Paiute Cutthroat Trout
(Oncorhynchus henshawi seleniris)

5-Year Review:
Summary and Evaluation

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U.S. Fish and Wildlife Service
Region 8, Pacific Southwest Region
Reno Fish and Wildlife Office
Reno, Nevada
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5-YEAR REVIEW

Paiute cutthroat trout (*Oncorhynchus henshawi seleniris*)

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5-YEAR REVIEW

Paiute cutthroat trout (*Oncorhynchus henshawi seleniris*)

I. GENERAL INFORMATION

Species: Paiute cutthroat trout (PCT; *Oncorhynchus henshawi seleniris*)

Date listed: March 11, 1967

Federal Register citation(s): Paiute cutthroat trout were listed by the Service on March 11, 1967, as endangered under the Endangered Species Preservation Act of 1966 (Service 1967). Paiute cutthroat trout were subsequently reclassified as threatened on July 16, 1975, under the Endangered Species Act (ESA), to facilitate management (Service 1975). A 4(d) rule was published in conjunction with the downlisting rule to facilitate management by the State of California and allow State-permitted sport harvest (Service 1975, p. 29864). There is no critical habitat designated for this species.

Changes in Taxonomic Classification or Nomenclature

Paiute cutthroat trout was first listed as *Salmo clarki seleniris*; however, all western North American trout were reclassified from the genus *Salmo* to the genus *Oncorhynchus*, as summarized by Smith and Stearly (1989, pp. 4–10) and adopted by the American Fisheries Society's Committee on Names of Fishes, the accepted authority on North American fish taxonomy (Robins *et al*. 1991, pp. 28, 79). The subspecies name *seleniris* was given to PCT in tribute to the moon goddess Selene after a fancied resemblance of its evanescent tints to the lunar moon and the common name Paiute was given recalling the aboriginal inhabitants of the region in which it is found (Snyder 1934, p. 105).

The species name for all cutthroat trout changed from *clarki* to *clarkii* to reflect the original spelling (Nelson *et al*. 2004, pp. 98, 209). More recently, in the eighth edition of common and scientific names of fishes, the species name for cutthroat trout has changed again and instead of consisting of one species now consists of four separate species including Coastal cutthroat trout (*Oncorhynchus clarkii*), Westslope cutthroat trout (*Oncorhynchus lewisi*), Lahontan cutthroat trout (*Oncorhynchus henshawi*), and Rocky Mountain cutthroat trout (*Oncorhynchus virginalis*) (Markle 2018, pp. 181–197; Page *et al*. 2023, pp. 83, 227). Since PCT are part of the Lahontan Basin and they have a common ancestor with Lahontan cutthroat trout, it is considered a subspecies of Lahontan cutthroat trout (*Oncorhynchus henshawi*) while maintaining its original subspecies name *seleniris* (Saglam *et al*. 2017, pp. 1291–1302; Peacock *et al*. 2018, pp. 231–259; Markle 2018, p. 188). Therefore, in this current 5-Year Review, we use the new PCT scientific name of *Oncorhynchus henshawi seleniris*; however, this revision has not yet been fully implemented by the Service, so the scientific name of *Oncorhynchus clarkii seleniris* is also still recognized.

Classification: Threatened

Lead Field Office: Reno Field Office

Most recent status review: U.S. Fish and Wildlife Service (Service). 2020. 5-Year Review: Summary and Evaluation. Paiute cutthroat trout (*Oncorhynchus clarkii seleniris*). Region 10, California-Great Basin Region, Reno Fish and Wildlife Office, Reno, Nevada. 90 pp.

Federal Register (FR) Notice Citation Announcing Initiation of This Review
U.S. Fish and Wildlife Service (Service). 2024. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 59 Pacific Southwest species. Federal Register 89:83510–83514. October 16, 2024.

II. REVIEW ANALYSIS

Information acquired since the last status review

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Reno Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on October 16, 2024 (Service 2024). We received no information from the public in response to our Federal Register Notice initiating this 5-year review. We received valuable information, since the last 5-year review, from the California Department of Fish and Wildlife (CDFW) and the Humboldt-Toiyabe National Forest. A literature search and a review of information in Service files was conducted. Our understanding of this subspecies has continued to improve through research since the last 5-year review; brief descriptions of several published journal articles are provided in Appendix A.

Background

The PCT (*Oncorhynchus henshawi seleniris*) has long been recognized as a unique subspecies of cutthroat trout (Snyder 1934, p. 105–112; Behnke and Zarn 1976, p. 32; Saglam *et al*. 2017, p. 1296). Paiute cutthroat trout (PCT) have the most restricted range of all cutthroat trout and historically only occupied approximately 17.8 kilometers (km) (11.1 miles (mi)) of stream habitat within the Silver King Creek drainage, Alpine County, California. In our revised recovery plan, we identified the following primary factors contributing to the threatened status: the present or threatened destruction, modification, or curtailment of habitat or range (Factor A) and hybridization from nonnative rainbow trout and small population size (Factor E) (Service 2004, pp 41–45).

This document briefly describes new information that has become available since the last 5-year review for PCT (Service 2020). A more thorough discussion on the status of PCT over the succeeding years (from 2020 until 2025) can be found in numerous reports/publications that have become available since the last review, and many of these reports/publications are cited in this document.

The new information is primarily from annual reports prepared by the CDFW. The Paiute cutthroat trout Recovery Program's recovery activities include conducting PCT population surveys, monitoring survival and habitat use patterns, monitoring genetic diversity, and capturing and translocating individuals into their historical range. Other activities include determining the risk of drought and the effects of fire on PCT occupied watersheds.

The primary focus of this review is new information provided under the Spatial Distribution, Abundance, Hybridization, and Fire sections.

Spatial Distribution

Paiute cutthroat trout are known from a single drainage in the Sierra Nevada range in east-central California. The presumed historical distribution was limited to 17.8 km (11.1 mi) of habitat in Silver King Creek (Alpine County), from Llewellyn Falls downstream to barriers in Silver King Canyon, as well as the accessible reaches of three small, named tributaries: (1) Tamarack Creek, (2) Tamarack Lake Creek, and (3) the lower reaches of Coyote Valley Creek downstream of barrier falls (Table 1; Figures 1 and 2; Service 2004, p. 12). Paiute cutthroat trout occupy habitat in five widely distributed drainages outside of their historical range (Table 1; Figures 1–5). They were first established in the upper reaches of the Silver King Creek drainage (above natural barriers) in 1912, when local livestock operators transplanted fish above Llewellyn Falls (Figure 2; Service 2004, p. 13). The progeny of these early day transplants were then introduced into several other lakes and streams in California, many of which were not successful (Service 2004, p. 17). However, four populations of PCT, outside their historical watershed, are established and self-reproducing (Table 1; Figures 1, 3, and 4).

The current distribution of PCT has changed since the 2020 5-year review (Service 2020, p. 6) due to recovery efforts conducted in Silver King Creek. Between 2013 and 2015, nonnatives were removed from the PCT's historical range using piscicides. On September 18, 2019, 30 PCT were translocated from Coyote Creek and placed into Silver King Creek in Long Valley marking the first time PCT have occupied their historical range since the early 1900s. In October 2020, 44 PCT were translocated from Corral Creek to Long Valley (Table 1; CDFW 2020b, p. 7) and in October 2021, an additional 52 PCT were translocated from Upper Fish Valley to Long Valley (Table 1; CDFW 2021, p. 49). In addition, PCT have been naturally recolonizing this area by moving downstream over Llewellyn Falls and barriers in Coyote Creek. Environmental DNA (eDNA) sampling conducted in 2018 indicated that PCT occupied all habitat in Silver King Creek between Llewellyn Falls and the Silver King Canyon (CDFW 2020a, pp. 8–9, 32). However, in 2021, nonnative rainbow trout were again detected in the historical range of PCT (CDFW 2024, pp. 55–67).

Table 1. Information regarding known existing populations of Paiute cutthroat trout including date of last translocation, number of founding individuals, and source populations.

Location	Code	Number of Founders	Date	Source Population	Notes
Upper Silver King Creek[1, 2]	USKC	139	1994	COY	Originally stocked by stockmen in 1912. USKC was last treated with rotenone between 1991-1993
		48	1995	FVC	
		108	1995	COY	
		134	1996	COY	
		145	1997	COY	
		30	1998	FVC	
		86	2017	NFC	
Lower Silver King Creek[2, 3, 4]	LSKC	30	2019	COY	All fish were placed into LSKC at Long Valley
		44	2020	COR	
		52	2021	USKC	
Fly Valley Creek[5]	FVC	54	1947	COR, COY	Stream was originally fishless
Four Mile Canyon Creek[5]	FMC	Unknown	Unknown before 1956	Original SKC transfer or fish movement	Thought to be a plant by stockmen
Bull Canyon Creek[5]	BCC	40	1964	FVC	Last treated with rotenone in 1964
Coyote Valley Creek[6]	COY	54	1989	FVC	Originally stocked from SKC circa 1860-1890s by stockmen. COY was last treated with rotenone between 1987-1989
Corral Valley Creek[6]	COR	20	1978	FVC	Originally stocked from SKC circa 1860-1890s by stockmen. COR was last treated with rotenone in 1977
North Fork Cottonwood Creek[7]	NFC	401	1946	COY (61%) USKC (32%) COR (7%)	Stream was originally fishless
Cabin Creek[5]	CAB	60	1968	NFC	Stream was originally fishless
Sharktooth Creek[5]	SHK	29	1968	NFC (79%) DEL (21%)	Stocked into Sharktooth Lake then moved downstream into the stream
Stairway Creek[5]	STW	77	1972	DEL	Stream was originally fishless
Delany Creek[5]	DEL	43	1966	FMC (93%) FVC (7%)	Population was extirpated due to brook trout

[1]CDFW, unpublished stocking records; [2]Service 2020, pp. 4, 16–17; [3]CDFW 2020b, p. 7; [4]CDFW 2021, p. 49; [5]Ryan and Nicola 1976, pp. 24–30; [6]Israel *et al*. 2002, p. 11; [7]Vestal 1947, p. 93.

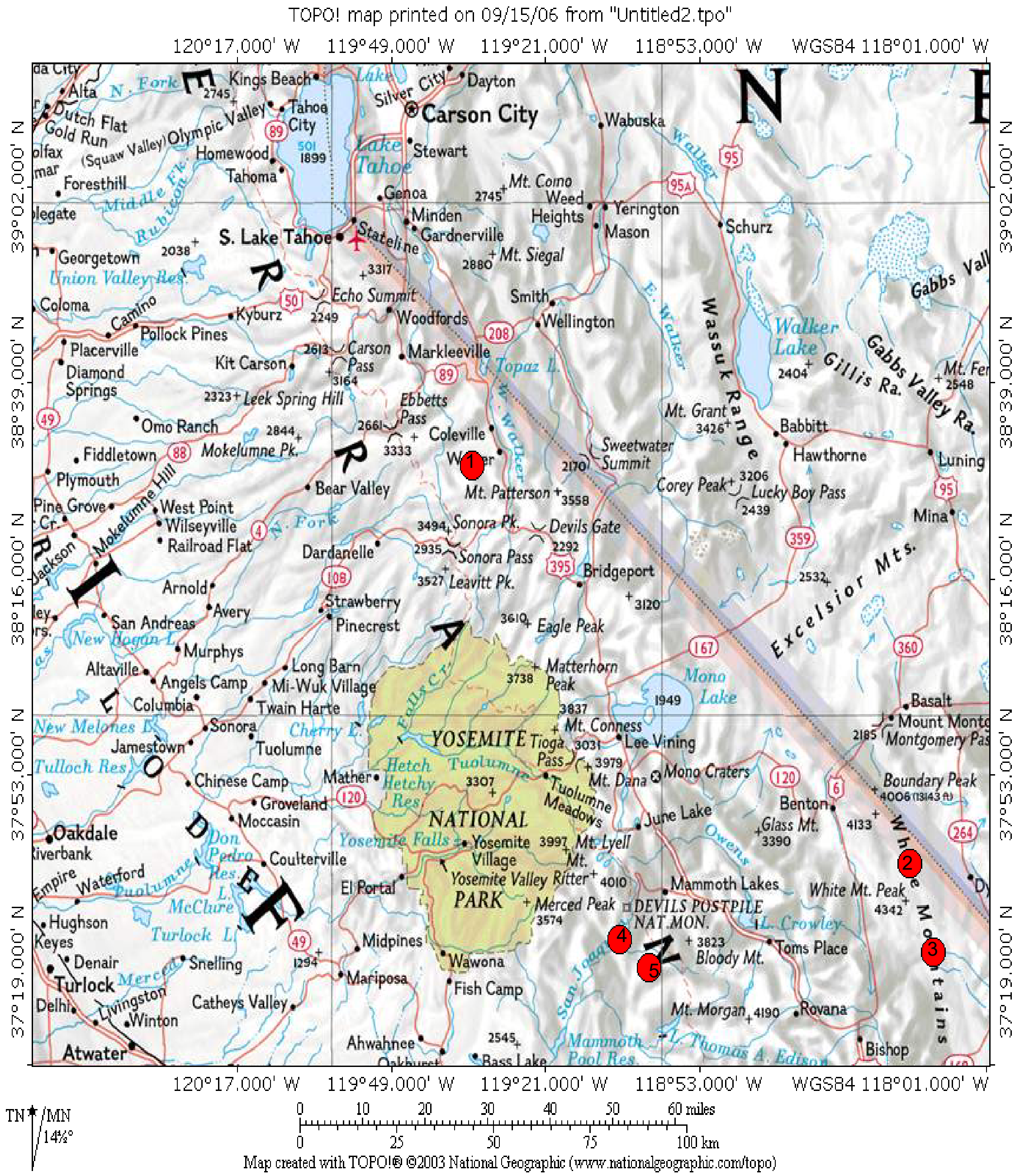

Figure 1. Location of existing Paiute cutthroat trout populations in the Sierra Nevada Mountain Range: (1) Silver King Creek, Humboldt-Toiyabe National Forest, Alpine County, California; (2) Cabin-Leidy Creeks, Inyo National Forest, Mono County, California; (3) North Fork Cottonwood Creek, Inyo National Forest, Mono County, California; (4) Stairway Creek, Sierra National Forest, Madera County, California; and (5) Sharktooth Creek, Sierra National Forest, Fresno County, California.

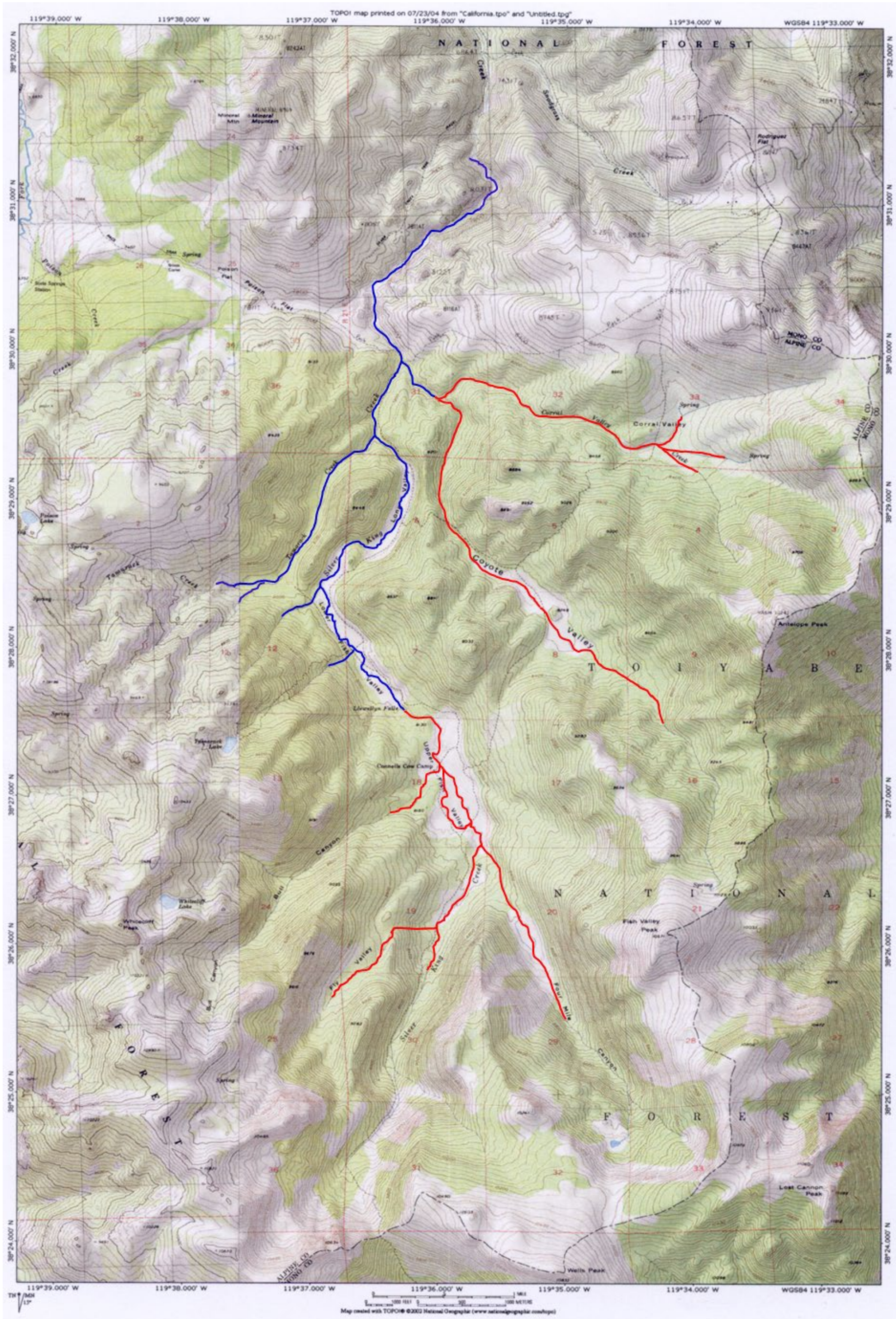

Figure 2. Historical (blue) and previously fishless yet currently occupied (red) habitat for Paiute cutthroat trout in the Silver King Creek drainage, Humboldt-Toiyabe National Forest, Alpine County, California.

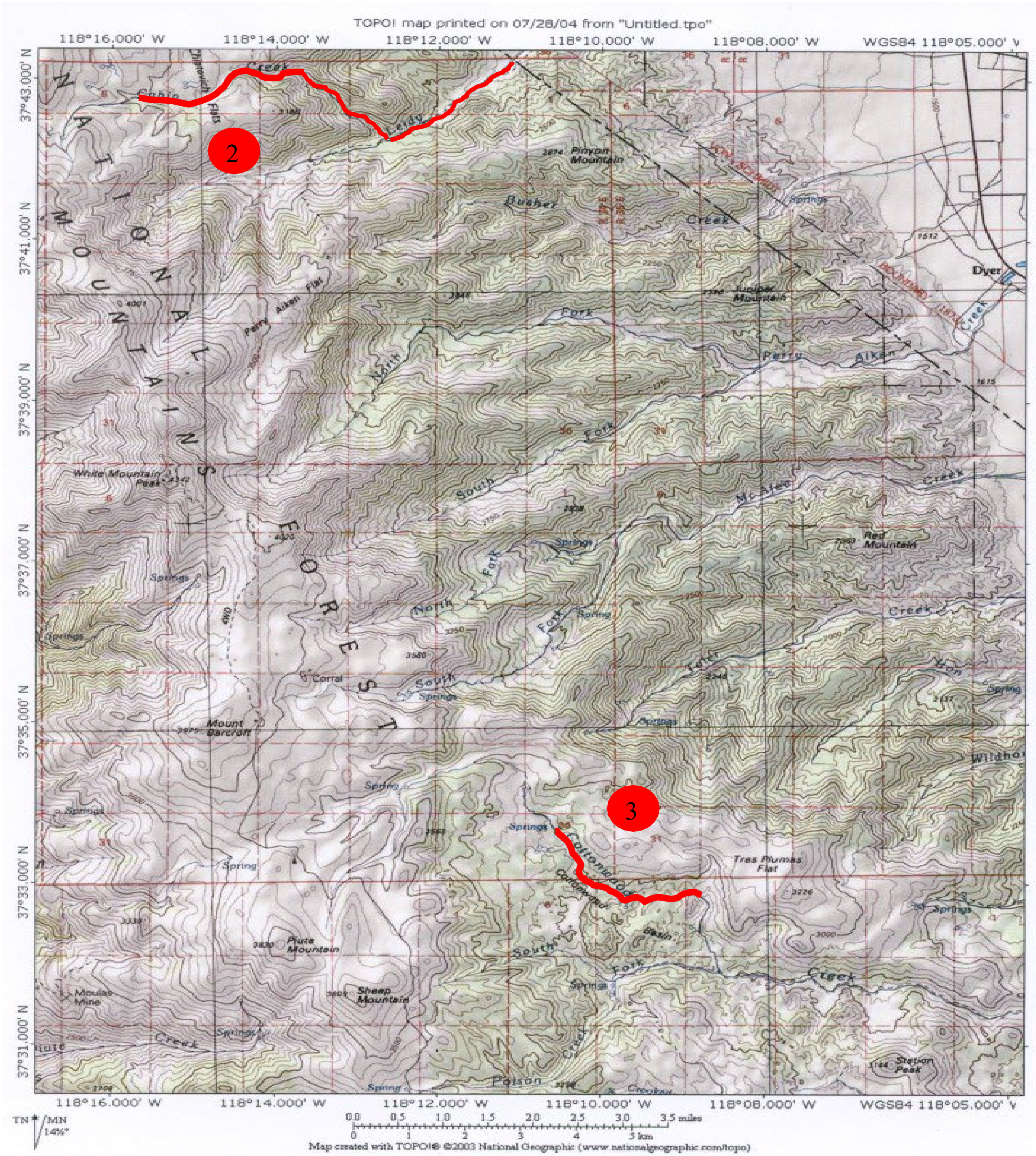

Figure 3. Refugial populations of Paiute cutthroat trout in Cabin Creek (2) and North Fork Cottonwood Creek (3), White Mountains, Inyo National Forest, Mono County, California. Cabin Creek (2) flows into Leidy Creek which has been documented with Paiute cutthroat trout.

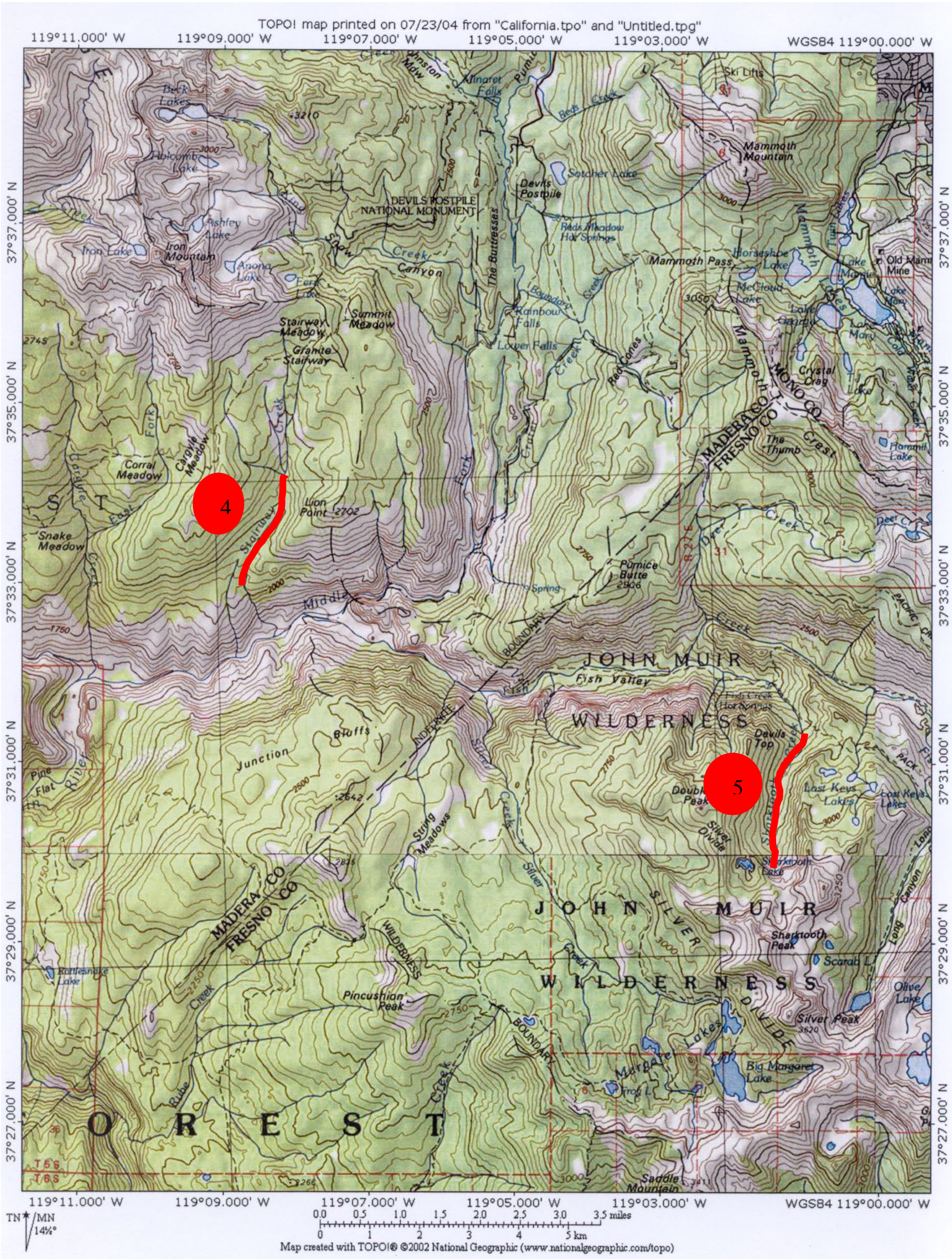

Figure 4. Refugial populations of Paiute cutthroat trout in Stairway Creek (4) and Sharktooth Creek (5), Sierra National Forest, Madera and Fresno Counties, California.

Abundance

It is difficult to fully characterize the abundance of PCT. Like most wildlife populations, numbers of PCT fluctuate annually due to biotic and abiotic factors. Further, population estimation methods, as described below, have varied by location, which means only general comparisons among the populations can be made.

Silver King Creek Drainage

Silver King Creek (Upper Fish Valley): Population estimates for Silver King Creek in Upper Fish Valley have been periodically conducted since 1964 using triple-pass depletion electrofishing and snorkeling. Four separate 150-m (500-ft) sections spaced throughout Upper Fish Valley are used to estimate the density of PCT. The most recent survey efforts (2015–2021) are shown in Figure 5. See the 2020 5-year review for historical estimates. This population was declining during the severe drought conditions experienced between 2012 and 2016; therefore, managers decided to augment the population with PCT from the North Fork Cottonwood Creek. On August 24, 2017, 86 PCT were translocated to Silver King Creek and placed in Upper Fish Valley (Table 1).

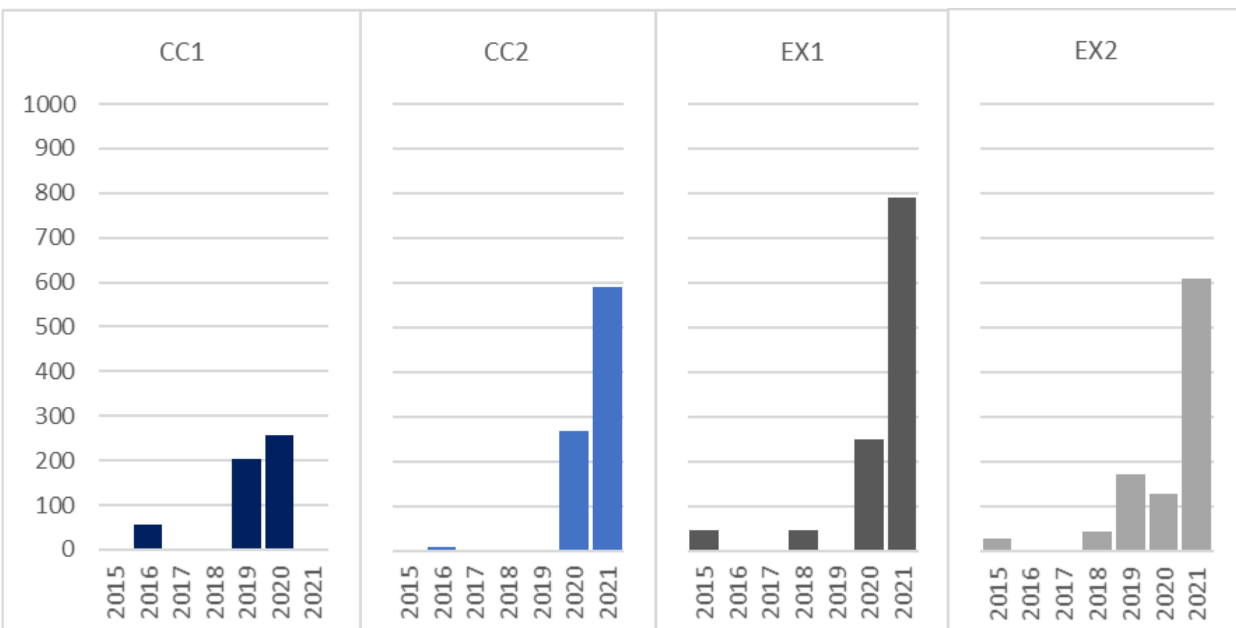

Figure 5. Population density estimates (fish per mile) from the four test sections in the Upper Fish Valley portion of Silver King Creek between 2015 and 2021 (CDFW 2021, p. 52). Population surveys have not occurred since 2021. Years with no data were not surveyed.

Coyote Valley Creek: Population density surveys on Coyote Valley Creek were sporadically conducted from 1964 to 2021. Two separate 150 m (500 ft) sections, Upper Meadow and Lower Meadow, were surveyed. Coyote Valley Creek is very productive with high numbers of juvenile fish nearly every year; particularly in the Lower Meadow section. The most recent survey efforts (2015–2021) are shown in Figure 6. See the 2020 5-year review for historical estimates.

Corral Valley Creek: Population density surveys on Corral Valley Creek were conducted from 1974 to 2021. Two separate 150 m (500 ft) sections were surveyed. Like Coyote Valley Creek, Corral Valley Creek is very productive with the large majority of individuals being juveniles. The most recent survey efforts (2015–2021) are shown in Figure 6. See the 2020 5-year review for historical estimates.

Fly Valley Creek: Population density surveys have been conducted on Fly Valley Creek starting in 1984 and the last was in 2021. The CDFW surveys one 150 m (500 ft) section of stream. The most recent survey efforts (2015–2021) are shown in Figure 6. See the 2020 5-year review for historical estimates.

Four Mile Canyon Creek: Population density surveys have not occurred since 2019. See the 2020 5-year review for historical estimates.

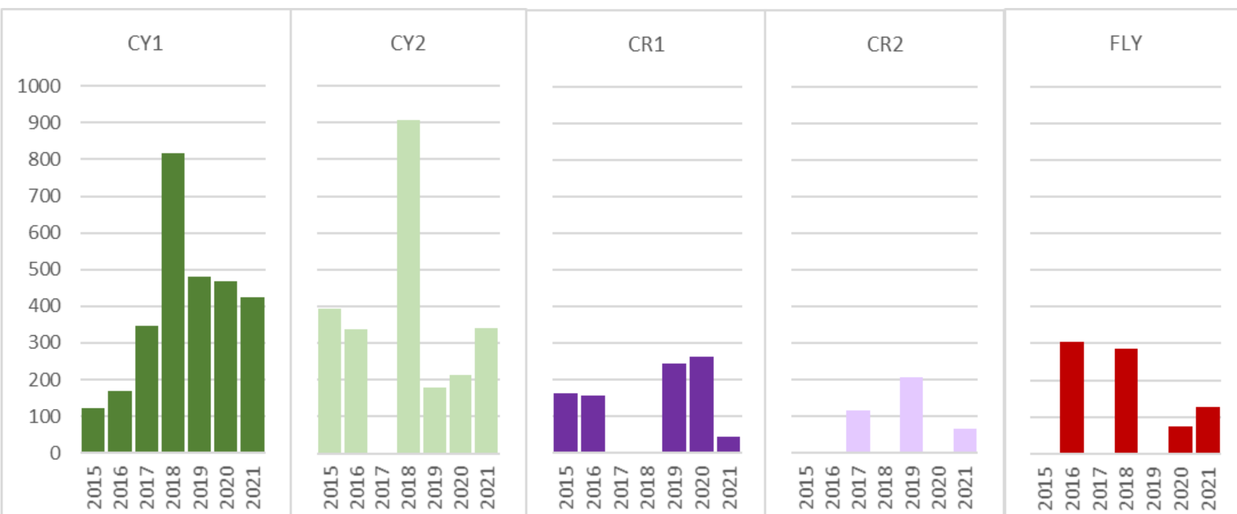

Figure 6. Population density estimates (fish per mile) for Paiute cutthroat trout in Coyote Valley Creek (CY1 and CY2), Corral Valley Creek (CR1 and CR2) and Fly Valley Creek (FLY) from 2015 to 2021. Population surveys have not occurred since 2021. Years with no data were not surveyed.

Sharktooth and Stairway Creeks

The CDFW visited Stairway Creek in 2021 to conduct genetic sampling to ensure introgression with rainbow trout has not occurred. Forty individuals were sampled for the study (CDFW 2021, p. 70). Crew members noted that fish densities were high and that the population was not at immediate risk from the drought conditions experienced during 2021 (CDFW 2021, p. 70).

In 2021, CDFW conducted a mark recapture sampling effort in Sharktooth Creek (CDFW 2021, 68–69). Forty individuals were captured via flyfishing then marked and released. Thirty of the marked fish were released into a 400 meter (0.25 mi) section of stream. One snorkeler then sampled the 400 m (0.25 mi) section and observed 174 individuals including 14 marked fish. A Lincoln-Peterson index estimated the fish density in that 400 m (0.25 mi) section at 343 fish (CDFW 2021, 68–69).

North Fork Cottonwood Creek, Cabin Creek, and Leidy Creek

North Fork Cottonwood Creek and Leidy Creek have not been surveyed since 2020. Visual surveys were conducted in a standard reach on upper Cabin Creek in 1995, 2000, 2009, 2015, 2016, 2020, and 2021 (CDFW, unpublished data, CDFW 2015, pp. 1–7; CDFW 2016, pp. 1–4; CDFW 2021, p. 163). In 2021, CDFW again conducted visual surveys on two separate dates in July 2021 as part of drought monitoring. Results of the number of individuals detected (19 and 15 respectively) were similar on both dates and stream temperature was recorded between 14 and 16 °C (57 and 61 °F) (CDFW 2021, p. 163). The report also notes that crews visited Cabin Creek in 2020 and numbers and distribution detected were similar to 2021 but no other information was provided (CDFW 2021, p. 163).

<u>Hybridization</u>

Hybridization from nonnative salmonids is a common threat to all native western trout species. Nonnative rainbow trout and golden trout readily hybridize with native cutthroat trout and produce fertile offspring; however, fitness and survival rates decreases as the proportion of rainbow trout admixture increases (Muhlfeld *et al*. 2009, pp. 329–331; Rasmussen *et al*. 2010, pp. 362–364). Even with reduced fitness, hybridization spreads rapidly because the initial F_1 (first generation) hybrids have high fitness, hybrids tend to stray more frequently, and all offspring of hybrids are hybrids (Boyer *et al*. 2008, p. 666; Muhlfeld *et al*. 2009, pp. 329–331). Extensive genetic mixing of natives, nonnatives, and hybrids contribute to the loss of locally-adapted genotypes and can lead to the extinction of a population or an entire species (Leary *et al*. 1995, p. 97; Rhymer and Simberloff 1996, pp. 96–100; Finger *et al*. 2011, pp. 1378–1379). As indicated by genetic analysis, hybridization by nonnative species had eliminated PCT from their entire historical habitat (Finger *et al*. 2011, pp. 1378–1379). In order to recover PCT, multiple agencies implemented a 3 year (2013–2015) chemical treatment which eradicated all nonnative trout within the historical range of PCT (Service and CDFW 2010, entire; CDFW 2020a, pp. 8–9). However, in 2021, routine eDNA sampling detected rainbow trout in the lower reaches of Silver King Creek within the historical range (Figure 7; CDFW 2024, pp. 55–67). Partner agencies have been selectively removing rainbow trout and hybrids since 2022 and have documented some success in limiting the upstream distribution and reducing the abundance of nonnatives (Figure 7; CDFW 2024, pp. 55–67). In addition, the main barrier in Silver King Canyon was reinforced in 2016 to further protect the restoration activities occurring upstream in the historical range (CDFW 2022, p. 1). Further barrier assessments have been completed in 2021 and 2022 to establish effectiveness of the barrier and indicate any further augmentations to the barrier (CDFW 2022, entire).

Environmental DNA, or DNA shed from an organism into its environment, has been effective in the detection of low abundance aquatic species, showing particularly great potential for target species identification in small, low order streams (Jane *et al*. 2015, pp. 220–225; Fremier *et al*. 2019, entire). Important considerations include, but are not limited to, the distance of travel of eDNA from source organism to potential sampling location, the timeframe of eDNA persistence in the environment before complete degradation, and confounding factors due to translocation of target species DNA by other organisms. Both the distance of detection possible and the persistence of eDNA in aquatic systems varies widely depending upon the volume of water sampled, target species studied, and several biotic and abiotic factors (Barnes *et al*. 2014, pp. 1822–1825; Thomsen and Willerslev 2015, p. 13; Barnes and Turner 2016, pp. 5–6).

Field crews collected eDNA samples along Silver King Creek and several tributaries (Tamarack Creek, Coyote Valley Creek, Llewellyn Creek, Tamarack Lake Creek, Poison Flat Creek) with an approximate 100-meter (300 ft) distance between sampling locations (Figure 8). At each location, field crews conducted sampling according to Carim *et al*. (2016, entire) which consisted of a 5-liter water sample pumped through a 1.5-µm-pore glass microfiber filter (47 mm diameter).

Once the distribution and density of rainbow trout is established, crews then use electrofishing techniques to capture and remove all pure rainbow trout and hybrid trout found. Because young-of-year individuals are difficult to identify, all individuals of this age group are culled from the population. Environmental DNA collected to date indicates that the removal methods being implemented are having the intended effect of containing the rainbow/hybrid population to the lower reaches of Silver King Creek and reducing the density of the rainbow/hybrid population (Figure 7; CDFW 2024, pp. 55–67; R. Titus, *in litt*. 2025).

The ability to identify rainbow trout, hybrids, and pure PCT is important to the success of these efforts. Data has indicated that crews have been successful in the field identifying these three forms (R. Titus, *in litt*. 2025). Up until 2024, only F^1 hybrids had been found within Silver King Creek making identification of hybrids relative simple. However, in 2024, the first F^2 hybrids were identified as young-of-year. Further backcrossing will make identification in the field more difficult; therefore, starting in 2025, all yearling (one year old) individuals will also be culled from the population to minimize hybridization (R. Titus, *in litt*. 2025).

Figure 7. Environmental DNA results for nonnative rainbow trout and hybrids in Silver King Creek (R. Titus, *in litt*. 2025). The two different series indicate separate tests.

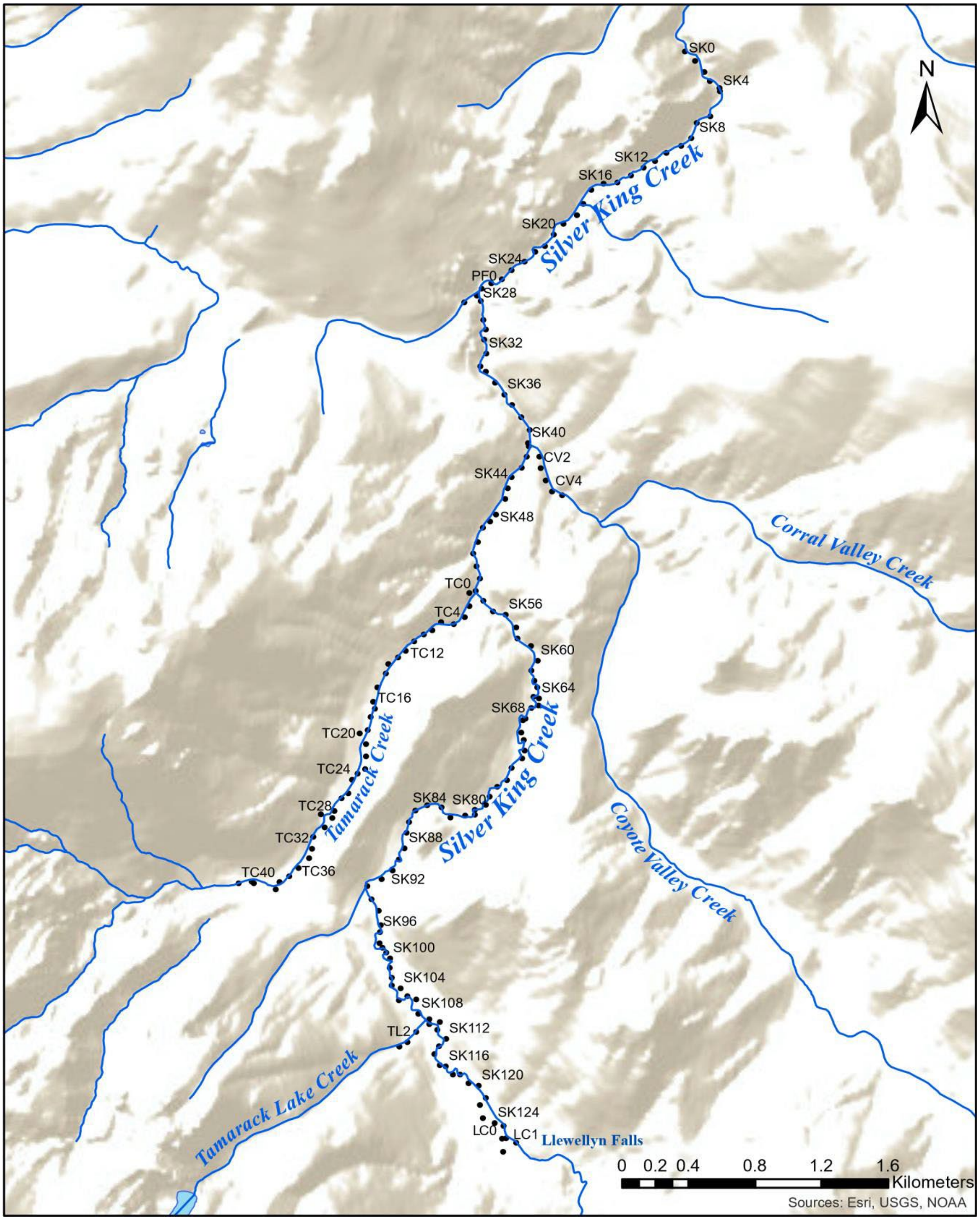

Figure 8. Environmental DNA sampling locations within Silver King Creek. SK0 is at the barrier in Silver King Gorge and SK127 is at Llewellyn Falls.

Fire

Fire has been one of the dominant factors shaping ecosystems for millennia (Skinner and Chang 1996, p. 1041; Van Wagtendonk *et al*. 2018, p. 254). Median fire return intervals in eastside Sierra Nevada forests where PCT reside are believed to be 7–16 years with a range of 5–47 years (Skinner and Chang 1996, p. 1056; North *et al*. 2009, pp. 25–30; Van de Water and North 2010, pp. 388–394; Van Wagtendonk *et al*. 2018, p. 255). In this fire regime type the following effects occur: (1) Fire controls plant species composition by favoring species that require sunlight (*e.g*., Jeffrey pine (*Pinus jeffreyi*) over shade-tolerant forms such as white fir (*Abies concolor*)), and by favoring fire-resistant and fire-dependent species over non-fire dependent species; (2) fire consumes understory vegetation without damaging the overstory; (3) crown fires are rare and patchy; and (4) small patches of intense surface burning often result in openings (Chang 1996, pp. 1071–1072).

Changes in historical fire regimes are well documented in the western United States (McKelvey *et al*. 1996, pp. 1033–1039; Arno 2000, pp. 100–105; Stephens and Sugihara 2006, pp. 431–441; Richardson *et al*. 2007, pp. 277–278; Brooks 2008, pp. 33–45; Van de Water and North 2011, pp. 222–226). Around the late 1800's, high-frequency, low-intensity fire regimes associated with dry forest types, as found in the eastern Sierra Nevada, began having longer fire return intervals due to: (1) Relocation of Native Americans which disrupted their historical burning practices; (2) loss of fine fuels, which carried low-intensity ground fires, due to extensive overgrazing; (3) disruption of fuel continuity on the landscape due to irrigation, agriculture, and development; and (4) fire exclusion management policies (Arno 2000, pp. 100–101; Keane *et al*. 2002, pp. 1–2). Effects from the post-Euroamerican settlement influence on fire regimes include longer fire return intervals which allow fuel loads to increase. In return, relatively small, low-intensity ground fires have become uncharacteristically large, stand-replacing fires (Arno 2000, p. 101; Miller *et al*. 2009, pp. 22–30; Miller and Safford 2012, pp. 45–54).

Changing climate has affected summer temperatures and the timing of spring snowmelt, which have contributed to increasing the length of the wildfire season, wildfire frequency, and the size of wildfires (McKenzie *et al*. 2004, pp. 893–897; Westerling *et al*. 2006, p. 941; Miller *et al*. 2009, pp. 22–30; Williams *et al*. 2019, pp. 896–906). Westerling *et al.* (2006, p. 942) conclude that there are robust statistical associations between wildfire and climate in the western United States and that increased fire activity over recent decades reflects responses to climate change. Miller *et al*. (2009, pp. 22–30) studied the frequency, severity, and size of fires in the Sierra Nevada forests and found that all three parameters are increasing. Although PCT evolved in a fire-prone environment, increases in wildfire frequency, size, and severity due to increased fuel loads and effects from climate change (Westerling *et al*. 2006, p. 942; Miller *et al*. 2009; p. 26; Williams *et al*. 2019, pp. 896–906) have increased the threats due to wildfire. Many small fires (a few hectares) have occurred since 2013 in the Silver King Creek watershed which have not caused any impacts to occupied habitat. The 2018 Lions Fire burned most of the Stairway Creek watershed including the entire occupied reach (USFS 2018, entire). In 2020, the Slink Fire burned over 11,028 ha (27,252 ac) including approximately 2.6 km (1.6 mi) of occupied habitat and 40 percent of the Corral Valley Creek watershed burned at moderate to high fire severity while lower Silver King Creek through the Silver King Canyon (approximately 3.2 km (2 mi)) burned at 14 percent moderate and 1 percent high severity (Figure 9; USFS 2020, pp. 8–9). Agency biologists were concerned about post-fire hydrologic events impacting the PCT population in Corral Creek (Figure 10). A fish rescue was conducted in the fall 2020 and 44 PCT were translocated to Silver King Creek in Long Valley (CDFW 2020b, pp. 7–9). Wildfires are a larger threat to PCT because of the current fragmented and isolated state of occupied habitat (Haak *et al*. 2010, p. 47).

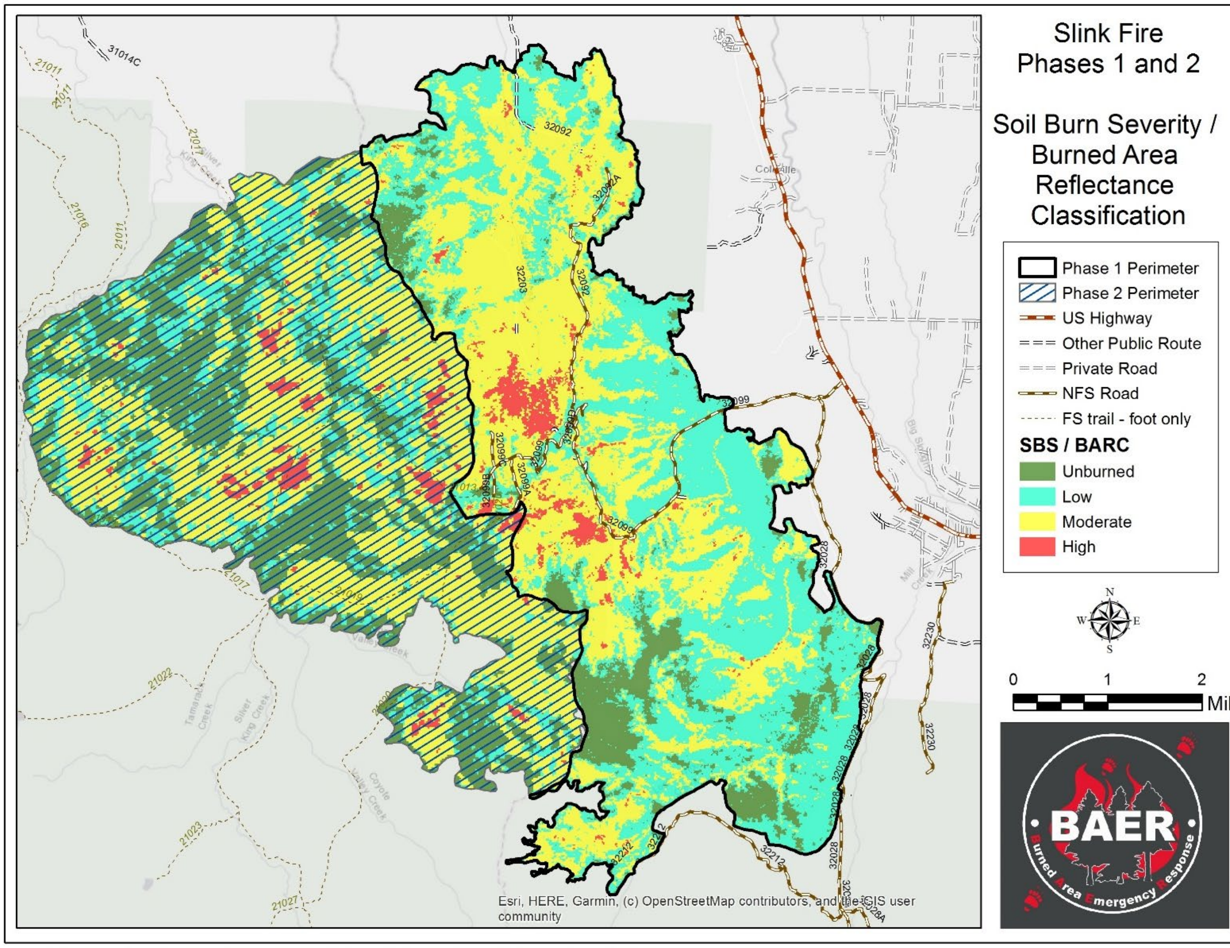

Figure 9. Soil burn severity and burned area reflectance classification for the Slink Fire. The Phase 2 perimeter is the wilderness boundary and is within the Silver King Creek watershed (USFS 2020, p. 4).

Fish mortalities can occur from increases in water temperatures which exceed lethal levels, fire induced changes in pH, increased ammonia levels from smoke gases absorbed into surface waters, and increased phosphate levels leached from ash (Brown 1989, pp. 107–108; Spencer and Hauer 1991, pp. 26–29; Rinne 1996, pp. 654–657; Rieman and Clayton 1997, pp. 51–53; Gresswell 1999, pp. 194–199; Earl and Blinn 2003, pp. 1020–1028; Ranalli 2004, pp. 1–21; Neary *et al*. 2005, pp. 119–134). Studies have shown that post-fire hydrologic events can severely reduce or extirpate local fish populations (Novak and White 1990, pp. 122–123; Propst *et al*. 1992, p. 120; Bozek and Young 1994, p. 92; Rinne 1996, p. 654; Rieman *et al*. 1997, pp. 50–53; Burton 2005, pp.142–148; Sestrich *et al*. 2011, pp. 139–140; Figure 10). Recolonization rates depend on the proximity and relative location of refugia, access from refugia to disturbed areas (*i.e*., no fish barriers), presence of nonnative fish, and interactions with complex life history traits and overlapping generations (Gresswell 1999, p. 210; Dunham *et al*. 2003, pp. 185–186; Howell 2006, pp. 990–993; Dunham *et al*. 2007, pp. 340–344; Neville *et al*. 2009, pp. 1321–1324; Sestrich *et al*. 2011, pp. 143–144). Isolated fish populations are at a much higher risk of extinction because they cannot recolonize after a large disturbance (Rinne 1996, p. 656; Dunham *et al*. 1997, p. 1131; Dunham *et al.* 2003, pp. 187–189; Burton 2005, pp.142–148; Dunham *et al*. 2007, pp. 340–344; Williams *et al.* 2009, pp. 543–546). Additionally, effects on small headwater streams are more severe because larger proportions of the drainage are burned at these smaller spatial scales, in contrast to larger stream orders, where relatively small proportions of the drainage burn (Romme *et al*. 2011, pp. 1204–1205; Sestrich *et al*. 2011, p. 143). All occupied PCT habitat is located in the headwaters of each watershed. The impacts from the 2018 Lions Fire and 2020 Slink Fire to the PCT populations in Stairway Creek and Corral Valley Creek, respectively, did not include extirpation as sampling events in 2021 in both streams indicated the two populations survived (CDFW 2021, pp. 44–46, 70).

Figure 10. Post-fire debris and overland flow in Corral Valley Creek in 2021. Photo credit: U.S. Fish and Wildlife Service.

III. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

Implement the Paiute Cutthroat Trout Restoration Project.
Continue efforts to control/eradicate nonnative rainbow trout and hybrids within the historical range of PCT. Implementation will fulfill Recovery Criteria 1 in the Revised Recovery Plan (Service 2004, pp. 49–50).

Continue monitoring the historical range for nonnative rainbow trout.
Environmental DNA sampling and evaluating the barriers in Silver King Canyon will be essential activities. Environmental DNA has been a useful monitoring tool to identify where rainbow trout are within the watershed. This information informs agency biologists where to focus their control/eradication efforts. Evaluation of the existing barriers will ensure they are functioning properly. The success of the Paiute Cutthroat Trout Restoration Project depends on the effectiveness of the barriers in keeping nonnative rainbow trout out of the historical range of PCT. Agencies should evaluate the need for an additional barrier for added security. Implementation will help fulfill Recovery Criteria 4 in the Revised Recovery Plan (Service 2004, pp. 51, 59).

Reevaluate habitat conditions in Silver King Creek.
Habitat monitoring was conducted in the late 1980s, 1990s, and early 2000s by agency researchers (Duff 1991, pp. 1–11; Overton *et al*. 1994, pp. 1–27; Flint 2004, pp. 1–14). Valuable baseline habitat information was collected at this time. Changes in habitat have been occurring since cessation of livestock grazing in 1995 and beaver activity. Documenting changes in habitat will help fulfill Recovery Criteria 3 in the Revised Recovery Plan (Service 2004, pp. 49, 51).

Improve population estimates in Silver King Creek drainage.
Population estimates for PCT are routinely conducted in low stream gradient meadow habitat. Fish densities are known to decrease in higher gradient portions of occupied streams but the extent of this decrease is unknown. To better understand population dynamics in all habitat types of Silver King Creek and its tributaries, population monitoring should also include higher gradient sections. A better understanding of population dynamics will help fulfill Recovery Criteria 2 (Service 2004, pp. 50, 52–53).

Evaluate Paiute cutthroat trout in Leidy Creek.
Little is known about Paiute cutthroat trout or habitat conditions in Leidy Creek on the Inyo National Forest. Continue to collect population and distribution data for Leidy Creek and collect baseline habitat data to better inform management. Implementation will fulfill Recovery Criteria 4 in the Revised Recovery Plan (Service 2004, pp. 61–62).

FIELD OFFICE APPROVAL:

Reno Fish and Wildlife Office, Field Supervisor, U.S. Fish and Wildlife Service

Approve KRISTEN JULE Digitally signed by KRISTEN JULE Date: 2025.08.25 16:28:22 -07'00' Date: *see signature block*

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Titus, Rob. 2025. Heritage and Wild Trout Senior Biologist, California Department of Fish and Wildlife, North Central Region, Rancho Cordova, California. Electronic mail to Chad Mellison, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Reno Fish and Wildlife Office, Reno, Nevada. Subject: Genetics Update for Silver King. August 18, 2025.

APPENDIX A. RESEARCH STUDIES RELATED TO PAIUTE CUTTHROAT TROUT CONDUCTED SINCE THE LAST 5-YEAR REVIEW

Listed below are examples of research and restoration projects which the Service has funded since the 2020 5-year review for PCT recovery efforts.

Paiute Cutthroat Trout Habitat Restoration Project, Phase III-California Department of Fish and Wildlife: On March 13, 2018, California Department of Fish and Game received a Section 6 grant from the Service to continue implementation of the Paiute Cutthroat Trout Restoration Project. The performance period for this grant was from April 1, 2018 through March 31, 2022. This grant was obtained to continue the restoration of PCT into their historical habitat by conducting assessment of existing donor populations, restocking PCT into their historical habitat, genetic sampling, nonnative fish removal, and fish barrier evaluations. Project Status: Complete.

Design of a SNP Panel for Genetic Management of Paiute Cutthroat Trout and Demonstration of a Successful Translocation Event-University of California, Davis (In press): RAD sequencing was used to identify single nucleotide polymorphisms (SNPs) from 476 individuals representing eight extant refuge populations. The authors selected a panel of 1,114 SNPs that were shared across all populations and validated the panel *in silico* by comparing population structure and genetic diversity estimates to those derived from the full RAD dataset. The SNP panel captured key patterns of genetic differentiation and diversity consistent with previous studies and the larger RAD dataset. The authors present updated baseline metrics for each refuge population, providing a consistent reference point for future monitoring efforts. Project Status: Ongoing.