State of California
Department of Fish and Wildlife

Memorandum

Date: 5 February 2021

To: Sarah Mussulman,
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

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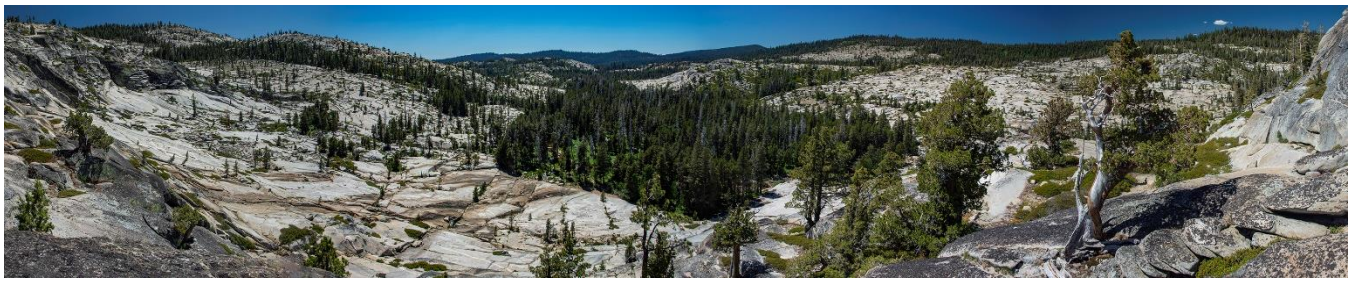
Subject: Native amphibian monitoring in Amador County; Tragedy Creek and Upper Bear River *Rana sierrae* monitoring



INTRODUCTION

The Tragedy Creek and Upper Bear River areas collectively contain a relatively small, but widespread, population of Sierra Nevada Yellow-legged Frogs (*Rana sierrae*; SNYLF). California Department of Fish and Wildlife (CDFW) has been monitoring the SNYLF population in Tragedy Creek since 2002. CDFW first assessed the Upper Bear River population in 2019, with expanded search effort in 2020. The SNYLF population is at-risk due to limited aquatic habitat and the presence of trout in a section of Tragedy Creek. Therefore, CDFW plans to continue monitoring both the Tragedy Creek and Upper Bear River SNYLF populations at least biennially.

ENVIRONMENTAL SETTING

The sections of Tragedy Creek (**Figure 1**) and Upper Bear River monitored by CDFW are located south of Highway 88 and northeast of Bear River Reservoir in Amador County (**Figure 2**). The sites are located between 6,350 and 7,800 feet (1,935 and 2,377 meters; m) in elevation and drain into Bear River Reservoir. Both Tragedy Creek and Upper Bear River are headwater tributaries to the North Fork Mokelumne River. Eldorado National Forest (ENF) manages these tributaries and the surrounding land.

CDFW field staff have previously observed SNYLF along approximately 2,700 m of Tragedy Creek and within isolated ponds immediately southeast. Among others, these sites include stream segments 50151 (**Figure 3**) 50152 (**Figure 4**); and 50153 **(Figure 5**); and stream pools 14750 (**Figure 6**) and stream 14777 (**Figure 7**). Nineteen years of monitoring data suggest that the SNYLF population is relatively small, but currently stable (see POPULATION STATUS section below for a discussion). In 2020, CDFW expanded monitoring efforts on Tragedy Creek to include most of the creek, from the confluence with Upper Bear River to sections of creek upstream of Site ID 50151 (**Figure 8**).

Prior to 2019, CDFW had only surveyed isolated sections of the Upper Bear River drainage (**Figure 9**), including Site ID 14881 (**Figure 10**), Site ID 50577, a pooled portion of stream segment 52740, and Site ID 14880, which is small pond just north of the river. In early September 2019, CDFW field staff made a cursory survey of a 3.7-kilometer (km) segment of the main stem Upper Bear River. During that survey, CDFW field staff observed approximately 50 post-metamorphic SNYLF and over 1,600 tadpoles. Consequently, CDFW planned to return in 2020 for more in-depth surveys of a larger reach of Upper Bear River. In late July 2020, CDFW and ENF staff returned to the site, and surveyed approximately 8 km of Upper Bear River, from the top of the waterfall at the downstream end of Site ID 52734, up a private property boundary at the upstream end of Site ID 52742 (**Figure 8**). These surveys included locations that received more cursory surveys in 2019, including stream segments 52734 (**Figure 11**), 52735 (**Figure 12**), 52736 (**Figure 13**), and 52737 (**Figure 14**), plus Site ID 14881 (**Figure 10**) and several kilometers of Upper Bear River upstream of Site ID 14881. Based on current survey results, Upper Bear River contains a healthy and widespread SNYLF population (see POPULATION STATUS section below for a discussion).

Figure 1. [See figure caption at the beginning of the next page.]

Figure 1 (continued). Tragedy Creek, Amador County, CA on 21 July 2020. This image was taken at Site ID 52755, which is a section of the creek further downstream than areas California Department of Fish and Wildlife (CDFW) field staff had surveyed during previous years. The water year leading up to summer 2020 was one of the driest on record. However, despite these dry conditions, during surveys in late July 2020, Tragedy Creek and Upper Bear River contained many pools, some of which were quite large, and areas with intermittent stream flow. Even during well above average water years (e.g., 2017 and 2019), Tragedy Creek and Upper Bear River are not flowing by late summer, at which time both water courses are primarily composed of intermittent pools. (CDFW)

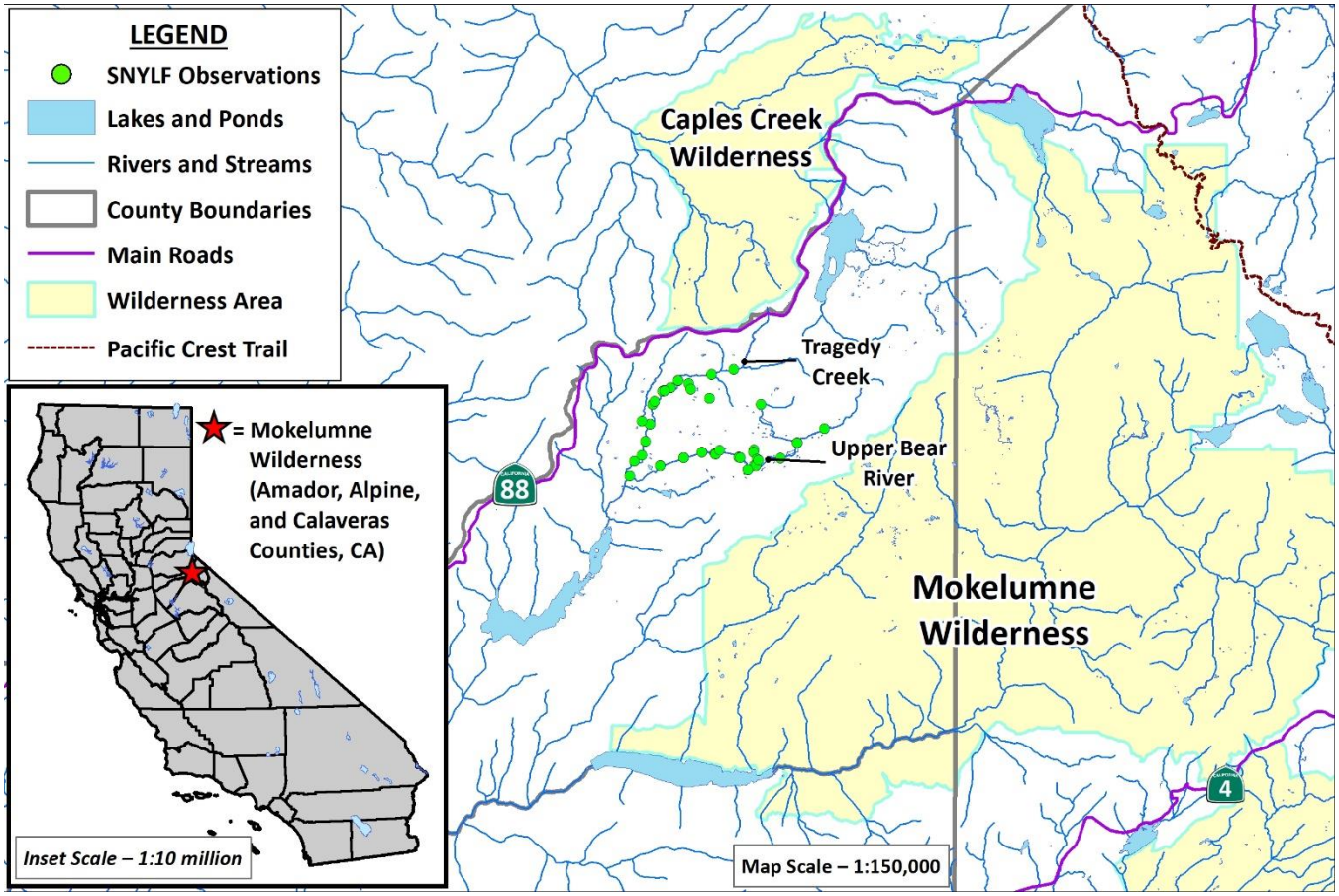


Figure 2. Map of the Upper Mokelumne area of Amador County, CA. Green dots show Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) detections by California Department of Fish and Wildlife (CDFW) and Eldorado National Forest (ENF) staff during visual encounter surveys (VES) in 2020.

Figure 3. Upstream end of Site ID 50151, looking downstream, in July 2020. Flows in the stream channel were very limited. (CDFW)

Figure 4. Upstream end of Site ID 50152, looking downstream, in July 2020. (CDFW)

Figure 5. A mostly dry section of Site ID 50153, looking upstream, in July 2020. The entire reach consisted of intermittent pools separated by dry stream channel. (CDFW)

Figure 6. A section of Site ID 14750 in September 2019. This is one of the sites in which an angler caught Rainbow Trout (*Oncorhynchus mykiss*; RT) in July 2017. (CDFW)

Figure 7. Panorama photo showing a section of Site ID 14777 in July 2020. This is one of the sites in which an angler caught Rainbow Trout (*Oncorhynchus mykiss*; RT) in July 2017. (CDFW)

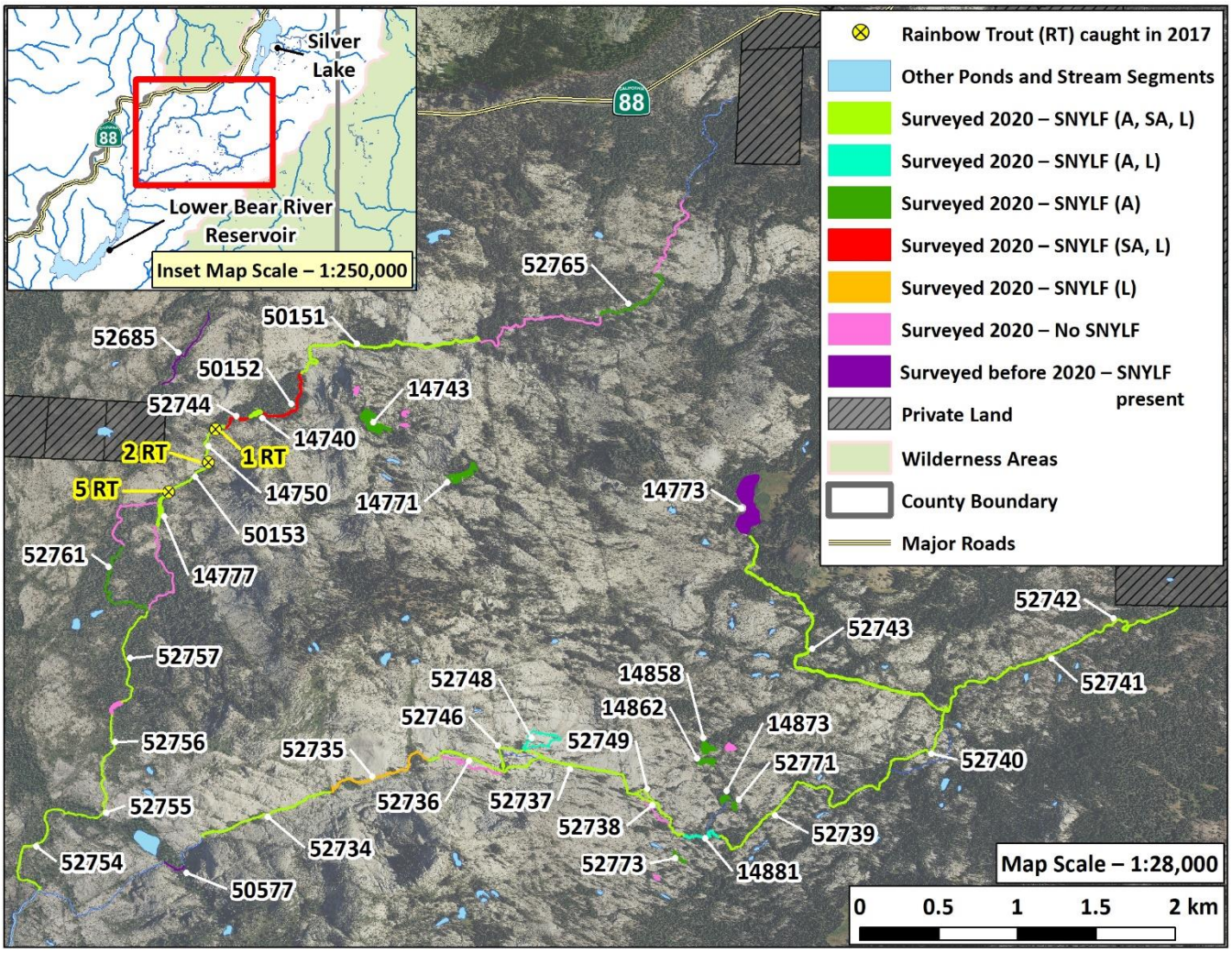


Figure 8. Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) and Rainbow Trout (*Oncorhynchus mykiss*; RT) occupancy in the Tragedy Creek and Upper Bear River areas, Amador County, CA. Since the early 2000's, California Department of Fish and Wildlife (CDFW) staff have consistently observed a small SNYLF population in Tragedy Creek, between Site IDs 14777 and 50151. In 2020, CDFW expanded search efforts to include most of Tragedy Creek, from the confluence with Upper Bear River (downstream end of Site ID 52754) to the upper reaches on public land just south of State Route 88. CDFW field staff first observed RT at Site ID 50153 during visual encounter surveys (VES) in 2002. The captures shown in yellow were reported to CDFW by a recreational angler in late summer 2017. CDFW first surveyed part of the main stem Upper Bear River (between Site IDs 52734 and 14881) in 2019. Although the VES in 2019 were cursory due to time restrictions, CDFW observed a larger SNYLF population in Upper Bear River than previously known. Therefore, in 2020, CDFW expanded search efforts of the Upper Bear River drainage, which including more in-depth VES of the entire reach, from a waterfall at the downstream end of Site ID 52734, up to a private property boundary at the upstream end of Site ID 52742, plus the outlet of Mud Lake (Site ID 52743). Observed SNYLF life stages are denoted by letter codes in the legend: "A" = adults, "SA" = subadults, and "L" = larvae. All flowing waters drain into Bear River Reservoir before reaching the North Fork Mokelumne River. Displayed five-digit numbers are Site IDs, which CDFW uses to partition waterbodies for data collection.

Figure 9. Overview of the Upper Bear River drainage, taken in July 2020 from the open granite slope north of the river, looking south. (CDFW)

Figure 10. The downstream end of Site ID 14881 on 21 July 2020. On historic USGS topographic maps, this site is shown as a pond; however, the site is merely a large stream widening, approximately 1.5–2 m deep, located along the main stem of Upper Bear River. On 21 July 2020, California Department of Fish and Wildlife (CDFW) staff set a 36-m long monofilament gill net in this section of the river for approximately six hours and caught no fish.

Figure 11. A section of Site ID 52734 in July 2020. (CDFW)

Figure 12. Panorama photo showing a section of Site ID 52735 in July 2020. (CDFW)

Figure 13. Panorama photo showing a section of Site ID 52736 in July 2020. (CDFW)

Figure 14. One of the deepest pools located within Site ID 52737. On 22 July 2020, California Department of Fish and Wildlife (CDFW) staff observed numerous Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) tadpoles in this pool.

THREATS

Marginal Habitats

SNYLF are persisting in relatively low numbers throughout a large extent of Tragedy Creek, Upper Bear River, and small ponds adjacent to both waterways (**Figure 8**). Occupied habitat includes mostly ephemeral stream channel with small, shallow, intermittent pools. 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 severe winter conditions, extended drought, or anthropogenic habitat disturbances.

Introduced Fish

Rainbow Trout (*Oncorhynchus mykiss*; RT) are present in the lower portion of the Tragedy Creek segment that CDFW regularly monitors, including Site IDs 14750, 14777, and 50153 (**Figure 8**). The presence of RT negatively affects SNYLF breeding and recruitment in areas where the species co-occur. Trout prey on SNYLF and are a potential source of competition for food (e.g., benthic macroinvertebrates).

CDFW field staff first observed RT at Site ID 50153 during visual encounter surveys (VES) in 2002, and again in 2016 and 2019. Staff have also noted RT during VES at Site ID 14777 in 2013 and 2016. In late July 2017, a recreational angler caught two RT in Site ID 50153 (**Figure 15**), one RT in Site ID 14750 (**Figure 16**), and five RT in Site ID 14777. Based on the number of observations, it is apparent that RT are self-sustaining in some sections of Tragedy Creek.

In fall 2017, CDFW collected genetic tissue samples from RT captured in Tragedy Creek, downstream of Site ID 14777. Analysis by the CDFW fish pathology lab revealed that the sampled trout were not triploid (i.e., sterile trout with an extra set of chromosomes), revealing that the fish did not originate from a recent CDFW hatchery source (CDFW 2015). Rather, the RT population in Tragedy Creek is a self-sustaining population introduced many years ago. CDFW does not know when RT were first introduced into Tragedy Creek or the source of initial introductions. There are no known RT-bearing waters that flow into Tragedy Creek. CDFW stocks Lower Bear River Reservoir with RT, and Bear River Reservoir has a self-sustaining RT population, but a large waterfall precludes upstream movement of trout from the reservoirs into the creek reaches discussed in this memorandum.

Regardless of the original source, RT have persisted in this portion of Tragedy Creek, despite extreme conditions, such as the 2012–2016 drought and the heavy snowpack of 2017 and 2019. Therefore, RT are clearly capable to persisting in the few remaining perennial pools during low flow conditions. It is reasonable to assume trout will continue to persist in these reaches into the foreseeable future.

CDFW does not know if RT occur in the upper reaches of Tragedy Creek: field staff have not observed any RT upstream of Site ID 14750, and the upstream reaches (above Site ID 14740) are poorer trout habitat (e.g., **Figures 3 and 4**). RT may be present in deeper pools or shaded stream segments above Site ID 14750, but CDFW has not observed fish to date during VES. Additional

survey efforts, including overnight gill net sampling and/or angling, are needed to determine the absence of RT more confidently in perennial aquatic habitats upstream of Site ID 14750.

In the Upper Bear River drainage, CDFW staff detected fish at Site IDs 14881 and 52740 in 2002. In each instance, staff only observed a single fish at each site. However, field staff have subsequently not detected fish at these locations. The fish species at Site ID 14881 was unknown, and the individual observed at Site ID 52740 was a BK, which may have reached Upper Bear River by moving downstream from Mud Lake. CDFW initially planted BK into Mud Lake in 1943, and plants continued regularly until 2000. However, CDFW did not capture any fish during an overnight gill net set in Mud Lake in 2002, and staff did not observe fish during VES in 2002 and 2019. In the absence of stocking, BK may have died out in Mud Lake. However, an additional overnight gill net set will help determine whether BK may still be present in Mud Lake.

During VES in late summer 2019, CDFW field staff did not observe any trout between Site IDs 50577 (below a large waterfall) and 14881 (the largest single pool along the main stem Upper Bear River; **Figures 8 and 10**). During expanded VES in 2020, CDFW staff did not observe any fish, nor capture any fish during a six-hour gill net set in Site ID 14881 (**Figure 10**). Therefore, based on current data and observations, it does not appear that trout still occupy Upper Bear River above the barriers to upstream fish movement from Bear River Reservoir. However, given the size, depth, and tannin staining of many large pools of Upper Bear River, additional gill net sampling and/or angling will be necessary to determine if trout may still be present.

Figure 15. A Rainbow Trout (*Oncorhynchus mykiss*; RT) hooked by an angler at Site ID 50153 in July 2017. (B. Serup)

Figure 16. Adult Rainbow Trout (*Oncorhynchus mykiss*; RT) hooked by an angler at Site ID 14750 in July 2017. (B. Serup)

Disease

Chytrid fungus (*Batrachochytrium dendrobatidis*; *Bd*) is present in all SNYLF populations in the northern Sierra Nevada that CDFW has sampled. In 2008 and 2010, field staff collected fifteen epithelial swabs from SNYLF captured along Tragedy Creek (Site IDs 50151, 50152, and 50153). Partner scientists screened the swabs for presence of *Bd* DNA using real-time quantitative polymerase chain reaction (qPCR) analysis. The swab analyses detected very light to heavy infection intensity. In 2020, CDFW collected an additional 20 epithelial swabs from Tragedy Creek (n = 8) and Upper Bear River (n = 12). In fall 2020, partner scientists at the Sierra Nevada Aquatic Research Laboratory (SNARL) screened the new swabs for presence of *Bd* DNA using real-time qPCR analysis (Knapp and Lindauer 2020). The swab analyses detected either no *Bd* (for Tragedy Creek, n = 1; for Upper Bear River, n = 2), or very light to high intensity. One sample from each site, both collected from subadult SNYLF, resulted in *Bd* loads that may be high enough to indicate potential for the sampled frogs to experience mortality from chytridiomycosis (the disease caused by *Bd*). No swabs collected from adult SNYLF at Tragedy Creek or Upper Bear River in 2020 had high *Bd* loads.

Loss of Genetic Diversity

Like many SNYLF populations in the northern Sierra Nevada, the populations in Tragedy Creek and Upper Bear River are relatively small when compared with many historic and/or *Bd*-naïve SNYLF populations. In fact, most SNYLF populations in the Bear River and Upper Mokelumne Management Units (CDFW 2016, CDFW 2020a) are small and isolated from one another. The nearest known SNYLF populations with more widespread occupancy are Jeff Davis Creek (CDFW 2014) and Desolation Valley (CDFG 2012), located in separate watersheds, approximately 20 km east and 25 km north, respectively. In addition to the threats presented by stochastic environmental events when a population is geographically isolated (e.g., drought, wildfire, 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 (Frankham et al. 2009).

POPULATION STATUS

During the past 19 years, CDFW field staff have observed a relatively small, but seemingly stable, SNYLF population in Tragedy Creek. However, throughout these years, observed SNYLF numbers of each life stage have widely fluctuated. Overall, the Tragedy Creek SNYLF population is small enough to be susceptible to extirpation through introduced trout predation, drought, and/or disease. In 2020, CDFW field staff observed adult SNYLF (**Figure 17**) numbers that were consistent with observations over the past two decades (**Figure 18**). However, field staff documented the highest subadult and larval SNYLF counts in the repeatedly monitored section of Tragedy Creek since surveys began in 2002 (**Figures 18 and 19**).

Environmental conditions may play a role in the variations in SNYLF detections through the years. For example, 2016–2017 and 2018–2019 winters may have been a factor in the reduced post-metamorphic SNYLF detections in summers 2017 and 2019. Winter 2016–2017 was record-setting in the northern Sierra Nevada, in terms of precipitation quantity (CDEC 2020a), during which northern Sierra Nevada snowpack levels reached about 150% of the April 1st average (CDEC 2020b). Precipitation and snowpack were also well above average in 2018–2019 (CDEC 2020a and 2020b). These conditions resulted in the Upper Mokelumne watershed retaining snow well into the summer during both 2017 and 2019. Long winters and deep snowpack can lead to increased overwinter SNYLF mortality (Bradford 1983).

Survey timing, in combination with seasonal conditions, is also likely a factor in the observed results. In general, when CDFW has conducted VES at Tragedy Creek earlier in the summer, during which streams are often flowing, leading to more available aquatic habitat and difficult visibility into the water in some areas, field staff have detected fewer SNYLF. For example, CDFW conducted the 2013 VES on 27 June and the 2017 VES in early July. Although 2013 was a below average water year, the creek was still flowing in late June (in part because approximately 1.5 inches of rain fell between 24 and 26 June 2013; CDEC data from nearby stations at Owens Camp [OWC], Silver Lake [SIL], and Salt Springs Powerhouse [SSR]; CDEC 2020c). Flows were also high in early July 2017, following the highest precipitation year on record (CDEC 2020a).

Other important factors may be influencing changes in the number of SNYLF life stages observed between years, including annual changes in distribution and abundance of introduced trout populations (which are especially detrimental to larval and young SNYLF; Knapp and Matthews 2000), weather conditions on the survey day (i.e., surveys on cooler, windier days tend to result in fewer detections than surveys on warmer, calmer days; pers. obs.), time of year (i.e., depending on weather conditions, shoulder season surveys of high elevation amphibian habitat in May into early June and late September into early October may lead to poorer detectability when compared with surveys during the core summer period of late June through early September; pers. obs.), and observer bias (Mazerolle et al. 2007).

An additional factor in the lower detections in 2017 is that field staff did not survey Site ID 50153 (**Figures 18 and 19**). Although CDFW field staff have not often detected an abundance of tadpoles in Site ID 50153, the site can contain a significant number of post-metamorphic SNYLF (e.g., field staff detected 41, 38, 11, and 14 post-metamorphic SNYLF at Site ID 50153 in 2010, 2012, 2016, and 2020, respectively). Therefore, the omission of this site from the surveys limits the comparability of the 2017 VES results with other years during which CDFW surveyed all three stream segments included in the histograms presented below (**Figures 18 and 19**).

This was the first summer during which CDFW field staff surveyed a large portion of the Upper Bear River drainage. These initial results are promising, indicating that SNYLF are successfully breeding and widespread in the drainage (**Figure 8; Table 1**). Conditions in the Upper Bear River drainage in late July 2020 were very similar to Tragedy Creek: due to the very dry summer (following a below average winter snowpack), the river was no longer flowing, so the available aquatic habitat was primarily interspersed pools, some of which were very large (e.g., **Figures 10 and 14**). With few exceptions, CDFW field staff observed SNYLF of all life stages in pools throughout the Upper Bear River reach, and post-metamorphic SNYLF were also present in several small ponds adjacent to the main river channel. Although the total number of SNYLF in Upper Bear River observed by CDFW in 2020 is still far lower than the high population densities found in some lentic and/or *Bd*-naïve populations in other areas of the Sierra Nevada, totals are still encouraging for a northern Sierra Nevada stream-based population (**Table 1**; Brown et al. 2019). The lack of any trout detections in the surveyed reach is also promising. The widespread presence of SNYLF tadpoles was another anecdotal indication that few, if any, trout are now present in the surveyed section of Upper Bear River. However, during the next round of surveys in the Upper Bear River drainage, CDFW plans to set overnight gill nets in additional large pools along the river channel to add confidence in the determination that trout may be absent.

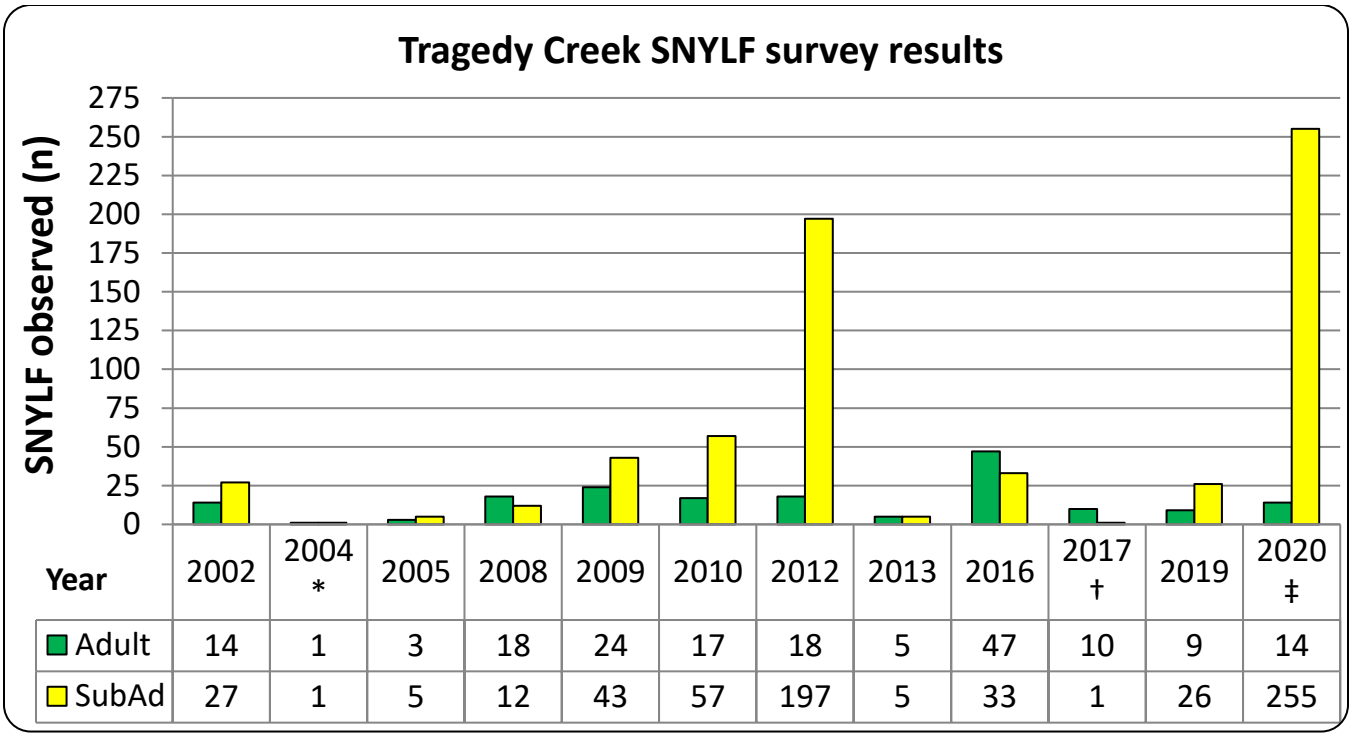
Until recently, CDFW focused amphibian VES on lentic habitats, largely based on baseline surveys and studies of SNYLF in places such as Yosemite National Park, John Muir Wilderness, and Sequoia and Kings Canyon National Parks, in which SNYLF and closely related *Rana muscosa* populations were primarily observed in lentic habitats. When surveying streams, CDFW would mainly focus within 200 m of a target lake or pond. In subsequent years, CDFW and partner scientists from the U.S. Forest Service, National Park Service, U.S. Geological Survey, and academic institutions have learned that SNYLF inhabit lotic habitats more commonly than previously known (Brown et al. 2019, Yarnell et al. 2019). These expanded survey efforts have resulted in new discoveries of SNYLF populations (e.g., the Upper Bear River population described in this memorandum). In some locations, more extensive lotic surveys have revealed that sparse SNYLF occurrences from early surveys represented part of larger and more broadly dispersed populations (e.g., South Fork Rock Creek watershed, Brown et al. 2019; CDFW 2020b). VES and CMR studies demonstrate that these stream populations are relatively small, especially when compared with lentic SNYLF populations in the core range of the species (Brown et al. 2019). However, small populations are still critical from the standpoint of species conservation and genetic diversity, particularly at the periphery of the species' range. Additionally, these stream-based populations are growing in importance as locations for management actions,

including conservation translocations (as both source and recipient sites), population augmentation, and captive-rearing (MYLF ITT 2018, Brown et al. 2020, CDFW 2020b).

Expanded surveys of Upper Bear River and Tragedy Creek have provided a learning opportunity to better understand the diversity of habitats occupied by SNYLF. CDFW suspects there are several reasons that Upper Bear River and Tragedy Creek may provide stream habitats particularly favorable to SNYLF. First, based on current survey results, fish are restricted to a relatively small section of Tragedy Creek (i.e., between Site IDs 14777 and 14750; **Figure 8**). Second, Tragedy Creek and Upper Bear River are ephemeral systems with a diversity of available aquatic habitat, the composition of which changes depending on the water year type and time of year. Importantly, in all observed water year types, Tragedy Creek and Upper Bear River flow rates decline substantially by mid-summer, and stream flow in most locations along the surveyed reaches stops altogether by late summer. These conditions result in both systems becoming a linear complex of variously sized pools; from relatively small, shallow puddles to perennial ponds deep enough to support overwintering tadpoles. In combination, this variety of habitat types may provide high quality habitat for stream based SNYLF (Yarnell et al. 2019). Third, this area is a very open, sun-exposed, granitic system, which may be conducive to providing ample algal forage base for tadpoles and quality basking habitat for adults. However, the abundance of open areas is interspersed with shaded, forested sections, resulting in an overall highly diverse habitat composition, which may meet the collective needs of all SNYLF life stages.

CDFW will continue periodic monitoring of Tragedy Creek and Upper Bear River to determine the relative abundance, general reproductive success, and demographic composition of the SNYLF population. Additionally, expanding future search efforts into other promising fishless lotic habitats within the species' range may reveal more discoveries like those discussed here. One potential option for focusing these surveys would be targeting areas with relatively recent detections (e.g., within the past 20 years), but in which only lentic surveys have occurred. Targeting ephemeral streams that retain a variety of pools into late summer and fall, particularly near locations with extant lentic SNYLF populations, may reveal broader occupancy than previously known. CDFW will continue to occasionally survey lotic habitats that received less attention during widespread survey efforts throughout the Sierra Nevada in the early 2000's, particularly in response to new anecdotal observations and reports of SNYLF sightings.

Figure 17. Adult Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) detected at Site ID 52773 during visual encounter surveys in July 2020. (CDFW)



Year	2002	2004 *	2005	2008	2009	2010	2012	2013	2016	2017 †	2019	2020 ‡
Adult	14	1	3	18	24	17	18	5	47	10	9	14
SubAd	27	1	5	12	43	57	197	5	33	1	26	255

Figure 18. Number of adult and subadult (SubAd) Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) detected during visual encounter surveys (VES) in Tragedy Creek (Site IDs 50151, 50152, and 50153). Field staff have also detected SNYLF in pooled areas of the creek and ponds nearby. However, this figure includes most adult and subadult SNYLF detections from the Tragedy Creek area, and fewer SNYLF have been observed in areas outside the main stem of Tragedy Creek. Additionally, California Department of Fish and Wildlife (CDFW) staff have monitored the other sites less consistently. Therefore, for better comparability, this figure only presents Site IDs 50151, 50152, and 50153.

*****Staff did not survey Site ID 50153 in 2004.

†Staff did not survey Site ID 50153 in 2017. Includes two adult SNYLF that staff observed in an additional stream segment (Site ID 52685) that CDFW had not previously surveyed.

‡In 2020, staff surveyed a much larger portion of Tragedy Creek, from the confluence with Bear River upstream to the upper portion of Tragedy Creek on public land, not far below State Route 88. However, the totals presented here do not include additional SNYLF that field staff observed during those surveys because the results are not directly comparable with totals from previous years.

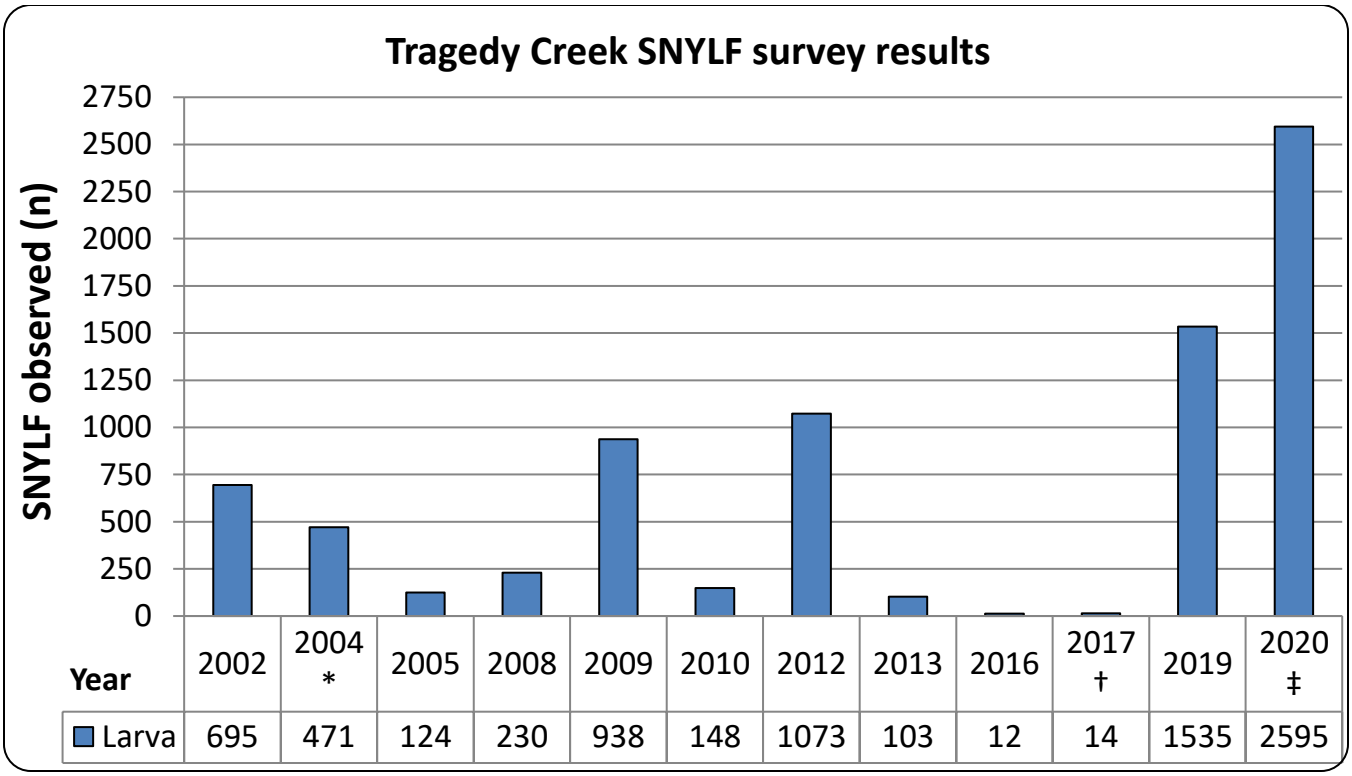


Figure 19. Number of larval Sierra Nevada Yellow-legged Frog (*Rana sierrae*; SNYLF) detected during visual encounter surveys (VES) in Tragedy Creek (Site IDs 50151, 50152, and 50153). Field staff have also detected SNYLF in pooled areas of the creek and ponds nearby (Site IDs 14740, 14743, 14750, and 14777). However, this figure includes most larval SNYLF detections from the Tragedy Creek area, and far fewer SNYLF have been observed in areas outside the main stem of Tragedy Creek. Additionally, California Department of Fish and Wildlife (CDFW) staff have monitored the other sites less consistently. Therefore, for better comparability, this figure only presents Site IDs 50151, 50152, and 50153.

*****Staff did not survey Site ID 50153 in 2004.

†Staff did not survey Site ID 50153 in 2017.

‡In 2020, staff surveyed a much larger portion of Tragedy Creek, from the confluence with Bear River upstream to the upper portion of Tragedy Creek on public land, not far below State Route 88. However, the totals presented here do not include additional SNYLF larvae that field staff observed during those surveys because the results are not directly comparable with totals from previous years.

Table 1. Total number of Sierra Nevada Yellow-legged Frogs (*Rana sierrae*) of each post-hatching life stage detected (i.e., given that surveys occurred in mid-summer, field staff did not observe egg masses) in Tragedy Creek (table at left) and Upper Bear River (table at right) drainages during visual encounter surveys (VES) by California Department of Fish and Wildlife in 2020. Cells from Tragedy Creek highlighted in yellow are the three stream segments included in the Tragedy Creek VES histograms presented above (**Figures 18 and 19**).

Tragedy Creek drainage

Site ID	Adults	Subadults	Larvae
14734	0	0	0
14740	1	12	4
14743	1	0	0
14744	0	0	0
14746	0	0	0
14749	0	0	0
14750	1	13	5
14771	1	0	0
14777	1	5	1
14852	0	0	0
50151	8	230	2548
50152	0	17	46
50153	6	8	1
52744	0	9	4
52754	3	2	3
52755	1	2	2
52756	3	2	15
52757	1	5	10
52758	4	4	0
52759	0	0	0
52760	3	0	0
52761	1	0	0
52762	0	0	0
52763	0	0	0
52764	4	3	0
52765	1	0	0
52766	0	0	0
TOTALS	**40**	**312**	**2639**

Upper Bear River drainage

Site ID	Adults	Subadults	Larvae
14858	2	0	0
14859	0	0	0
14862	2	0	0
14873	1	0	0
14881	3	0	67
14888	0	0	0
52734	1	3	19
52735	0	0	8
52736	2	1	33
52737	10	14	712
52738	10	22	771
52739	19	64	1387
52740	10	19	185
52741	4	7	81
52742	3	1	18
52743	11	13	25
52745	0	0	0
52746	3	1	10
52748	4	0	33
52749	1	1	80
52750	0	0	0
52771	1	0	0
52773	8	0	0
TOTALS	**95**	**146**	**3429**

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