

EL DORADO IRRIGATION DISTRICT

El Dorado Hydroelectric Project (FERC No. 184)



2022 SIERRA NEVADA YELLOW-LEGGED FROG SURVEYS

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2022 SIERRA NEVADA YELLOW-LEGGED FROG SURVEYS

El Dorado Hydroelectric Project (FERC No. 184)

1.0 INTRODUCTION

1.1 Monitoring Requirements

El Dorado Irrigation District (District) owns and operates the El Dorado Hydroelectric Project (Project) on the South Fork American River (SFAR) in El Dorado County, California, under license from the Federal Energy Regulatory Commission (FERC; Project No. 184). Sierra Nevada yellow-legged frog (SNYLF; *Rana sierrae*; formerly referred to as mountain yellow-legged frog [*Rana muscosa*]) is a federally endangered amphibian species known to occur in Project waters. As required by the Project 184 License,¹ the District, in coordination with the U.S. Forest Service (FS), the California State Water Resources Control Board (SWRCB), and the Ecological Resources Committee, developed the Project 184 Mountain Yellow-Legged Frog Monitoring Plan (Plan; EID 2010) to monitor potential effects of Project operations on SNYLF populations in the area.

The Plan specifies routine SNYLF population monitoring be performed every five years at established sites within Project waters in the Lake Aloha, Caples Lake, and Silver Lake regions. Monitoring scheduled for 2021 had to be cancelled due to the Caldor Fire and was rescheduled to be conducted in 2022.² In addition, the Plan requires the District to conduct targeted trout removal and SNYLF surveys in ponds immediately downstream of Lake Aloha's seven auxiliary dams following spill events. Lake Aloha spilled in 2022 and the District contracted with Kleinfelder to conduct both routine SNYLF population surveys as well as trout removal and targeted Lake Aloha auxiliary dam spillway SNYLF surveys in 2022. Results of routine five-year SNYLF monitoring are reported herein; results of 2022 trout removal and Lake Aloha auxiliary dam SNYLF surveys are reported under separate cover.

1.2 SNYLF Status and Distribution

The United States Fish and Wildlife Service (USFWS) listed SNYLF as endangered under the federal Endangered Species Act (ESA) on April 29, 2014. The California Fish and Game Commission listed Sierra Nevada yellow-legged frog as threatened under the California Endangered Species Act on April 1, 2013. SNYLF is also considered a sensitive species by the FS. Portions of the Project are within Critical Habitat for the species (USFWS 2016).

¹ FS Section 4(e) Conditions 37 and 38; SWRCB 401 Water Quality Certification Condition 13d; Project 184 Settlement Agreement Sections 7 and 8.

² EID September 9, 2021 notification regarding P-184 Adaptive Management Program - Monitoring Changes due to Caldor Fire (Docket No. P-184; Accession No. 20210909-5105)

SNYLF is a highly aquatic species. Adults and juveniles may be found in a variety of aquatic habitats, including perennial lakes, perennial and ephemeral ponds, isolated pools, wet meadows, and streams in the Sierra Nevada at elevations typically ranging from 4,500 to 12,000 feet. Because of their multi-year tadpole stage, permanent water is required for successful breeding. Breeding activity begins soon after ice-melt in spring, ranging from April at lower elevations to June and July in higher elevations (AmphibiaWeb 2017). Eggs are deposited underwater in clusters attached to rocks, gravel, vegetation, or under banks (AmphibiaWeb 2017).

2.0 METHODS

2.1 SNYLF Surveys

2.1.1 Survey Locations for SNYLF

Routine SNYLF population surveys were conducted in 2022 at eight sites (and associated subsites) as identified in the Plan (Figure 2.1-1):

- Site 440 T/L – Camp Harvey tributary and associated ponds (Subsites A-F).
- Site 455 LP – western shoreline of Upper Echo Lake.
- Site 550 LP – Lake Aloha and associated downstream ponds and habitats (southern shoreline of Lake Aloha; snowmelt pond and associated tributary; ponds A-X downstream of the Lake Aloha auxiliary dams).
- Site 750 LP – Silver Lake (southern and eastern shorelines).
- Site 752 IT – unnamed tributary to Silver Lake – up to 0.5 mile from confluence, depending on suitable habitat.
- Site 753 IT – Camp Silverado – up to 0.5 mile from confluence depending on suitable habitat.
- Site 895 LP – Caples Lake (southern shoreline).
- Site 897 IT – Emigrant Creek – up to 1.0 mile from confluence depending on suitable habitat.

2.1.2 Visual Encounter Surveys for SNYLF

Surveys for SNYLF followed the California Department of Fish Game (CDFG) Sierra Nevada Fish and Amphibian Survey Protocol (CDFG 2009). Visual encounter surveys (VES) targeted life stages of SNYLF including tadpoles (i.e., hatch-year and over-winter tadpoles), juveniles, and adults. Egg masses were not a life stage targeted for VES due to the timing of surveys in late summer when they are likely to be hatched out.

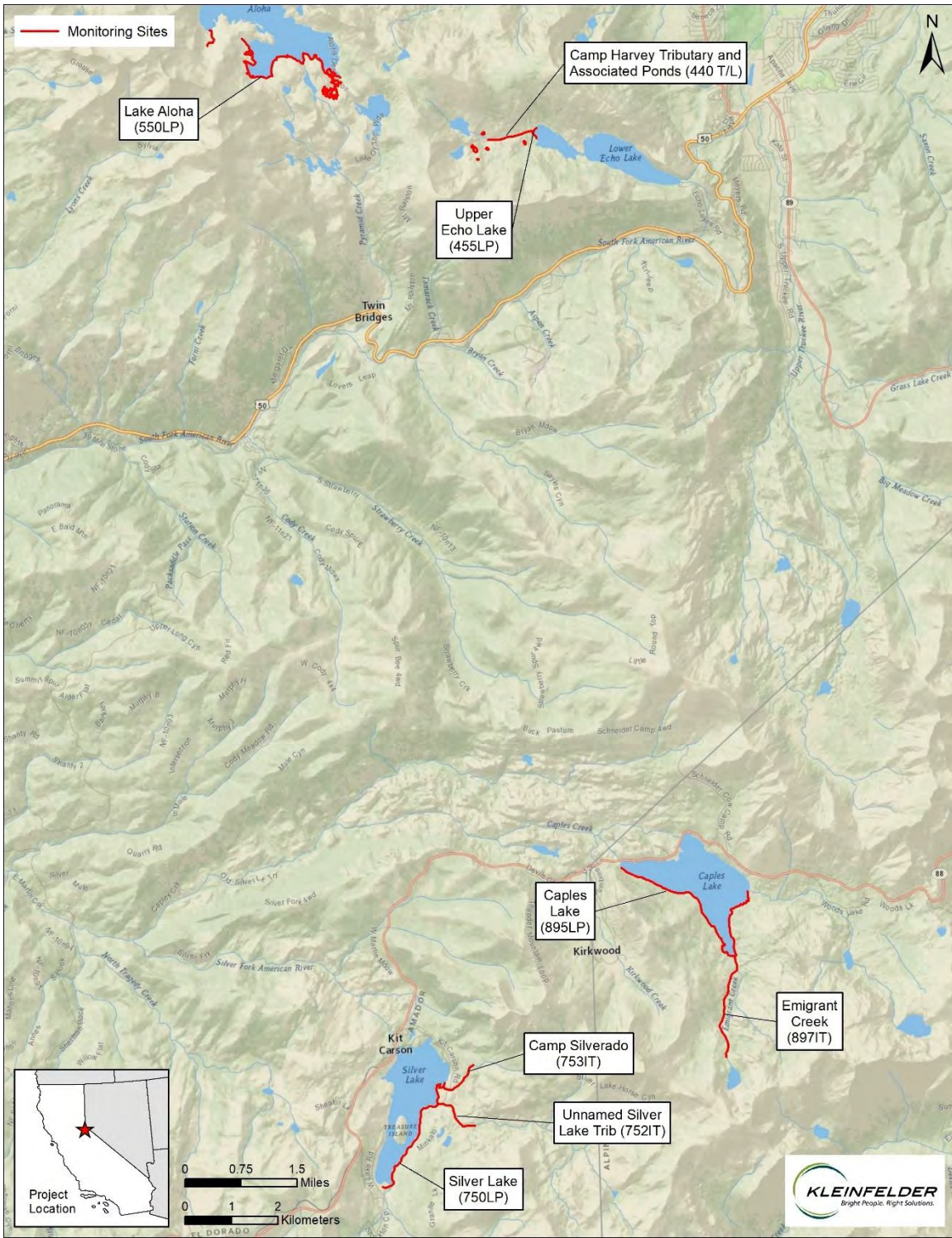


Figure 2.1-1. Overview of Project 184 Sierra Nevada yellow-legged frog monitoring sites.

VES was conducted in August and September 2022 by teams of two to four biologists walking along the margins of lakes, ponds, and tributaries where frogs could be observed basking. All measurements were estimated and no individual adults, juveniles, or larvae were handled during surveys. Frogs greater than 40 millimeters (mm) snout-urostyle length (SUL) were considered adult, while frogs ranging from 25 to 39 mm SUL were considered juveniles. Larval SNYLF were given an estimated measurement for total length (TL) and attempts were made to observe characteristics of over-wintered larvae (i.e., hind legs) versus hatch-year larvae (lack of hind legs and lower TL). Locations of SNYLF were recorded with hand-held global positioning system (GPS) units. Habitat characteristics were recorded for each site including water temperature, color, turbidity, and maximum depth in addition to weather conditions. In addition to SNYLF, all other herpetofauna observations were recorded. All snakes that were captured were palpated, if possible, to identify prey items, and then released.

3.0 RESULTS

3.1 SNYLF VES Results

A total of 60 adult, 1,629 juvenile, and 702 larval SNYLF were observed during the 2022 surveys (Table 3.1-1). Adult frogs were observed at Site 550 LP (Lake Aloha shoreline, snowmelt pond and tributary, and Ponds A, D, E, I, and X) and Site 752 IT (unnamed tributary to Silver Lake). Juveniles were observed at most sites where adults were observed. Overwintered larvae were observed at Site 550 LP (snowmelt pond and Pond H). SNYLF egg masses were not observed at any site.

Incidental herpetofauna observed included Sierran chorus frog (*Pseudacris sierra*) tadpoles, metamorphs, and adults in addition to mountain garter snakes (*Thamnophis elegans elegans*).

VES results (from 2022 and previous survey years) are summarized in Table 3.1-1 and 2022 SNYLF observations are shown in Figures 3.1-1 through 3.1-5. Site photographs are provided in Appendix A.

Table 3.1-1. Project 184 SNYLF survey history and results.

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
Camp Harvey 440 T/L	A (Cagwin Lake)	9/1/2022	0	0	0	0
		8/25/2016	0	0	0	0
		9/1/2011	0	0	0	0
		7/28/2004	0	0	0	0
		7/31/2002	0	0	0	0
	B	9/1/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/22/2011	0	0	0	0
		7/28/2004	0	0	0	0
		7/30/2002	0	0	0	0
	C	9/1/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/22/2011	0	0	0	1
		7/28/2004	0	0	2	0
		7/30/2002	0	0	0	1
	D	9/1/2022	0	0	0	0
		8/25/2016	1	0	0	0
		8/22/2011	0	0	0	0
		7/28/2004	0	0	0	0
		7/30/2002	0	0	0	0
	E	9/1/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/29/2011	0	0	0	0
		7/28/2004	0	0	0	0
		7/30/2002	0	0	0	0
F	9/1/2022	0	0	0	0	
	8/25/2016	0	0	0	0	
	8/22/2011	0	0	0	0	
	8/13/2004	0	0	0	0	
	7/30/2002	0	0	0	0	

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE	
Upper Echo Lake 455 LP		9/1/2022	0	0	0	0	
		8/25/2016	0	0	0	0	
		8/22/2011	0	0	0	0	
		7/29/2004	0	0	0	0	
		8/3/2004	0	0	0	0	
		7/31/2002	0	0	0	0	
Lake Aloha 550 LP	Snowmelt pond	8/31/2022	21	0	1560	700	
		8/24/2016	17	0	274	19	
		9/1/2011	64	42	11	331	
		8/14/2004	0	0	>100	>1000	
	Trib between snowmelt pond and Lake Aloha	8/31/2022	28	0	22	0	
		8/24/2016	58	0	20	0	
		9/1/2011	56	27	4	16	
		8/14/2004	45 ^b	0	0	0	
	Southern shoreline Lake Aloha	8/31/2022	2	0	0	0	
		8/24/2016	2	0	5	5	
		8/31- 9/1/2011	10	4	3	55	
		8/10- 8/11/2004, 8/14/2004	19	0	9	299	
		9/11/2002	4 (+4 unk.)	0	5	12	
	Ponds Downstream of Auxiliary Dams						
	A		8/31/2022	1	0	7	0
			8/24/2016	0	0	5	1
			8/29/2011	0	1	4	16
			8/5/2010	1	6	0	3
			7/19/2007	0	2	0	4
			7/18/2007	0	1	0	0
			7/17/2007	1	0	0	0
B		8/30/2022	0	0	4	0	
		8/25/2016	0	0	2	0	
		8/30/2011	0	3	0	0	

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
		8/5/2010	0	2	0	0
		7/19/2007	0	4	0	0
		7/17/2007	0	2	0	0
	C	8/30/2022	0	0	0	0
		8/25/2016	1	0	1	0
		8/30/2011	3	0	1	0
		8/5/2010	0	1	0	0
		7/19/2007	1	3	0	0
	D	8/30/2022	1	0	2	0
		8/24/2016	0	0	0	0
		8/29/2011	0	0	1	1
		8/3/2010	0	0	0	3
		7/17/2007	0	1	0	0
	E	8/30/2022	2	0	6	0
		8/24/2016	0	0	1	0
		8/29/2011	1	0	0	8
		8/3/2010	0	2	0	14
		7/17/2007	0	0	0	0
	F	8/30/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/30/2011	2	0	0	0
		8/5/2010	2	0	0	0
		7/19/2007	3	0	0	0
	G	8/30/2022	0	0	2	0
		8/25/2016	3	0	2	0
		8/30/2011	1	0	0	0
		8/5/2010	0	1	0	2
		7/19/2007	2	2	0	0
	H	8/30/2022	0	0	2	2
		8/25/2016	0	0	3	0
8/31/2011		0	0	0	0	
8/5/2010		1	1	0	4	

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
		7/19/2007	0	0	0	0
	I	8/30/2022	1	0	3	0
		8/23/2016	1	0	0	0
		8/30/2011	0	3	1	0
		8/4/2010	1	3	0	0
		7/19/2007	0	3	0	0
	J	8/30/2022	0	0	2	0
		8/23/2016	0	0	4	0
		8/30/2011	0	0	2	8
		8/4/2010	0	6	0	8
		7/19/2007	1	0	0	0
		7/17/2007	1	0	0	0
	K	8/30/2022	0	0	0	0
		8/23/2016	0	0	0	0
		8/30/2011	0	0	0	0
		8/4/2010	0	0	0	0
		7/18/2007	0	0	0	0
	L	8/30/2022	0	0	0	0
		8/24/2016	0	0	0	0
		8/30/2011	0	0	0	0
		8/3/2010	2	1	0	0
		7/17/2007	0	2	0	0
	M	8/30/2022	0	0	5	0
		8/24/2016	0	0	0	0
		8/30/2011	2	0	0	0
		8/3/2010	5	0	0	0
		7/17/2007	1	1	0	0
	N	8/30/2022	0	0	0	0
		8/24/2016	1	0	4	0
		8/31/2011	1	1	0	0
		8/5/2010	3	0	0	0
		7/17/2007	5	2	0	0

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
	O	8/30/2022	0	0	0	0
		8/24/2016	1	0	6	0
		8/31/2011	1	1	0	0
		8/5/2010	1	0	0	0
		7/17/2007	2	2	0	0
	P	8/31/2022	0	0	0	0
		8/24/2016	0	0	0	0
		8/30/2011	1	2	2	0
		8/4/2010	0	6	0	0
		7/16/2007	0	5	0	0
	Q	8/30/2022	0	0	0	0
		8/23/2016	0	0	0	0
		8/31/2011	0	0	0	0
		8/4/2010	0	0	0	0
		7/18/2007	0	0	0	0
	R	8/30/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/31/2011	0	0	1	0
		8/5/2010	0	0	0	0
		7/19/2007	0	0	0	0
	S	8/30/2022	0	0	0	0
		8/25/2016	0	0	0	0
		8/31/2011	1	0	0	0
		8/5/2010	0	0	0	0
		7/19/2007	0	0	0	0
	T	8/30/2022	0	0	0	0
8/24/2016		1	0	1	0	
8/30/2011		0	0	0	0	
8/3/2010		1	0	0	0	
7/19/2007		0	0	0	0	
U	8/30/2022	0	0	0	0	
	8/24/2016	0	0	0	0	

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
		8/30/2011	0	6	0	0
		8/3/2010	1	0	0	0
		7/19/2007	0	1	0	0
	V	8/30/2022	0	0	1	0
		8/25/2016	0	0	2	0
		8/31/2011	0	0	0	0
		8/5/2010	0	0	0	0
		7/19/2007	1	0	0	0
		8/30/2022	0	0	3	0
	W	8/25/2016	0	0	1	0
		8/30/2011	0	2	0	0
		8/5/2010	1	0	0	0
		7/19/2007	1	0	0	0
		8/30/2022	2	0	0	0
	X	8/25/2016	0	0	0	0
		8/31/2011	0	0	0	1
		8/5/2010	1	0	0	0
		7/19/2007	0	0	0	0
		8/12-8/18/2004	0	0	0	0
Silver Lake 750 LP		9/27/2022	0	0	0	0
		8/29/2016	0	0	0	0
		8/24/2011	0	0	0	0
		8/5/2004	0	0	0	0
		8/6/2004	0	0	0	0
		7/9/2002	0	0	3	0
Unnamed Silver Lake tributary 752 IT		9/27/2022	1	0	0	0
		8/29/2016	11	0	8	0
		8/25/2011	1	0	0	0
		7/10/2002	5	0	0	0
Camp Silverado 753 IT		9/27/2022	0	0	0	0
		8/29/2016	0	0	0	0

SITE NAME	SUBSITE	DATE	# ADULTS	# SUB ^a	# JUV ^a	# LARVAE
		8/24/2011	0	0	0	0
		8/11/2004	6	0	1	0
		7/10/2002	1	0	1	0
Caples Lake 895 LP		9/27/2022	0	0	0	0
		8/29/2016	0	0	0	0
		8/24/2011	0	0	0	0
		8/4/2004	0	0	0	0
		7/23/2002	0	0	0	0
Emigrant Creek 897 IT		9/27/2022	0	0	0	0
		8/29/2016	0	0	0	0
		8/23/2011	0	0	0	0
		7/26/2002	1	0	1	0

^aIn 2016 and 2022, subadult and juvenile age classes were combined into one “juvenile” category as biologists did not handle individuals; measurements were estimated. Frogs with estimated SUL greater than 40 mm were considered adult, while frogs ranging from 25 to 39 mm SUL were considered juveniles.

^bThese 45 frogs varied in size from 25-65 mm SUL but were lumped together.

^cIn 2004, ponds below the auxiliary dams were surveyed, but prior to pond nomenclature (i.e., A-X) adopted in 2007.

3.1.1 Camp Harvey (Site 440 T/L)

No SNYLF were observed at Cagwin Lake or any other Camp Harvey subsites in 2022 (Table 3.1-1; Figure 3.1-1).

3.1.2 Echo Lake (Site 455 LP)

No SNYLF were observed along the western shoreline of Upper Echo Lake in 2022 (Table 3.1-1; Figure 3.1-1).

3.1.3 Lake Aloha and Associated Downstream Ponds and Habitats (Site 550 LP)

Two adult SNYLF were observed along the Lake Aloha southern shoreline in 2022 (Table 3.1-1; Figure 3.1-2).

Twenty-one adults, 1,560 juvenile, and 700 larval (all overwintered) SNYLF were observed at the snowmelt pond in 2022 (Table 3.1-1; Figure 3.1-2). Twenty-eight adults and 22 juveniles were observed within the tributary between snowmelt pond and Lake Aloha

(Table 3.1-1; Figure 3.1-2). Numerous large brook trout (*Salvelinus fontinalis*) were observed just below a waterfall along the tributary located about 60 m upstream of Lake Aloha; fish were not observed upstream of this apparent barrier. Two adults were observed along the southern shoreline of Lake Aloha (Table 3.1-1; Figure 3.1-2).

Eight adult, 32 juvenile, and one overwintered larval SNYLF were observed within the ponds downstream of the Lake Aloha auxiliary dams in 2022 (Table 3.1-1; Figure 3.1-3). Adults were observed in Ponds A, D, E, I, and X. Juveniles were observed in ponds A, B, D, E, G, H, I, J, M, V, and W (Table 3.1-1;). No hatch-year tadpoles were observed in the auxiliary ponds.

3.1.4 Silver Lake (Site 750 LP)

No SNYLF were observed at Silver Lake in 2022 (Table 3.1-1; Figure 3.1-4). Juvenile fish and river otter sign were present.

3.1.5 Unnamed Silver Lake Tributary (Site 752 IT)

One adult SNYLF was observed within the unnamed tributary to Silver Lake (Table 3.1-1; Figure 3.1-4). The tributary was intermittent downstream of the downstream-most SNYLF observations; upstream of this location, the tributary was flowing. Larval SNYLF were notably absent from this tributary.

3.1.6 Camp Silverado (Site 753 IT)

No SNYLF were observed at the Camp Silverado tributary. The tributary was mostly dry with few isolated pools (Table 3.1-1; Figure 3.1-4).

3.1.7 Caples Lake (Site 895 LP)

No SNYLF were observed along the lake margin (Table 3.1-1; Figure 3.1-5). Signal crayfish (*Pacifastacus leniusculus*), suckers (*Catostomus* sp.), and Lahontan redbside (*Richardsonius egregious*) were observed in the lake.

3.1.8 Emigrant Creek (Site 897 IT)

No SNYLF were observed at in Emigrant Creek (Table 3.1-1; Figure 3.1-5). Trout were observed in the creek.

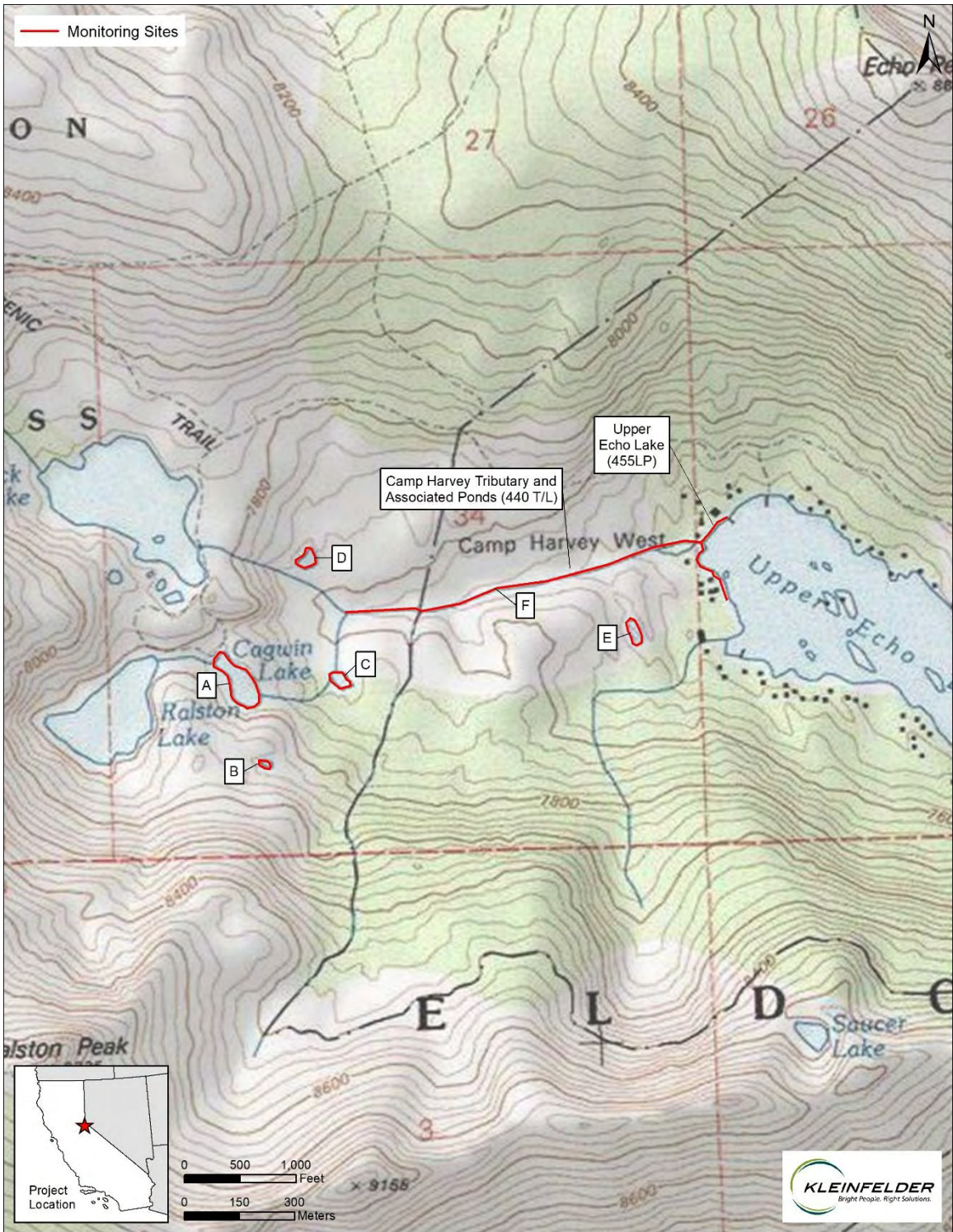


Figure 3.1-1. Camp Harvey tributary and associated ponds and Upper Echo Lake SNLYF sites.

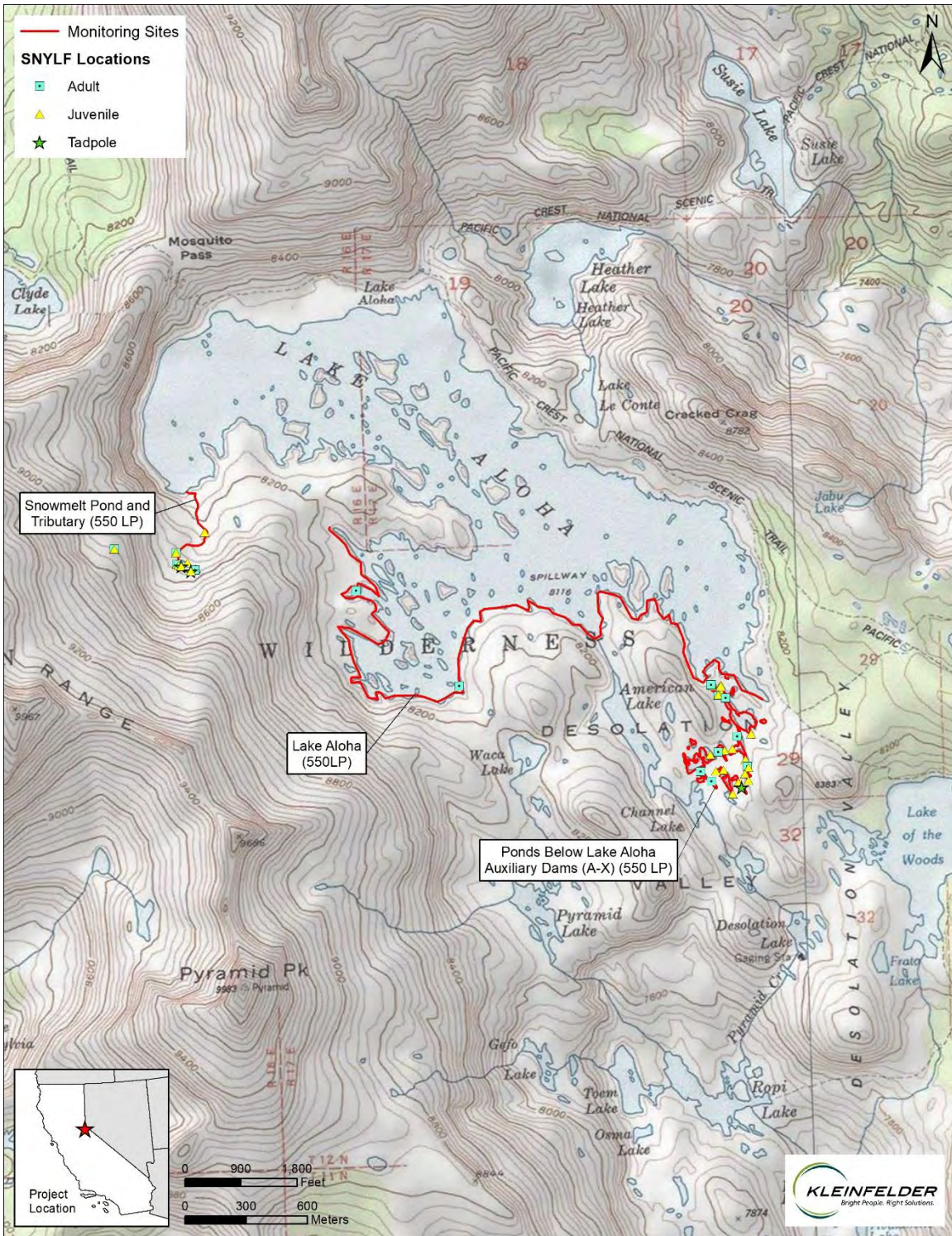


Figure 3.1-2. Lake Aloha and associated downstream ponds and SNYLF habitats.

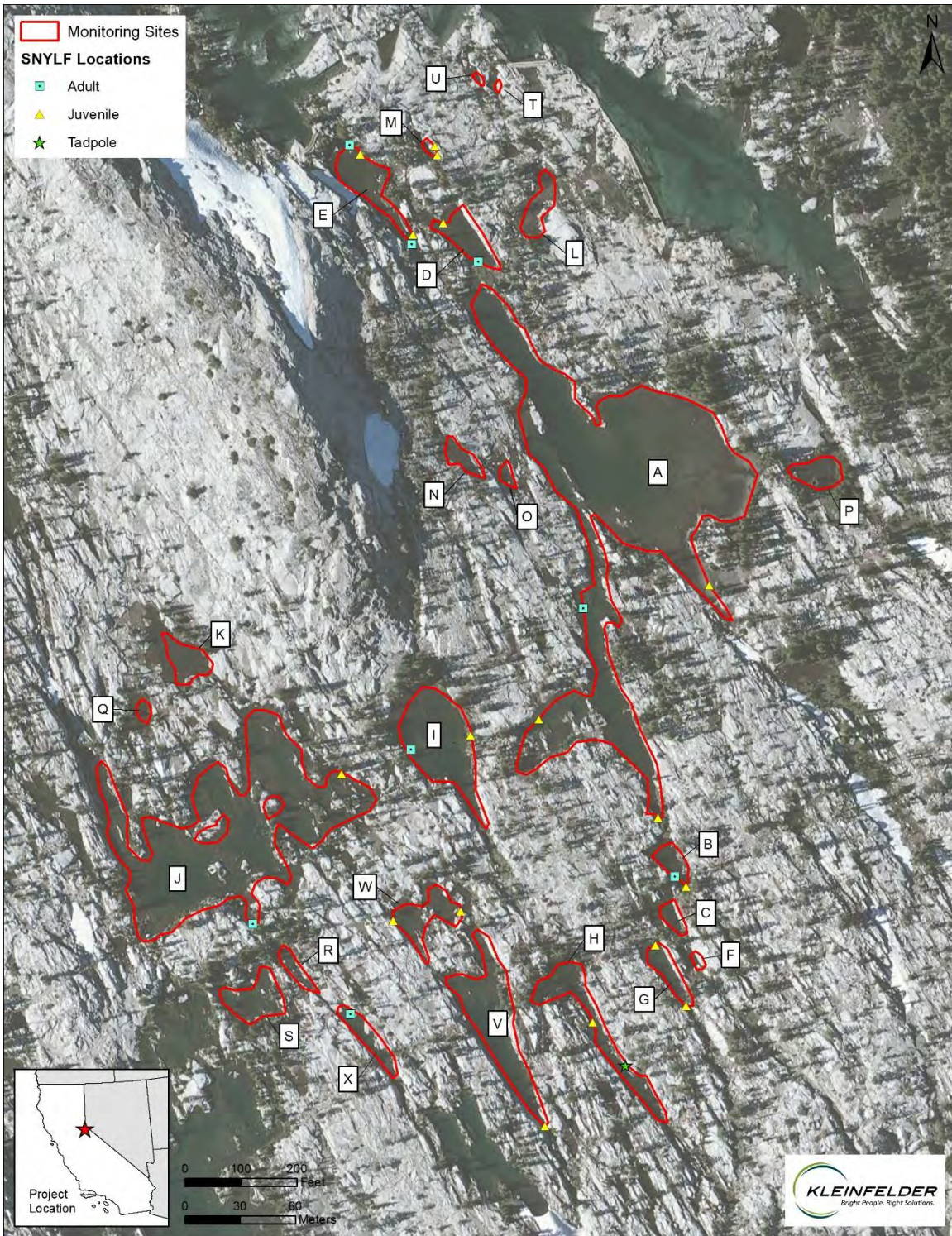


Figure 3.1-3. Lake Aloha auxiliary dam ponds (A-X) and SNYLF habitats.

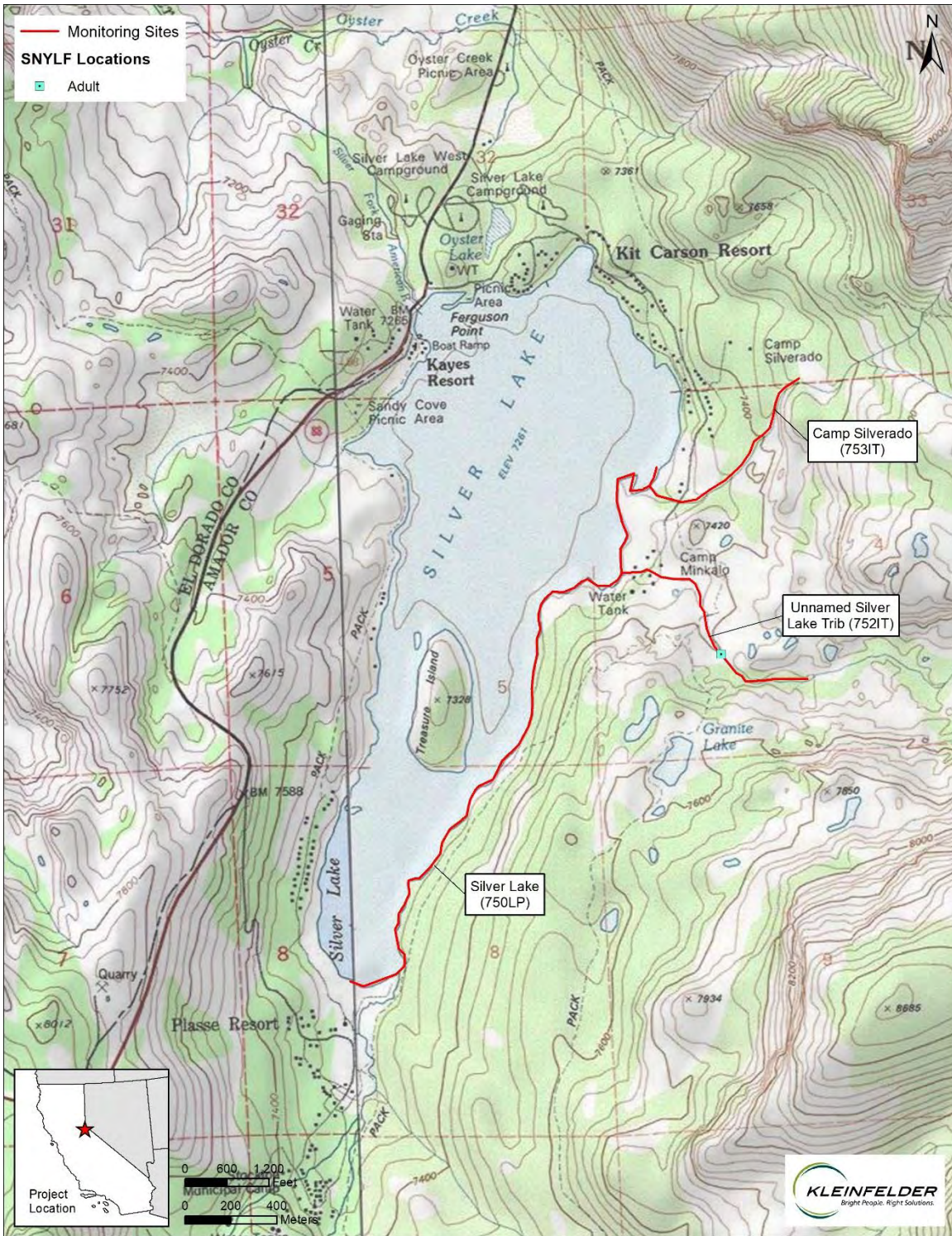


Figure 3.1-4. Silver Lake (southern and eastern shorelines) SNYLF sites.

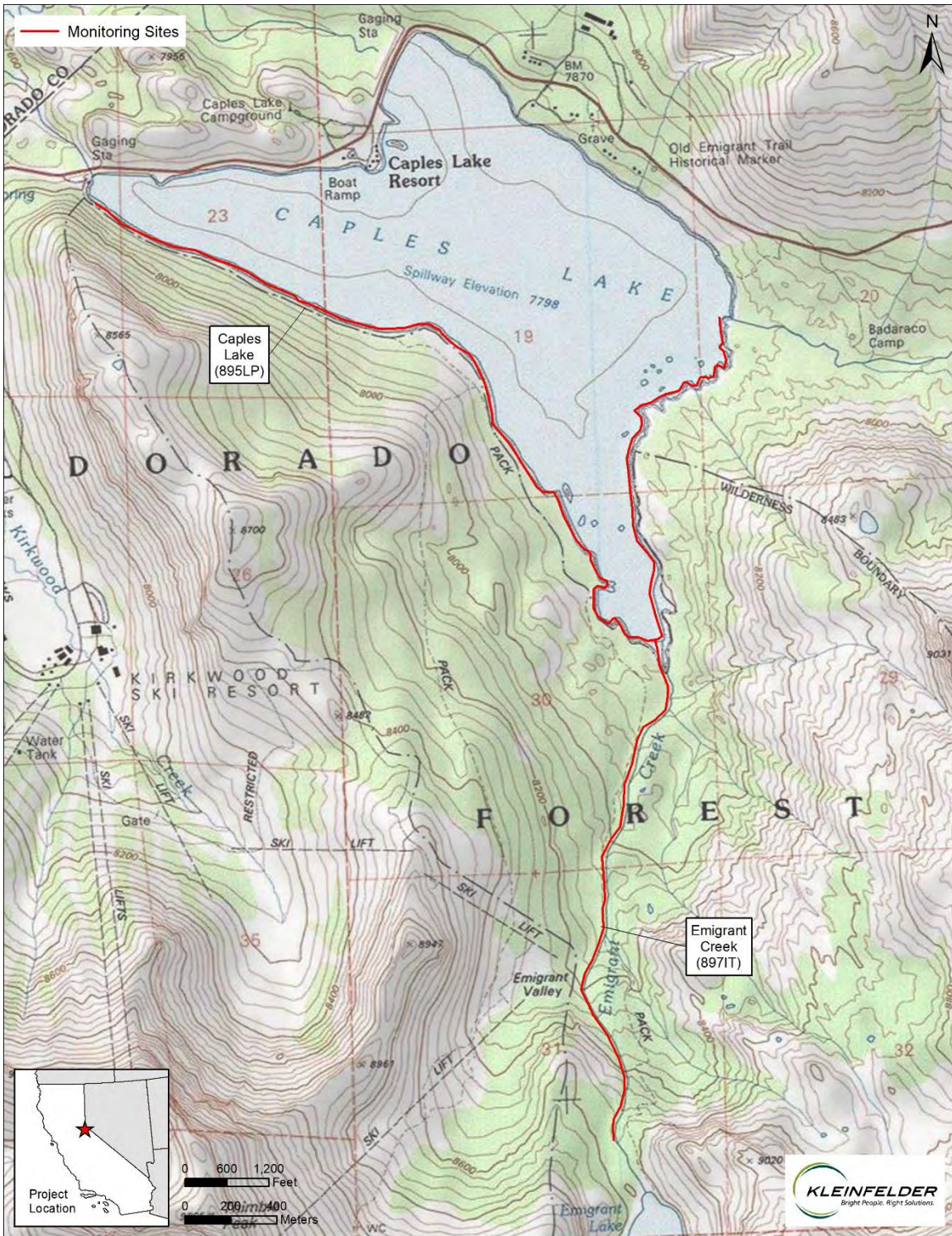


Figure 3.1-5. Caples Lake (southern shoreline) and Emigrant Creek SNYLF sites.

4.0 DISCUSSION

Results of SNYLF surveys from 2002 to 2022 indicate that most populations within the study area have persisted through time, while others have apparently declined or have never had frog observations (Table 3.1-1; ECORP 2002; ECORP 2005; GANDA 2008; ECORP 2011; GANDA 2011; GANDA 2016).

At Site 550 LP (Lake Aloha), SNYLF populations remain persistent with relatively high numbers of individuals across years (Table 3.1-1). A particularly robust population is present at the western-most snowmelt pond and tributary above Lake Aloha where thousands of juveniles and overwintered larvae were observed in 2022. The ponds (A–X) below the auxiliary dams at Lake Aloha similarly contain a persistent population since at least 2007.

SNYLF have not been observed on the shores of Silver Lake since they were first observed there in 2002 (Table 3.1-1). Heavy recreational use and the presence of predatory fish may preclude frogs from permanently inhabiting the lake, although frogs have been observed in both the Camp Silverado tributary (none since 2004) and the unnamed tributary to Silver Lake (where frogs have been observed during each survey year). Frogs have not been observed to date at Caples Lake and frogs were last observed in Emigrant Creek in 2002 (Table 3.1-1). The SNYLF population at this site may be small, or perhaps this site is only used seasonally.

5.0 LITERATURE CITED

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Appendix A:

Site Photographs



Photo 1. Cagwin Lake, Site 440 T/L (subsite A), view looking southwest (9/1/22).



Photo 2. Site 440 T/L (subsite B), view from north shore looking south (9/1/22).



Photo 3. Site 440 T/L (subsite C), view from west looking east (9/1/22).



Photo 4. Site 440 T/L (subsite D), view from south shore looking north (9/1/22).



Photo 5. Site 440 T/L (subsite E), view from north shore looking south (9/1/22).



Photo 6. Camp Harvey Tributary, Site 440 T/L (subsite F), looking upstream (9/1/22).



Photo 7. Upper Echo Lake, Site 455 LP, view west from northern shoreline (9/1/22).



Photo 8. Site 550 LP, snowmelt pond located south of Lake Aloha (8/31/22).



Photo 9. Site 550 LP, tributary from snowmelt pond to Lake Aloha, view north (8/31/22).



Photo 10. Site 550 LP, southern edge of Lake Aloha, view southeast (8/24/16).



Photo 11. Site 550 LP, Pond A, south end of pond looking north from (8/31/22).



Photo 12. Site 550 LP, Pond B, view south from north edge (8/30/22).



Photo 13. Site 550 LP, Pond C, view north from south edge (8/30/22).



Photo 14. Site 550 LP, Pond D, view north from south edge (8/30/22).



Photo 15. Site 550 LP, Pond E, view north from south edge (8/30/22).



Photo 16. Site 550 LP, Pond F, view south from north edge (8/30/22).



Photo 17. Site 550 LP, Pond G, view south from north edge (8/30/22).



Photo 18. Site 550 LP, Pond H, view south from north edge (8/30/22).



Photo 19. Site 550 LP, Pond I, view south from north edge (8/31/22).



Photo 20. Site 550 LP, Pond J, view east from west edge (8/23/16).



Photo 21. Site 550 LP, Pond K, view northwest from south edge (8/23/16).



Photo 22. Site 550 LP, Pond L, view south from north edge (8/26/16).



Photo 23. Site 550 LP, Pond M, view north from south edge (8/30/22).



Photo 24. Site 550 LP, Pond N, view west from east edge (8/30/22).



Photo 25. Site 550 LP, Pond O (dry in foreground) looking southeast (8/30/22).



Photo 26. Site 550 LP, Pond P (dry), view east from west edge (8/31/22).



Photo 27. Site 550 LP, Pond Q, view north from south edge (8/23/16).



Photo 28. Site 550 LP, Pond R, view south from north edge (8/30/22).



Photo 29. Site 550 LP, Pond S, view south from north edge (8/30/22).



Photo 30. Site 550 LP, Pond T, view north from south edge (8/30/22).



Photo 31. Site 550 LP, Pond U, view south from north edge (8/30/22).



Photo 32. Site 550 LP, Pond V, view south from north edge (8/30/22).



Photo 33. Site 550 LP, Pond W, view northwest from southeast edge (8/30/22).



Photo 34. Site 550 LP, Pond X, view south from north edge (8/30/22).



Photo 35. Site 750 LP, Silver Lake, view north from eastern edge (9/27/22).



Photo 36. Site 752 IT, unnamed tributary to Silver Lake (9/27/22).



Photo 37. Site 753 IT, Camp Silverado tributary to Silver Lake (9/27/22).



Photo 38. Site 895 LP, southern shoreline of Caples Lake (9/27/22).



Photo 39. Site 897 IT, Emigrant Creek, view upstream (9/27/22).