (4–5 August 2021) to provide evidence of fish absence. The net set resulted zero fish captures.

Anecdotally, staff did not detect SNYLF in any of the 11 small ponds. However, given past survey results in Five Lakes Basin, CDFW expected this result. The same 11 sites have been surveyed for SNYLF in 2001, 2010, 2013, and 2018. During all of these earlier surveys, staff did not detect SNYLF. The nearest past SNYLF detections were in Elaine Lake (Site ID 12713; **Figure 15**) in 2008, and one adult observed briefly in the outlet stream of Elaine Lake in 2018 (CDFW 2019b).

At the end the 2021 field season, CDFW staff set gill nets in each waterbody in the main fish removal area (Elaine Lake, Blacks Lake, Meyers Lake, Glacier Lake, and Site ID 12742; **Figure 2**) to capture fish overwinter. Staff set the winter gill nets on 12 October 2021.



Figure 14. Site ID 12779 on 4 August 2021. This is the one small pond outside the primary fish removal area in which California Department of Fish and Wildlife (CDFW) staff set an overnight gill net in 2021 to detect potential fish presence. The overnight net set resulted in zero fish captures. (CDFW)



Figure 15. [See figure caption at the beginning of the next page.]

Figure 15 (continued). In August 2021 and 2022, CDFW staff surveyed 11 and eight small ponds surrounding the fish removal area, respectively. The goal of these surveys was to spot-check for any potential fish presence and conduct visual encounter surveys for amphibians and reptiles. Surveys revealed that most ponds were very shallow and ephemeral. Most smaller ponds in Five Lakes Basin desiccate entirely by late summer or early fall during dry water years, such as those in 2020–2022. Exceptions include Site IDs 12704, 12705, and 12779. Staff did not detect SNYLF or fish while surveying any of the ponds shown in 2021 or 2022.

2022 Updates

CDFW staff returned to Five Lakes Basin in mid-June 2022 to pull overwinter nets and set summer nets in lower Five Lakes Basin (i.e., all sites with the exception of Glacier Lake). Due to time constraints on the initial trip, CDFW staff postponed checking winter gill nets in Glacier Lake until the following site visit. After cleaning and repairing winter nets, staff set summer gill nets into each of following waterbodies: Meyers Lake (n = 6), Blacks Lake (n = 4), Elaine Lake (n = 10), Site ID 12742 (n = 2). During the next site visit in late July 2022, staff checked overwinter gill nets in Glacier Lake, then reset additional nets for the summer (n = 10; Figure 15). Additionally, during the third site visit in August 2022, staff temporarily removed two gill nets from Meyers Lake and placed the nets into Helen Lake (Site ID 12729; Figure 16) for two nights to spot check for trout. After the two-night set, staff reset gill nets back into Meyers Lake. Gill net set and check dates, along with associated fish captures, are displayed in Table 3.

Table 3. Summary information for gill net sets and fish captures in Five Lakes Basin (Grouse Ridge Non-motorized Area, Tahoe National Forest) during summer and early fall 2022. California Department of Fish and Wildlife staff removed all gill nets from the site on 27 September 2022.

Site ID	Name	Summer nets (n)	Date of first net check	Date of final net pull	Net check events (n)	BK Total	RT Total
12713	Elaine	10	14 Jun '22	27 Sept '22	4	0	0
	Lаке						
12727	Blacks	1	14 Jun '22	27 Sept '22	4	0	0
	Lake	4					
12729	Helen	2	22 Aug '22	24 Aug '22	1	0	0
	Lake						
12735	Meyers	6	14 Jun '22	27 Sept '22	4	0	0
	Lake						
12742	None	2	14 Jun '22	27 Sept '22	4	0	0
12808	Glacier	10	26 July '22	26 Sept '22	3	0	0
	Lake	10				0	0
TOTALS		34				0	0



Figure 16. Panorama image of Helen Lake (Site ID 12729) in summer 2018. (CDFW)

During summer and fall 2022, CDFW staff visited Five Lakes Basin to check gill nets four times (mid-June, late July, late August, and late September). During each site visit, staff checked gill nets set in the basin and cleaned the nets of algae and fish. CDFW did not capture any fish in Five Lakes Basin in 2022, including from the 2021–2022 overwinter gill net sets, or nets set during summer and early fall 2022 (**Table 2**).

On 23 August 2022, CDFW staff conducted VES in eight small ponds adjacent to the Five Lakes Basin fish removal area (**Figure 15**). The primary purpose of these surveys was to check for amphibians and reptiles, with specific focus on SNYLF. Only one of these ponds was historically stocked with trout (Site ID 12704; **Figure 17**). This site only received one plant of fingerling RT in 1997, and CDFW staff have not observed any sign of fish during subsequent surveys at the site in 2001, 2010, 2013, 2018, and 2022. Therefore, it appears no natural fish reproduction occurred at Site ID 12704. Additionally, the very low potential for fish presence at this site is of limited concern to CDFW, because the ephemeral outlet of Site ID 12704 drains into the Five Lakes Basin outlet stream, below a barrier to upstream fish movement (**Figure 2**).



Figure 17. Photo of Site ID 12704 taken on 23 August 2022. (CDFW)

Anecdotally, staff did not detect SNYLF during VES in any of the eight small ponds. However, given past survey results in Five Lakes Basin, CDFW expected this result. CDFW staff surveyed the same eight sites for SNYLF in 2001, 2010, 2013, and 2018. During all of these earlier surveys, staff did not detect SNYLF. The nearest past SNYLF detections were in Elaine Lake (Site ID 12713; **Figure 15**) in 2008, and one adult observed briefly in the outlet stream of Elaine Lake in 2018 (CDFW 2019b).

During the final site visit in late September 2022, CDFW staff used a backpack electrofishing unit to spot-check for fish among any remaining water in the ephemeral stream channels within the main project area. Staff found very small pools present in three locations: below Site ID 12742 (**Figure 2a**), in the main Glacier Lake outlet channel, and in the main outlet of Elaine Lake. Staff electrofished each of these areas, none of which provides suitable habitat for trout. As expected, staff did not detect any sign of fish while electrofishing these marginal stream habitats. Additionally, given very low water levels, staff also electrofished Site ID 12742, which becomes a narrow, shallow channel by late summer (**Figure 8**).

During the final 2022 field season visit to Five Lakes Basin, CDFW staff removed all remaining gill nets from the restoration area (Blacks Lake, Elaine Lake, Glacier Lake, Meyers Lake, and Site ID 12742; **Figure 15**). Additionally, CDFW removed all public notification signs, which staff had posted near shorelines in numerous commonly accessed locations to inform the public about the project, and warn about the presence of gill nets in the lakes (**Figure 18**). Staff had also placed these signs at the Grouse Ridge Trailhead, and at two points along the route to Five Lakes Basin, including at an old sign board adjacent to the trail on the hillside below Grouse Ridge, and at the junction of the Sand Ridge and Glacier Lake hiking trails.



Figure 18. A project notification sign displayed at Glacier Lake (Site ID 12808) in Fall 2021. (CDFW)

Net Sabotage

In late August 2022, CDFW staff discovered that an individual or group had tampered with all gill nets set in Glacier Lake. Fortunately, whoever meddled with the nets merely pulled each one into shore, leaving the nets either in a pile within shallow water, or up on the lakeshore (**Figure 19**). Although a few nets were damaged enough to require removing from the site for repair, most were still in good enough condition for staff to reset the same day. It appeared that whoever removed the nets did not make specific attempts at damaging the nets. However, pulling gill nets in from shore commonly results in damage, since the weighted sink line tends to get stuck on rocks, branches, and other debris when being pulled in horizontally (an inappropriate method for retrieving gill nets). Despite a lack of intentional damage to the nets, the culprit was likely aware that these nets were set by CDFW (and not the result of illegal netting by a private party), given that every net set in Five Lakes Basin had a laminated sign at the shoreline anchor point with a CDFW logo, the project lead's name, and contact information (**Figure 19**). Additionally, CDFW staff had set numerous signs, explaining the project and warning about the presence of gill nets, along the heavily used western shoreline of Glacier Lake (**Figure 18**).



Figure 19. A monofilament gill net found piled up at the shoreline of Glacier Lake in late August 2022. During late July or August 2022, someone had tampered with all nets set in Glacier Lake, pulling all nets from shore, and piling up each net in this manner. (CDFW)

Plans for 2023

Under original terms of the endangered species recovery grant (Federal Grant Award #F19AP00750) for the Five Lakes Basin non-native trout removal and SNYLF reintroduction, CDFW planned to translocate SNYLF back into Five Lakes Basin during summer 2022, using adult frogs collected from the Mossy Pond area. However, VES in the Mossy Pond area in late summer and fall 2021, early summer 2022, and late summer 2022 revealed fewer adult SNYLF than anticipated (see the **Mossy Pond and Rattlesnake Creek areas memorandum** for details; CDFW 2023). CDFW and TNF staff detected <70 total adult SNYLF during VES. Since CDFW plans to collect at least 20 adult SNYLF to undertake the translocation effort, and the grant terms dictate that no more than 20% of adults observed during VES will be collected, CDFW needs to detect at least 100 adult SNYLF in the Mossy Pond area, during a single round of surveys soon before the planned translocation, in order to collect adults for translocation to Five Lakes Basin. Therefore, given these recent survey results, CDFW may not be able to collect adult SNYLF from the Mossy Pond area without the potential for unacceptable risk to the persistence and health of the source population.

Given these recent VES results and need to limit unnecessary risk to the source population, CDFW may pursue an alternative option for reintroducing SNYLF to Five Lakes Basin. After discussion with the CDFW Statewide Amphibian and Reptile Conservation coordinator, supervisory staff in the Region 2 Fisheries Program, Tahoe National Forest partners, and U.S. Fish and Wildlife Service, CDFW may collect early life stage SNYLF (tadpoles and/or recent metamorphs) from Rattlesnake Creek, which is located <5 km south of the Mossy Pond area. Rattlesnake Creek is a site at which CDFW and TNF staff have occasionally observed large numbers of SNYLF tadpoles, some of which have required rescue from tiny, shallow, rapidly drying pools during late summer in dry water years (CDFW 2021). Rattlesnake Creek would be a preferred alternative to Mossy Pond for collecting early life stage SNYLF because CDFW and TNF staff have detected comparatively far fewer tadpoles in the Mossy Pond area, most of which have been observed in a small stream channel that flows into the eastern end of Fordyce Lake. Given consistent SNYLF breeding at Rattlesnake Creek and ability to more easily collect early life stages from shallow pools during late summer, CDFW would plan to collect a subset (≤20% of tadpoles through recent metamorphs seen during VES conducted soon before to collection) for translocation to Five Lakes Basin. However, collecting early life stage SNYLF from Rattlesnake Creek would still be an alternative, with the preferred option being moving adults if staff detect a sufficient number during surveys of the Mossy Pond area in summer 2023.

Given the need to postpone the SNYLF translocation from the Mossy Pond and Rattlesnake Creek areas to Five Lakes Basin, CDFW has applied for an official extension to continue the grant through the end of 2023. CDFW anticipates receiving this approval by spring 2023, which will allow funding of additional surveys in the Mossy Pond and Rattlesnake Creek areas during early to mid-summer 2023, plus the translocation in late summer 2023.

Conclusion

Based on sampling before staff began fish removal in summer 2020, CDFW expected low fish densities in Five Lakes Basin. Following three seasons of fish removal work (three summers and two winters), even fewer fish were present than CDFW had anticipated. Of the 174 trout captured during the project, CDFW captured 143 (82%) during the first four months of gillnetting in 2020. During the 2022 field season, CDFW caught no fish during constant gillnetting in the basin. These results followed the 2021 field season, during which CDFW only caught 31 trout, all of which staff captured in Glacier Lake during the first two trips of the season. All subsequent trips resulted in zero fish captures in all of Five Lakes Basin (**Figure 20**). Therefore, CDFW estimates that, as of mid-summer 2021, no trout remained in the Five Lakes Basin, CDFW plans to begin translocating SNYLF into Five Lakes Basin during summer 2023.



Figure 20. Trout captures during gillnetting of the five primary fish removal lakes in Five Lakes Basin, July 2020 to September 2022 (Blacks Lake, Site ID 12727; Elaine Lake, Site ID 12713; Glacier Lake, Site ID 12808; Meyers Lake, Site ID 12735; and Site ID 12742). Following the initiation of gillnetting, trout captures rapidly declined. Apart from Glacier Lake, trout captures ceased in all waterbodies before winter 2020–2021 (i.e., lower Five Lakes Basin was fishless after only one summer of gillnetting). Glacier Lake retained trout until early summer 2021, after which California Department of Fish and Wildlife staff captured no more fish during 14 months of gillnetting.

LITERATURE CITED

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