

State of California  
Department of Fish and Wildlife  
**Memorandum**

**Date: 9 April 2021**

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**Subject: Native amphibian restoration in Five Lakes Basin (Grouse Ridge  
Non-Motorized Area, Tahoe National Forest, Nevada County)**

- **Five Lakes Basin fish removal**



**SUMMARY**

In early July 2020, CDFW field staff began removing introduced Brook Trout (*Salvelinus fontinalis*; BK) and Rainbow Trout (*Oncorhynchus mykiss*; RT) from six waterbodies in Five Lakes Basin using monofilament gill nets. In late September 2020, staff began fish removal in Glacier Lake. Between 8 July 2020 and 7 October 2020, CDFW staff removed 127 BK and 16 RT, for a total of 143 fish removed. Staff left 20 gill nets in five of the waterbodies to capture fish overwinter. CDFW plans to continue fish removal work through 2022. Once fish removal is complete, CDFW plans to reintroduce Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF) into Five Lakes Basin, using adult frogs translocated from the nearby Mossy Pond area.

## 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.

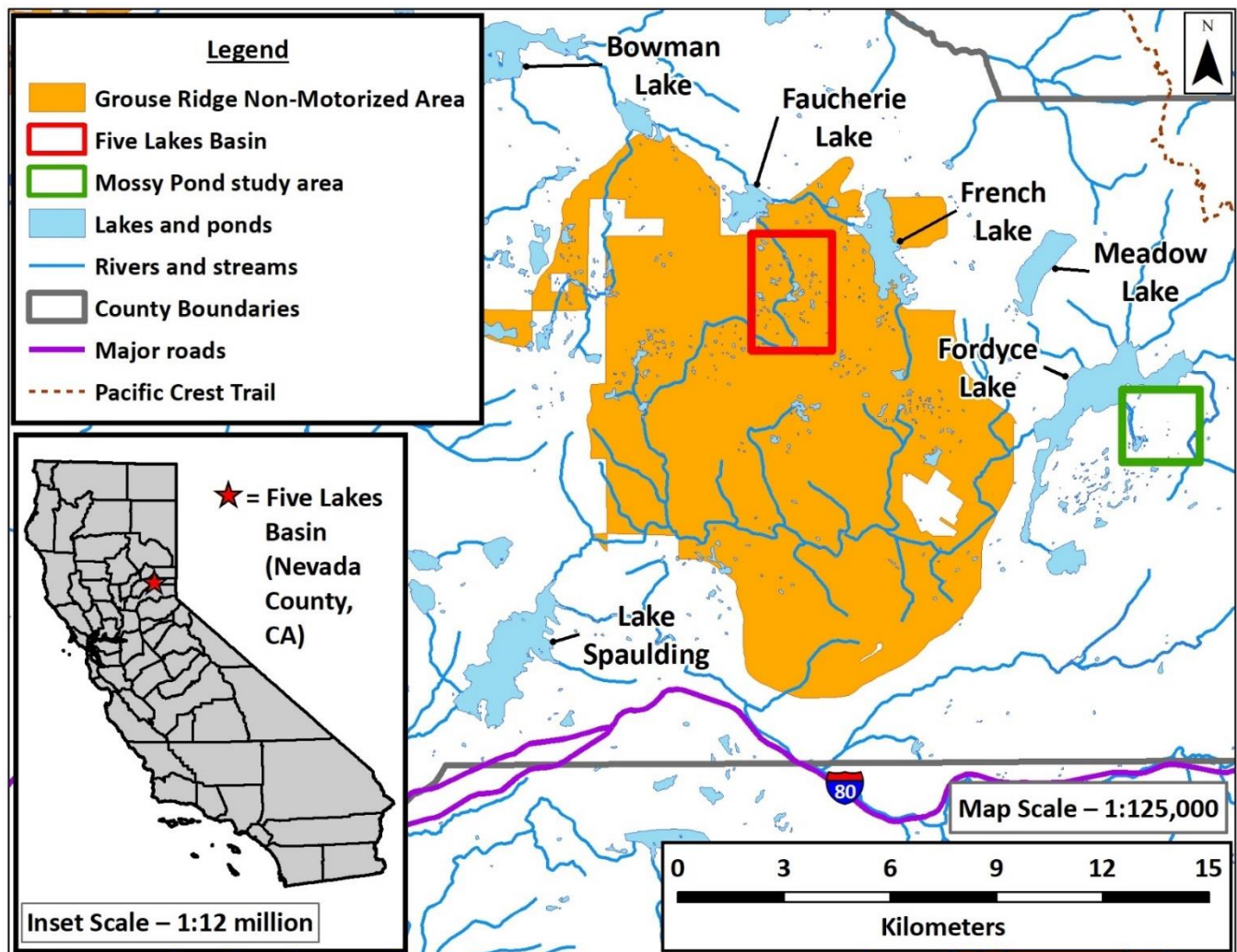
## BACKGROUND

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) for Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF) 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 Mountain Yellow-legged Frog Interagency Technical Team (MYLF ITT) 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 translocations in Five Lakes Basin as part of the frog conservation area descriptions and species conservation action plan (MYLF ITT 2018; Attachments 1 and 2, respectively).

In summer 2018, CDFW staff conducted visual encounter survey (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 [discussed in a separate memo](#) (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, 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 study area, where, in 2018, CDFW concluded a five-year capture-mark-recapture (CMR) study of Sierra Nevada yellow-legged frogs (*Rana sierrae*; SNYLF), is outlined in green. The Mossy Pond population may serve as a source to reestablish a SNYLF population in Five Lakes Basin.



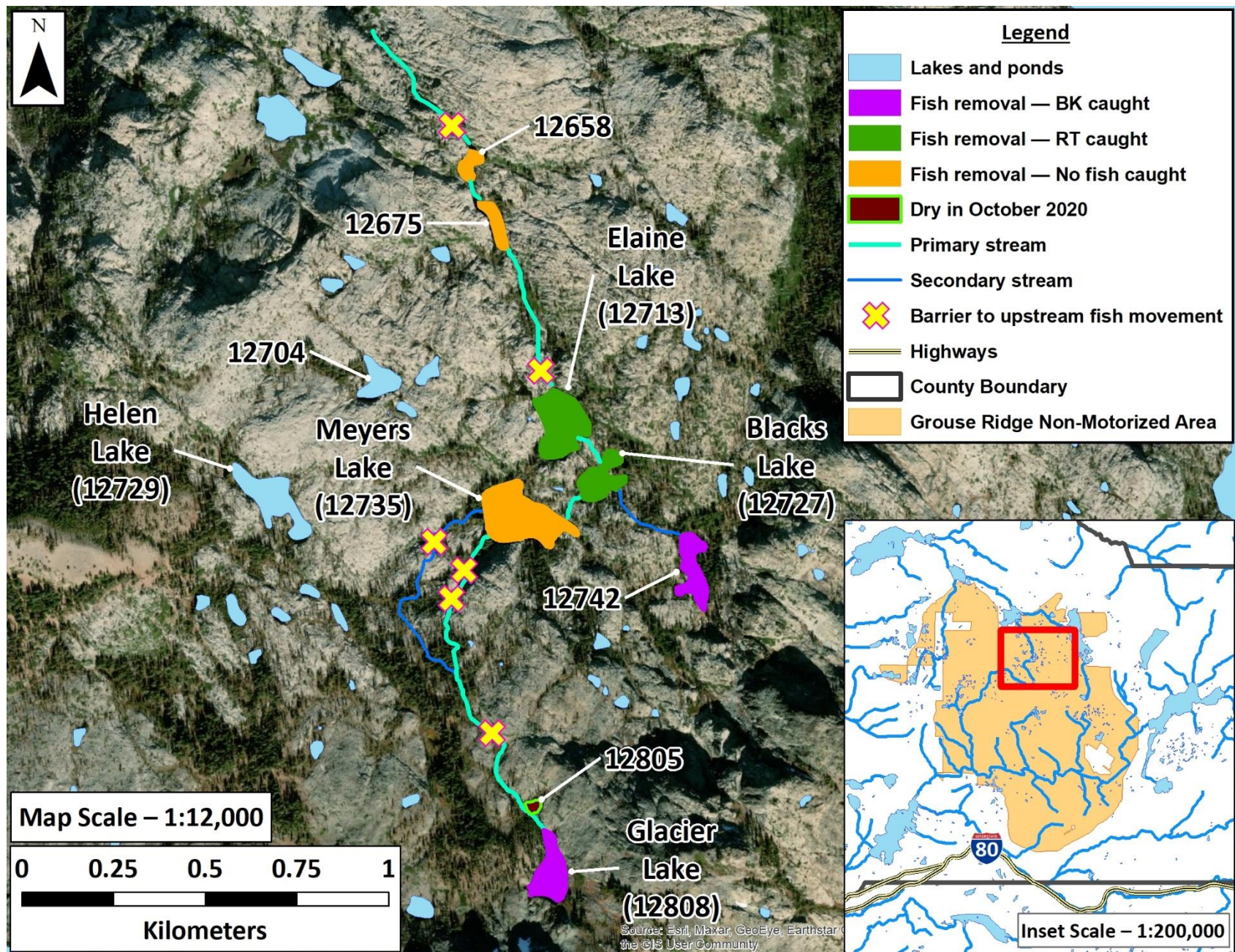


Figure 2. [See figure caption at the beginning of the next page.]

**Figure 2 (continued).** Five Lakes Basin, Nevada County, CA. In July 2020, California Department of Fish and Wildlife (CDFW) staff began removing non-native trout from Elaine Lake (Site ID 12713), Blacks Lake (Site ID 12727), Meyers Lake (Site ID 12735), and several unnamed, connected ponds (Site IDs 12742, 12658, and 12675) using monofilament gill nets. In September 2020, CDFW staff began implementing the same methods in Glacier Lake (Site ID 12808). During most years, all streams in Five Lakes Basin stop flowing, leaving small, intermittent pools—which often dry up by early fall during dry years—between the larger lakes and ponds. CDFW is restoring aquatic habitat to benefit Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF), a federally endangered and state threatened species. Once all non-native trout are removed, natural barriers to upstream fish movement—shown as yellow X’s—will prevent fish from regaining entry into Five Lakes Basin. CDFW uses the five-digit Site IDs to partition waterbodies for data collection.

## **FISH REMOVAL**

### ***Stocking history***

CDFW stocked Blacks Lake, Meyers Lake, and Helen Lake with BK from about 1938 until 2000. CDFW also 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 mykiss aguabonita*; GT) from 1968 until 2008. Additionally, CDFW conducted single year stocking of RT at three sites: Helen Lake in 1996, and Site IDs 12704 and 12742 in 1997 (**Figure 2**).

### ***Fish removal work in 2020***

Overnight gill net surveys beginning in 2001, and most recently undertaken in 2018, revealed self-sustaining trout presence in Elaine Lake (RT), Blacks Lake (BK and RT), Pond 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 in mid-summer 2018, and one BK in a small pond along the outlet stream of Elaine Lake in early summer 2019. Trout prey on SNYLF and are a potential source of competition for food (e.g., benthic macroinvertebrates). The continued presence of self-sustaining trout is a threat to SNYLF reintroduction. Therefore, CDFW is implementing physical trout removal prior to SNYLF reintroduction efforts.

Fish removal areas in Five Lakes Basin (**Figure 3**) 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 12685; **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**), and any pools that may remain during summer in the stream sections that connect these waterbodies.



CDFW initiated fish removal in Five Lakes Basin in early July 2020. Staff initially set 10 gill nets in Meyers, six in Blacks, 12 in Elaine, four in Site ID 12742, two in Site ID 12675, and one in Site ID 12658 (**Figure 2**). In late September 2020, CDFW set 12 nets into Glacier Lake. 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	<i>None</i>	1	7 Jul '20	24 Sept '20	3	0	0	0
12675	<i>None</i>	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	<i>None</i>	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
<b>TOTALS</b>		<b>47</b>				<b>127</b>	<b>16</b>	<b>20</b>



**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) in July 2018, looking north. (CDFW)



**Figure 5.** Blacks Lake (Site ID 12727) in July 2018, looking northeast. (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 of summer 2020, during which CDFW had 10 gill nets set in the lake. It currently 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. The main channel running through the middle of the site is faintly visible in this image. (CDFW)





**Figure 8.** Pond 12742 on 5 October 2020, looking south. This location has retained self-sustaining Brook Trout (*Salvelinus fontinalis*; BK), despite becoming a shallow, narrow channel by late summer during dry years, such as 2020. California Department of Fish and Wildlife (CDFW) only has a single stocking record for this location (a plant of 3,000 fingerling Rainbow Trout [*Oncorhynchus mykiss*; RT] in 1997), 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 mykiss 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 in fall 2020, CDFW only captured BK in Glacier Lake. CDFW had twelve nets set in Glacier Lake and staff checked those nets several times during a two-week period. Given that only BK were captured in 2020, CDFW suspects that GT were likely extirpated from the site before fish removal began. (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. By October 2020, this site was completely dry. (CDFW)

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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. Field staff will check the overwinter gill nets in June 2021. After cleaning and repairing the nets, staff will place the full suite ( $n \approx 45$ ) of summer nets into Five Lakes Basin to capture trout throughout the summer. CDFW field staff will visit Five Lakes Basin regularly (at least once per month in mid-summer, and more often in the late summer and early fall) during weekdays to check gill nets, sample stream pools with a backpack electrofishing unit, and conduct VES for native amphibians.

In summer 2021, CDFW plans to sample Helen Lake (Site ID 12729) and Site ID 12704 (**Figure 2**) with gill nets to obtain more recent data on potential fish occupancy. Based on the most recent data available, trout were likely extirpated from both sites in the absence of stocking. Helen Lake was last sampled for fish with two overnight gill nets in July 2010, neither of which resulted in any fish captures (CDFW 2014). Helen Lake is a small, shallow lake with an ephemeral outlet stream connected to Meyers Lake (Site ID 12735; **Figure 2**) during periods of high water. The lack of any trout captures in Meyers Lake in 2018 and 2020 is additional anecdotal evidence suggesting that fish are likely absent from Helen Lake. However, CDFW will set a few gill nets into Helen Lake to add further evidence that trout are no longer present.

Site ID 12704 is a small pond that was only stocked once, in the late 1990's, with RT. Site ID 12704 has an ephemeral outlet stream, the confluence of which meets the upstream (southern) end of Site ID 12675, below the barrier to upstream fish passage north of Elaine Lake (**Figure 2**). Therefore, there is no direct connection between Site ID 12704 and Elaine Lake for any fish that may be present. However, CDFW has not previously sampled Site ID 12704 for fish, so staff will set at least one overnight gill net during summer 2021 to determine if any fish may still be present. Given that the pond is small and isolated, and only a single RT plant occurred approximately 25 years ago, CDFW does not expect to capture any fish in Site ID 12704.

Previous surveys of Five Lakes Basin have revealed that all streams in the basin appear to be ephemeral (CDFW 2019b). However, small pools may persist in some areas, apart from the driest years, during which streams likely dry entirely. Therefore, in late summer and fall 2021, CDFW plans to use a backpack electrofisher to check for trout in any water still present along all stream channels connected to the Five Lakes Basin restoration area.

Based on sampling conducted before fish removal work began in summer 2020, CDFW expected low fish densities in Five Lakes Basin. Following the first season of fish removal work, even fewer fish were present than CDFW had anticipated. Therefore, CDFW estimates that trout may be completely removed from the Five Lakes Basin restoration area by late fall 2021. However, even if so, CDFW will continue fish removal work through fall 2022, to have reasonable confidence that fish have been eradicated from the restoration area. If fish captures ceased by fall 2021, CDFW may consider beginning adult SNYLF translocation from the Mossy Pond area into Five Lakes Basin in early summer 2022.

## LITERATURE CITED

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