Santa Cruz Long-Toad Salamander
(*Ambystoma macrodactylum croceum*)

5-Year Review:
Evaluation and Summary

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U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
Ventura, California

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5-YEAR REVIEW
Santa Cruz Long-toed Salamander (*Ambystoma macrodactylum croceum*)

GENERAL INFORMATION:

Species: Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*)
Date Final Listing Rule Published: March 11, 1967, under Endangered Species Preservation Act of 1966 (precursor to Endangered Species Act of 1973)
Federal Register (FR) citation(s): 32 FR 4001
Classification: Endangered
Critical Habitat Designation: We have not designated critical habitat for the Santa Cruz long-toed salamander. We proposed to designate critical habitat on June 22, 1978 (Service 1978; 43 FR 26759). The proposal was withdrawn in 1979 (44 FR 12382).

State Listing: The State of California listed the Santa Cruz long-toed salamander as endangered in 1971 (California Fish and Game Commission May 21, 1971), and it is a State fully protected species per Fish and Game Code 5050.

BACKGROUND:

FR notice citation announcing this status review:
[Service] U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 59 Pacific Southwest. Federal Register 89:83510–83514.

Most recent status review:
[Service] U.S. Fish and Wildlife Service. 2019. Santa Cruz long-toad salamander (*Ambystoma macrodactylum croceum*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California. 11 pp.

We recommended no status change in the 2019 5-year review (Service 2019, p. 10).

Prior to 2019, we completed one additional 5-year review in 2009 and recommended no status change (Service 2009, p. 19).

Species overview:
The Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) inhabits seasonal and permanent aquatic features (ponds or wetlands) for breeding and adjacent upland scrub and woodland areas during the nonbreeding season. The range of the Santa Cruz long-toed salamander is limited and fragmented, occurring along the central coast of California in 6 metapopulation areas in southern Santa Cruz County (4 metapopulations) and northern Monterey County (2 metapopulations) (Service 2019, p. 2). Figure 1 shows the range of the Santa Cruz long-toed salamander.

The Santa Cruz long-toed salamander was initially discovered in 1954 at Valencia Lagoon in Santa Cruz County, which was nearly eliminated in 1969 when California State Route 1 (also

known as Highway 1) was constructed. Subsequent surveys in 1956 revealed one other breeding site at Ellicott Pond in Santa Cruz County. Since its discovery in 1954, the Santa Cruz long-toed salamander is currently known from 48 breeding sites. For the purposes of this review, a breeding site is defined as a site where Santa Cruz long-toed salamander breeding, or evidence of breeding, has been observed at some point in time. See Table 1.

ASSESSMENT:

Information acquired since the last status review:
The U.S. Fish and Wildlife Service's (Service) Ventura Fish and Wildlife Office (VFWO) conducted this 5-year review. We announced the review through a FR notice on October 16, 2024 (89 FR 83510). We received one comment with information from the public in response to our FR notice announcing this review. We also contacted species experts, partners, and universities to request any data or information we should consider in our review. Additionally, we conducted a literature search and a review of information in our files, including a review of Santa Cruz long-toed salamander section 10(a)(1)(A) recovery permit annual reports. Below, we discuss new information since the 2019 5-year review regarding tide gate repairs, road undercrossing projects, newly discovered or created breeding sites, and research.

Distribution and Abundance:
At the time of listing in 1967, Santa Cruz long-toed salamanders were known from three breeding sites in Santa Cruz County: Velencia Lagoon (discovered 1954), Ellicott Pond (discovered 1956), and Anderson's Pond (discovered 1960s). In the 1999 draft revised recovery plan, the Santa Cruz long-toed salamander was described as occurring within three metapopulations comprised of 12 breeding sites (Service 1999, pp. 3, 11). In the 2009 5-year review, we had new information that indicated the Santa Cruz long-toed salamander occurs in six metapopulations: (1) Valencia-Seascape Metapopulation, (2) Ellicott-Buena Vista Metapopulation, (3) Freedom Metapopulation, (4) Larkin Valley Metapopulation (5) McClusky Metapopulation, and (6) Elkhorn Metapopulation (Service 2009, pp. 5–6; Figure 1, p.7). Additionally in the 2009 5-year review, the number of breeding sites increased from 12 to 24 (Service 2009, p. 18). At that time the Santa Cruz long-toed salamander was considered likely extirpated from 2 breeding sites (Service 2009, p. 5). The metapopulations remained the same in the 2019 5-year review and the number of breeding sites increased to 32. In the 2019 5-year review, the Santa Cruz long-toed salamander was considered to be successfully breeding at 23 sites, while likely extirpated from 4 breeding sites: (1) Bennett Slough/Struve Pond, (2) Zmudowski Pond, (3) Rancho Road Pond, and (4) Anderson's Pond(Service 2019, pp. 2–3). Status was unknown at 2 breeding sites and 3 were identified in need of work to become suitable again.

There is no range-wide, long-term monitoring program for Santa Cruz long-toed salamanders. However, over the past several years researchers have conducted surveys regularly at some sites. At other sites, presence/absence surveys are conducted periodically as resources and funding are available and access is allowed. In recent years, the number of Santa Cruz long-toed salamander individuals observed tends to be low when surveyors have counted, especially in Monterey County.

Currently, the Santa Cruz long-toed salamander is known to be present, or assumed to be present, at 43 breeding sites and the surrounding uplands within six metapopulations. It is likely extirpated from 3 breeding sites. Status of the Santa Cruz long-toed salamander at 2 breeding sites is currently unknown. Additionally, there are 7 ponds that have not functioned as Santa Cruz long-toed salamander breeding sites but have potential to do so in the future. Figure 1 shows the Santa Cruz long-toed salamander metapopulation areas, breeding sites (present, assumed present, likely extirpated, or unknown), and potential breeding sites.

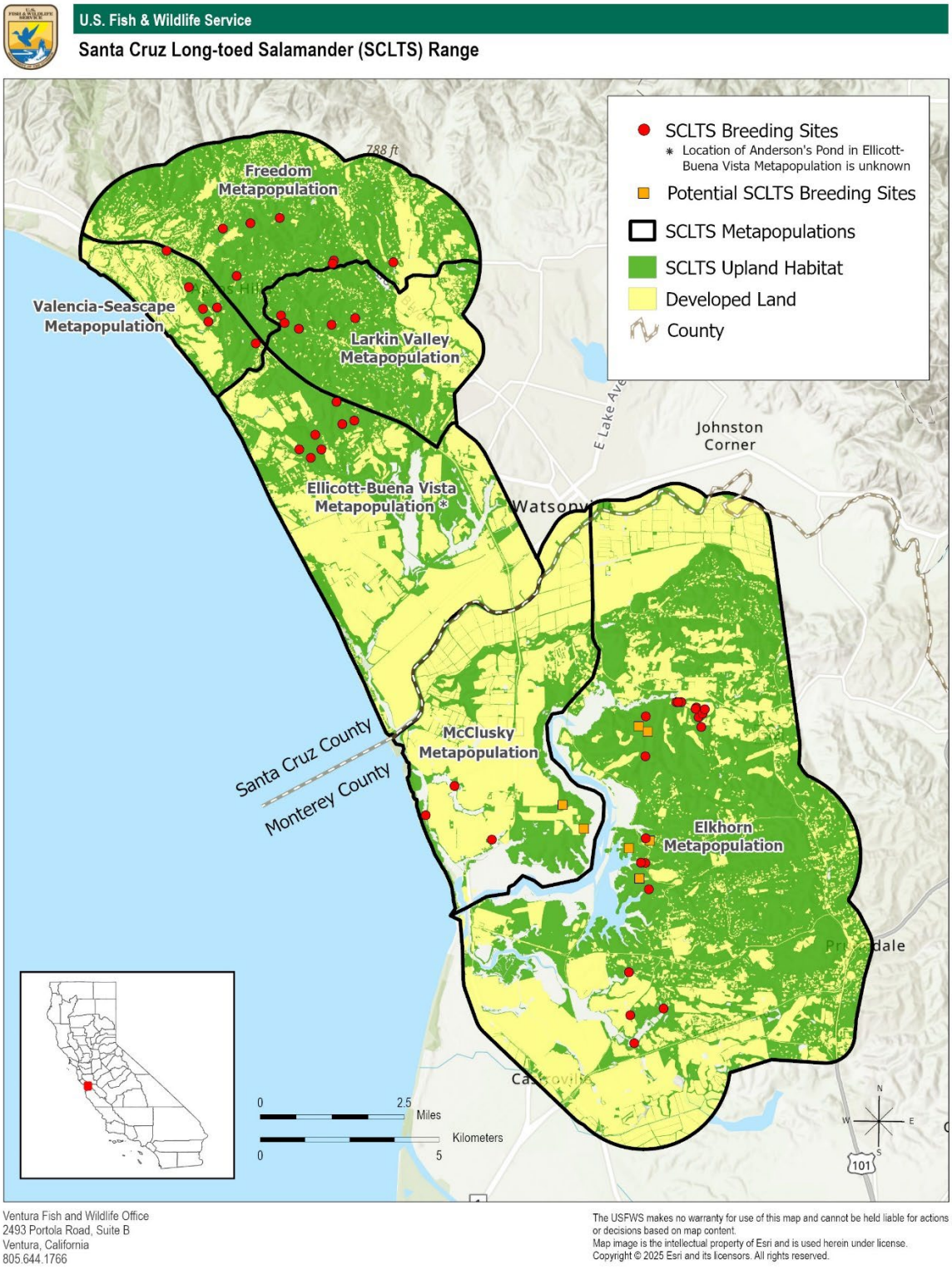

Figure 1. Santa Cruz long-toed salamander range, metapopulations, upland habitat, breeding sites, potential breeding sites, and developed land.

Below we discuss the current status of the Santa Cruz long-toed salamander breeding sites within each of the six metapopulations. We also include survey, monitoring, and abundance information when available. As applicable to some breeding sites, we provide information where native and non-native predators have been observed that are or may be threats to Santa Cruz long-toed salamanders. Table 1 includes current status as well as statuses in the 2009 and 2019 5-year reviews. For the purposes of this document, we define status as present, assumed present, likely extirpated, unknown, or not applicable:

- Present, Santa Cruz long-toed salamanders have been observed in aquatic habitat or uplands since 2020.
- Assumed present, Santa Cruz long-toed salamanders were observed prior to 2020 and have not been observed in aquatic habitat or uplands since 2020 but suitable habitat exists and we have no information to consider status to be otherwise.
- Likely extirpated, Santa Cruz long-toed salamanders have not been observed since 2020 and suitable habitat is not present.
- Unknown, Santa Cruz long-toed salamanders have been observed prior to 2020 at this breeding site but current status of Santa Cruz long-toed salamanders and habitat is not known.
- Not applicable (N/A), was not known to serve as a Santa Cruz long-toed salamander breeding site, or not a Santa Cruz long-toed salamander breeding site but has potential to become one through colonization (based on proximity to other breeding sites, need for restoration, or both).

We evaluated the risk that sea level rise may pose to Santa Cruz long-toed salamander breeding sites. To account for potential ranges of sea level rise, we used low and high scenarios (NOAA 2025). The low scenario projected an increase of 0.33 feet (0.10 meter) by 2040 (NOAA 2025). The high scenario projected an increase of 6.43 feet (1.96 meter) by 2100 (NOAA 2025). We found that sea level rise could potentially affect several breeding sites in Monterey County through increased salinity, saltwater intrusion, coastal flooding, or saltwater inundation. If realized, such breeding sites could become non-functional.

Valencia-Seascape Metapopulation, Santa Cruz County

The Valencia-Seascape Metapopulation consists of six breeding sites. Three of the breeding sites in this metapopulation have been studied over several years, while we have limited to no abundance data for the other half of the breeding sites within the Valencia-Seascape Metapopulation.

Valencia Lagoon. Valencia Lagoon occurs on the Santa Cruz long-toed salamander Ecological Reserve, which is owned by the California Department of Fish and Wildlife (CDFW). Santa Cruz long-toed salamanders were initially discovered at this site in 1954. The Santa Cruz long-toed salamander is considered present at Valencia Lagoon.

Santa Cruz long-toed salamanders were observed at Valencia Lagoon in 2019, 2021, and 2023 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.).

Seascape Pond 1 (also called Seascape Uplands Pond). Seascape Pond 1 is owned and managed by the Center for Natural Lands Management (CNLM). Santa Cruz long-toed salamanders were discovered at Seascape Pond 1 in 1974 (Laabs and Allaback 2025, in litt.). The Santa Cruz long-toed salamander is considered present at Seascape Pond 1.

During a study from 1986–1987, over 3,000 juvenile Santa Cruz long-toed salamander were captured from Seascape Pond 1 and the local population was estimated at over 1,450 breeding adults (Laabs and Allaback 2025, in litt.). During a study from 2001–2002, 1,527 adult Santa Cruz long-toed salamander were captured (Laabs and Allaback 2025, in litt.). Researchers found that the abundance of breeding adult Santa Cruz long-toed salamanders at Seascape Pond 1 has significantly declined since a long-term monitoring study began in the winter of 1998–1999, from a high of approximately 3,000 to 1,000 or fewer individuals over the past decade (Laabs and Allaback 2025, in litt.). Santa Cruz long-toed salamanders that breed in one of the Seascape Ponds have been observed using upland habitats at the adjacent Willow Canyon area (Laabs and Allaback 2025, in litt.). Santa Cruz long-toed salamanders were observed at Seascape Pond 1 in 2019, 2021, 2022, and 2023 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.; Laabs and Allaback 2025, in litt.).

Seascape Pond 2 (also called Castillo Pond). Seascape Pond 2 is owned and managed by CNLM. Seascape Pond 2 was created in 1999 and Santa Cruz long-toed salamanders colonized the pond 3 years later (Laabs and Allaback 2025, in litt.). The Santa Cruz long-toed salamander is considered present at Seascape Pond 2.

Monitoring for Santa Cruz long-toed salamander at Seascape Pond 2 was conducted in the winter of 2007–2008 (Laabs and Allaback 2025, in litt.). Researchers found that the abundance of Santa Cruz long-toed salamanders at Seascape Pond 2 increased after colonization and has fluctuated over the past 15 years from less than 100 to approximately 1000 breeding adults (Laabs and Allaback 2025, in litt.). Santa Cruz long-toed salamanders were observed at Seascape Pond 2 in 2019, 2021, 2022, 2023, and 2024 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.; Laabs and Allaback 2025, in litt.).

In 2022, red swamp crayfish (*Procambarus clarkii*) were observed at Seascape Pond 2 (Allaback and Laabs 2025, in litt). Since that time, crayfish have colonized the site and are a threat to Santa Cruz long-toed salamanders at this site.

Seascape Pond 3 (also called Bonita Pond). Seascape Pond 3 is owned and managed by CNLM. Seascape Pond 3 was created in 1999 and Santa Cruz long-toed salamanders colonized the pond in the following year (Laabs and Allaback 2025, in litt.). The Santa Cruz long-toed salamander is considered present at Seascape Pond 3.

Monitoring for Santa Cruz long-toed salamander at Seascape Pond 3 was conducted in the winter of 2002–2003 (Laabs and Allaback 2025, in litt.). Researchers found that the abundance of Santa Cruz long-toed salamanders at Seascape Pond 3 increased after colonization and leveled off at approximately 500 breeding adults for approximately the past 20 years (Laabs and Allaback 2025, in litt.). Santa Cruz long-toed salamanders were observed at Seascape Pond 3 in 2019,

2021, 2022, 2023, and 2024 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.; Laabs and Allaback 2025, in litt.).

Willow Canyon Pond. Willow Canyon Pond occurs on the Santa Cruz long-toed salamander Ecological Reserve, which is owned by CDFW. Willow Canyon Pond was created in 2015 (Service 2019, p. 4). Santa Cruz long-toed salamanders were translocated to Willow Canyon Pond in a 3-year project starting in 2016 (Kasteen et al. 2021, p. 229). In 2020, evidence of Santa Cruz long-toed salamander breeding was observed at Willow Canyon Pond (Kasteen et al. 2021, p. 230). The Santa Cruz long-toed salamander is considered present at Willow Canyon Pond.

During a study from 2001–2002, 643 adult Santa Cruz long-toed salamanders were captured (Laabs and Allaback 2025, in litt.). Santa Cruz long-toed salamanders were observed at Willow Canyon Pond in 2019, 2021, 2022, 2023, and 2024 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.).

Weelili Pond (also called La Selva Upland Property). Weelili Pond occurs on lands owned by the Land Trust of Santa Cruz County. Weelili Pond was discovered as a Santa Cruz long-toed salamander breeding site in 2024. The Santa Cruz long-toed salamander is considered present at Weelili Pond.

Santa Cruz long-toed salamander adults were observed in uplands near Weelili Pond during 2024–2025. Non-native aquatic predators (red swamp crayfish, American bullfrogs (*Lithobates catesbeinanus*), non-native fish) were also observed during that time and are a threat to Santa Cruz long-toed salamanders at this site. The land trust plans to drain the pond in summer 2025 to address the threat.

Ellicott-Buena Vista Metapopulation, Santa Cruz County

The Ellicott-Buena Vista Metapopulation consists of eight breeding sites, described below. We have limited to no abundance data for all breeding sites within the Ellicott-Buena Vista Metapopulation.

Ellicott Pond (also called Ellicott Slough). Ellicott Pond occurs on lands owned by the Ellicott Slough National Wildlife Refuge (ESNWR). The Santa Cruz long-toed salamander is considered present at Ellicott Pond.

Santa Cruz long-toed salamanders were observed at Ellicott Pond in 2008, 2019, 2021, 2022, 2024 (Service 2009, p. 8; Service 2019, p. 7, table 1; O'Brien 2024, in litt.).

Ellicott Pond was deepened in 2015 and since that time Santa Cruz long-toed salamander productivity has increased (Allaback and Laabs 2025, in litt).

During the 2021–2024 breeding seasons, researchers found that Ellicott Pond had the highest Santa Cruz long-toed salamander productivity out of all the breeding sites in their study; 371 emerging metamorphs were observed (Searcy and O'Brien 2025, unpaginated).

Santa Cruz long-toed salamanders from Ellicott Pond served as a source for the controlled propagation and reintroduction program in project year 2023–2024 and are planned as a source for 2024–2025 (Spranger and Parandhaman 2024, in litt.).

Rough-skinned newts (*Taracha granulosa*) are believed to be expanding in range and breeding has been observed at Ellicott Pond (Allaback and Laabs 2025, in litt). Where newts and Santa Cruz long-toed salamanders co-occur, newts are presumed to prey on Santa Cruz long-toed salamander eggs, larvae, and adults (Service 2019, p. 4). Newts may be a threat to Santa Cruz long-toed salamanders at Ellicott Pond.

Green's Pond. Green's Pond occurs on private land. Santa Cruz long-toed salamander breeding was confirmed at Green's Pond in 1989 (Service 1999, p. 18). Santa Cruz long-toed salamanders were observed at Green's Pond in 2015 (Service 2019, p. 7, table 1). The Santa Cruz long-toed salamander is assumed present at Green's Pond.

Rough-skinned newt breeding has been observed at Green's Pond (Allaback and Laabs 2025, in litt). Newts may be a threat to Santa Cruz long-toed salamanders at Green's Pond.

Buena Vista Pond 1. Buena Vista Pond 1 occurs at the Watsonville Slough Ecological Reserve, which is owned by CDFW. The Santa Cruz long-toed salamander is considered present at Buena Vista Pond 1.

This site was enhanced in 2014; Santa Cruz long-toed salamanders were observed at Buena Vista Pond 1 in 2008, 2019, and 2024 (Service 2009, p. 8; Service 2019, p. 7, table 1; O'Brien 2024, in litt.).

The hydroperiod at Buena Vista Pond 1 can be variable depending on the year. In 2025, Santa Cruz long-toed salamander rescues were performed due to concerns that the pond may not hold water long enough for larvae to complete metamorphosis. Additional work may be needed to determine if restoration is needed or if the shortened hydroperiod is solely a result of low rainfall.

Buena Vista Pond 2. Buena Vista Pond 2 occurs at the Watsonville Slough Ecological Reserve, which is owned by CDFW. Constructed in 2020, Buena Vista Pond 2 is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at Buena Vista Pond 2 in 2023 and 2024 (O'Brien 2024, in litt.).

Rancho Road Pond. Rancho Road Pond occurs on private lands. Santa Cruz long-toed salamander breeding was last confirmed at Rancho Road Pond in 1996 (Service 1999, p. 8). Culvert repairs along Rancho Road altered the hydrology for this pond and as a result it no longer supports Santa Cruz long-toed salamander breeding (Allaback pers. comm. 2009 as cited in Service 2009, p. 8). The Santa Cruz long-toed salamander is considered likely extirpated at Rancho Road Pond.

Anderson's Pond. Anderson's Pond occurs on private land. Santa Cruz long-toed salamander breeding was last confirmed at Anderson's pond in the 1960s (Service 1999, p. 8). The Santa Cruz long-toed salamander is considered likely extirpated at Anderson's Pond.

The precise location of Anderson's Pond had been lost and the current existence of this pond is unknown. Over the years, work has been conducted to attempt to identify ponds for the Santa Cruz long-toed salamander, including the location and current status of Anderson's Pond. Until we have new information, Anderson's Pond is presumed to no longer exist (i.e., it may have been filled in or paved).

Prospect Pond. Prospect Pond occurs at ESNWR and was reconstructed in 2012 to serve as a Santa Cruz long-toed salamander breeding site (Service 2019, p. 4). The Santa Cruz long-toed salamander is considered present at Prospect Pond.

Santa Cruz long-toed salamanders were observed at Prospect Pond in 2019, 2021, 2022, and 2024 (Service 2019, p. 7, table 1; O'Brien 2024, in litt.).

Delaney Pond. Delaney Pond occurs on private land. The Santa Cruz long-toed salamander was discovered at Delany Pond in 2013 (Service 2019, p. 5). The Santa Cruz long-toed salamander is considered present at Delaney Pond.

The pond was enhanced in 2015 to better serve as a Santa Cruz long-toed salamander breeding site. The Santa Cruz long-toed salamander was observed at Delany Pond in 2019, 2023, and 2024 (Service 2019, p. 5, 8, table 1; O'Brien 2024, in litt.).

Rough-skinned newts were observed at Delaney Pond in 2023 and 2024 (Fox 2025a, in litt.). Newts may be a threat to Santa Cruz long-toed salamanders at Delaney Pond.

Freedom Metapopulation, Santa Cruz County

The Freedom Metapopulation consists of seven breeding sites, described below. We have limited to no abundance data for all but one of the breeding sites within the Freedom Metapopulation.

Palmer Pond. Palmer Pond occurs on private land. In the 2009 5-year review, we identified that Santa Cruz long-toed salamanders were discovered in Palmer Pond in 2004 (Service 2009, p. 9). However, researchers question whether the site may exist (or ever existed). According to some species experts, it may have never existed, it may have been only temporarily in existence, or it may have been misidentified/mislabeled for another nearby pond (Allaback and Laabs 2025, in litt.). The Santa Cruz long-toed salamander status is unknown at Palmer Pond.

Tucker Pond. Tucker Pond occurs on private land and is owned and managed by CNLM. Tucker Pond was constructed in 1976 and Santa Cruz long-toed salamanders were discovered in the pond in 2002 (Allaback et al. 2022, in litt.). At that time there were estimated to be over 1,000 individuals at Tucker Pond (Allaback et al. 2022, in litt.). Since then, numbers of Santa Cruz long-toed salamanders have steadily declined. The Santa Cruz long-toed salamander is considered present at Tucker Pond.

Santa Cruz long-toed salamanders were observed at Tucker Pond in 2019, 2022, and 2023 (Service 2019, p. 8, table 1; Allaback et al. 2022, in litt.; O'Brien 2024, in litt.). The number of breeding adults was estimated to be below 100 in 2022 (Allaback et al. 2022, in litt.).

From 2007–2017, Tucker Pond was managed for the Santa Cruz long-toed salamander under requirements of a HCP, including removal of non-native American bullfrogs and annual pond draining (Allaback et al. 2022, in litt.). Bullfrogs were eradicated by 2015 (Allaback 2023, in litt.).

Rough-skinned newts were observed preying on Santa Cruz long-toed salamander eggs at Tucker Pond, prompting initiation of removal efforts in 2016 (Allaback 2023, in litt.). However, newts have been subsequently observed annually. Due to removal efforts, the numbers of newts appears to have decreased in 2025. Newts are a threat to Santa Cruz long-toed salamanders at Tucker Pond.

Millsap Pond 1. Millsap Pond 1 occurs on the Santa Cruz long-toed salamander Ecological Reserve, which is owned by CDFW. Studies at Millsap Pond 1 from 20 years ago estimated approximately 140 adult Santa Cruz long-toed salamanders (Service 2009, p. 9). Santa Cruz long-toed salamanders were observed at Millsap Pond 1 in 2019 (Service 2019, p. 8, table 1). The Santa Cruz long-toed salamander is assumed present at Millsap Pond 1.

Rough-skinned newt breeding has been observed at Millsap Pond 1 (Allaback and Laabs 2025, in litt). Newts may be a threat to Santa Cruz long-toed salamanders at Millsap Pond 1.

Millsap Pond 2. Millsap Pond 2 was created in 2014 and occurs on the Santa Cruz long-toed salamander Ecological Reserve, which is owned by CDFW. Millsap Pond 2 was not included in the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at Millsap Pond 2 in 2022 and 2023 (O'Brien 2024, in litt.).

Rough-skinned newt breeding has been observed at Millsap Pond 2 (Allaback and Laabs 2025, in litt). Newts may be a threat to Santa Cruz long-toed salamanders at Millsap Pond 2.

Merk Pond. Merk Pond occurs on private land. Santa Cruz long-toed salamanders were discovered in Merk Pond in 2003 and breeding was confirmed in 2005; additionally, catfish (*Ictalurus* spp.) along with other fish species were found in Merk Pond in 2005 (Service 2009, p. 9). The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were detected at Merk Pond in 2021 and 2022 (Ralson et al. 2025, table S9).

Racehorse Lane Pond. Racehorse Lane Pond occurs on private land. Santa Cruz long-toed salamanders were discovered at Racehorse Lane Pond in 2005 (Service 2009, p. 9). The Santa Cruz long-toed salamander is considered present at Racehorse Lane Pond.

Santa Cruz long-toed salamanders were observed at Racehorse Land Pond in 2023 and 2024 (O'Brien 2024, in litt.).

Shadowmere Pond. Shadowmere Pond occurs on private land. This is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

The Santa Cruz long-toed salamander was observed at Shadowmere Pond in 2020 (Allaback and Laabs 2025, in litt).

Rough-skinned newt breeding has been observed at Shadowmere Pond (Allaback and Laabs 2025, in litt). Newts may be a threat to Santa Cruz long-toed salamanders at Shadowmere Pond.

Larkin Valley Metapopulation, Santa Cruz County

The Larkin Valley Metapopulation consists of 5 breeding sites, described below. We have limited to no abundance data for most breeding sites within the Larkin Valley Metapopulation. Researchers discovered a movement corridor among the uplands connecting the 5 breeding sites in this metapopulation area (Allaback and Laabs 2025, in litt.).

Calabasas Pond. Calabasas Pond occurs on lands owned and managed by ESNWR. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at Calabasas Pond in 2019, 2021, 2022, 2023, and 2024 (Service 2019, p. 8, table 1; O'Brien 2024, in litt.). A Santa Cruz long-toed salamander study conducted in 2019–2020 estimated 4,311 breeding adults at Calabasas Pond (Allaback and Laabs 2025, in litt.).

Santa Cruz long-toed salamanders from Calabasas Pond served as a source for the controlled propagation and reintroduction program in project years 2020–2021 and 2021–2022 (Spranger and Parandhaman 2024, in litt.).

Suess Pond. Suess Pond occurs on private land. Until recently, Santa Cruz long-toed salamander breeding was last confirmed at Suess Pond in 2004 (Service 2009, p. 9). The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at Suess Pond in 2022, 2023, and 2024 (O'Brien 2024, in litt.).

Olives Pond. Olives Pond occurs on private land. Santa Cruz long-toed salamander breeding was last confirmed at Olives Pond in 2004 (Service 2009, p. 9). The Santa Cruz long-toed salamander is assumed present at Olives Pond.

Winterwind Way Pond. Winterwind Way Pond occurs on private land. Santa Cruz long-toed salamanders were discovered at Winterwind Way Pond in 2013 and again observed in 2016

(Service 2019, p. 5, 8, table 1). The Santa Cruz long-toed salamander is considered present at this site.

The Santa Cruz long-toed salamander was observed in uplands adjacent to Winterwind Way Pond in 2020 (Allaback and Laabs 2025, in litt.).

Dusty Trail Pond. Dusty Trail Pond occurs on private land. Dusty Trail Pond is a newly discovered Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander was known to breed at Dusty Trial Pond in 2020 (Allaback and Laabs 2025, in litt.) and is considered present at this site.

McClusky Metapopulation, Monterey County

The McClusky Metapopulation consists of three breeding sites, one newly created breeding site planned for Santa Cruz long-toed salamander translocation in 2025, and one breeding site that is planned to be created, described below. We have limited to no abundance data for most breeding sites within the McClusky Metapopulation. Most of the breeding sites within the McClusky Metapopulation have experienced salinity issues or are at risk from projected sea level rise. In the 2019 5-year review, two breeding sites within the McClusky Metapopulation were identified as potentially being functionally lost: McClusky Slough and Zmudowski Pond (Service 2019, p. 3). Since that time, the Santa Cruz long-toed salamander has been observed at both sites, but concerns remain about the potential effects of saltwater intrusion and increased salinity.

McClusky Slough. McClusky Slough occurs on private land. Santa Cruz long-toed salamanders were observed during surveys at McClusky Slough in 2002 and 2004; at that time the population was estimated at under 100 adults (Service 2009, p. 10). The Santa Cruz long-toed salamander is considered present at this site.

Researchers observed Santa Cruz long-toed salamander at McClusky Slough in 2021 (Allaback and Laabs 2025, in litt.).

Santa Cruz long-toed salamanders from McClusky Slough served as a source for the controlled propagation and reintroduction program in project years 2020–2021, and individuals in captivity were breeders in 2021–2022 and 2023–2024 (Spranger and Parandhaman 2024, in litt.).

McClusky Slough could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Zmudowski Pond. Zmudowski Pond occurs on lands owned by CDFW. Santa Cruz long-toed salamanders were observed during surveys at Zmudowski Pond from 2002–2003; at that time the population was estimated at 19 adults (Service 2009, p. 10). Until recently, breeding was last confirmed at Zmudowski Pond in 2004 (Service 2009, p. 10). The Santa Cruz long-toed salamander is considered present at this site.

Researchers observed Santa Cruz long-toed salamander at Zmudowski Pond in 2022 (Ralson et al. 2025, p. 10) and an adult was observed in the uplands in 2023.

Zmudowski Pond could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Bennett Slough/Struve Pond. Bennett Slough/Struve Pond occurs on a combination of private land and lands owned by CDFW. Santa Cruz long-toed salamanders were discovered in Bennett Slough/Struve Pond in 1973 and breeding was last confirmed at this site in 1985 (Service 2009, p. 10). Researchers found salinity levels of about 40 part per thousand (ppt) in Bennett Slough in 2004, and no Santa Cruz long-toed salamanders were observed at that time (Service 2009, p. 10). The Santa Cruz long-toed salamander is likely extirpated at Bennett Slough/Struve Pond due to high salinity.

Bennett Slough/Struve Pond could be further affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Dragonfly Pond. Dragonfly Pond occurs on private land. Dragonfly Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review and was created in 2024. As part of the controlled propagation and reintroduction program, Santa Cruz long-toed salamanders are planned to be translocated into Dragonfly Pond in summer 2025.

Ray's Pond. Ray's Pond is planned to be created in summer 2025 and would be on private land.

<u>Elkhorn Metapopulation, Monterey County</u>

The Elkhorn Metapopulation consists of 19 breeding sites, one newly created breeding site that is planned for Santa Cruz long-toed salamander translocation in 2025, and four potential breeding sites where Santa Cruz long-toed salamander breeding has not been observed. Regular surveys of approximately half of the breeding sites within the Elkhorn Metapopulation have been conducted in recent years. We have limited to no abundance data for other breeding sites within the metapopulation. Since the 2019 5-year review, many of the breeding sites described below were created, enhanced, or restored in efforts to increase Santa Cruz long-toed salamander breeding sites. Many of the breeding sites within the Elkhorn Metapopulation have experienced salinity issues or are at risk from projected sea level rise.

Oxbow Pond. Oxbow Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. Santa Cruz long-toed salamanders were discovered at Oxbow Pond in 2007. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed during surveys at Oxbow Pond in 2019, 2020, 2023, and 2024.

Santa Cruz long-toed salamanders from Oxbow Pond served as a source for the controlled propagation and reintroduction program in project year 2023–2024 and are planned as a source for 2024–2025 (Spranger and Parandhaman 2024, in litt.).

Oxbow Pond often receives flood waters from nearby Carneros Creek, which can introduce non-native aquatic predators that pose a threat to any Santa Cruz long-toed salamanders in the pond.

Oxbow Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Upper Cattail Pond (also called Upper Cattail Swale). Upper Cattail Pond occurs on land owned by ESNERR. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at Upper Cattail Pond in 2019, 2020, 2022, 2023, and 2024 (Service 2019, p. 9, table 1; O'Brien 2024, in litt.).

Santa Cruz long-toed salamanders from Upper Cattail Pond served as a source for the controlled propagation and reintroduction program in project years 2020–2021, 2021–2022, 2023–2024, and are planned as a source for 2024–2025 (Spranger and Parandhaman 2024, in litt.).

Upper Cattail Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Lower Cattail Pond (also called Lower Cattail Swale). Lower Cattail Pond occurs on land owned by ESNERR. Santa Cruz long-toed salamanders were discovered at Lower Cattail Pond in 2003 (Service 2009, p. 10). The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were detected at Lower Cattail Pond in 2017 and 2023 (Service 2019, p.9, table 1; Service 2023, p. 7) and 2024.

Lower Cattail Pond has experienced increased salinity and may be vulnerable to projected sea level rise. In 2025, researchers observed increased salinity at 8 ppt, and no evidence of Santa Cruz long-toed salamander breeding. Lower Cattail Pond could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Northern Moro Cojo Slough (also called Upper Moro Cojo Slough). Northern Moro Cojo Slough occurs on private land. Santa Cruz long-toed salamanders were discovered at Northern Moro Cojo Slough in 1978 (Service 2009, p. 11). Santa Cruz long-toed salamanders were last observed at Northern Moro Cojo Slough in 2004 (Service 2019, p. 8, table 1). The Santa Cruz long-toed salamander status is currently unknown at this site.

Researchers observed salinity levels of 2.2 ppt in 2023 and 1.9 ppt in 2024 at Northern Moro Cojo Slough (Stemle 2025, in litt.). These consecutive, annual salinity levels are high enough to raise concern about the potential loss of suitability of this breeding site based on an observed die-off at Howell Pond in 2019, where salinity was found at 3.3 ppt and higher (Service 2019, p. 5). Additionally, Northern Moro Cojo Slough could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Southern Moro Cojo Slough (also called Lower Moro Cojo Slough or South Moro Cojo Tributary). Southern Moro Cojo Slough occurs on private land. Santa Cruz long-toed salamander breeding was confirmed at Southern Moro Cojo Slough in 1990 and 2015 (Service 2009, p. 11; Service 2019, p. 9, table 1). The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were recently observed at Southern Moro Cojo Slough in 2021 and 2022 (O'Brien 2024, in litt.).

At Southern Moro Cojo Slough, researchers observed salinity levels of 0.9 ppt in 2021, 0.7 ppt in 2022, 0.3 ppt in 2023, 0.4 ppt in 2024, and 0.3 ppt in 2025 (Stemle 2025, in litt.). These salinity levels are low enough to not be a concern for Santa Cruz long-toed salamander breeding or survival but should continue to be monitored to watch for increases. Additionally, Southern Moro Cojo Slough could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Howell Pond. Howell Pond occurs on lands owned by Elkhorn Slough Foundation. Santa Cruz long-toed salamanders were discovered at Howell Pond in 2019 (Service 2019, p. 5, 9, table 1). The Santa Cruz long-toed salamander is assumed present at this site.

Howell Pond has experienced issues with saltwater intrusion and increased salinity. A Santa Cruz long-toed salamander die-off occurred at this site in 2019 that is attributed to salinity levels above 3 ppt (Service 2019, p. 5). Additionally, Howell Pond could be affected under the low and high scenarios for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site under either scenario.

Central Pond. Central Pond occurs on lands owned by the County of Monterey and was created in 2006 (Service 2023, p. 12). The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were discovered at Central Pond in 2019 and again observed in 2022, but were not observed during surveys conducted 2023–2024 (Service 2019, p. 5, 9, table 1; Fork 2025, in litt.).

Visitor Center Pond. Visitor Center Pond occurs on lands owned by ESNERR. Visitor Center Pond was created in 2016. Visitor Center Pond had water quality concerns from 2020–2023 (Service 2023, p. 9). Currently, the status of Visitor Center Pond is N/A; it is not a functional Santa Cruz long-toed salamander breeding site.

Swimming Pool Pond. Swimming Pool Pond occurs on lands owned by ESNERR. Swimming Pool Pond is a new potential Santa Cruz long-toed salamander breeding site since the 2019 5-year review and was created in 2019 (Service 2023, p. 10). Santa Cruz long-toed salamanders were released into Swimming Pool Pond in 2021 as part of the controlled propagation and reintroduction program (Spranger and Parandhaman 2024, in litt.). In 2022, Swimming Pool Pond was found to have salinity levels unsuitable for Santa Cruz long-toed salamanders (Service

2023, p. 10). Currently, the status of Swimming Pool Pond is N/A; it is not a functional Santa Cruz long-toed salamander breeding site.

Swimming Pool Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Long Valley Pond. Long Valley Pond occurs on lands owned by ESNERR. Long Valley Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review and was created in 2021 (Service 2023, p. 9). As part of the controlled propagation and reintroduction program, Santa Cruz long-toed salamanders were translocated into Long Valley Pond in 2021 and 2022. Larval individuals were observed in 2024 (Stemle 2024, in litt.) and in 2025. The Santa Cruz long-toed salamander is considered present at this site.

Long Valley Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Hidden Pond. Hidden Pond occurs on lands owned by the Elkhorn Slough Foundation. Hidden Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. As part of the controlled propagation and reintroduction program, Santa Cruz long-toed salamanders are planned to be translocated into Hidden Pond in summer 2025.

Rush Pond. Rush Pond occurs on lands owned by the Elkhorn Slough Foundation. Rush Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. As part of the controlled propagation and reintroduction program, Santa Cruz long-toed salamanders were translocated into Rush Pond in 2021, 2022, and 2024. No Santa Cruz long-toed salamanders were observed at Rush Pond during surveys in 2025. The Santa Cruz long-toed salamander is considered present at this site.

Monterey County Park Pond (also called North County Parks Pond). Monterey County Park Pond occurs on private land. Monterey County Park Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were discovered in Monterey County Park Pond in 2023 and again observed in 2024 (O'Brien 2024, in litt.).

Monterey County Park Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Cecil Pond (also called Wallace Pond). Cecil Pond occurs on lands owned by the Elkhorn Slough Foundation. Cecil Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review and was created in 2021 (Service 2023, p. 10). As part of the controlled propagation and reintroduction program, Santa Cruz long-toed salamanders were translocated into Cecil Pond in 2023. Santa Cruz long-toed salamanders are planned to be translocated into Cecil Pond in summer 2025. The Santa Cruz long-toed salamander is considered present at this site.

Pig Pond. Pig Pond occurs on lands owned by the Elkhorn Slough Foundation. Pig Pond is new potential breeding site since the 2019 5-year review, but Santa Cruz long-toed salamanders have not been observed. Currently, the status of Pig Pond is N/A.

Carneros Pond 1 (also called J Pond). Carneros Pond 1 occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. Carneros Pond 1 is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamander breeding was confirmed at Carneros Pond 1 in 2023 and 2024 (O'Brien 2024, in litt.; Fork 2025, in litt.; Fox 2025b, in litt.).

Carneros Pond 1 could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Carneros Pond 2 (also called G Pond). Carneros Pond 2 occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. Carneros Pond 2 is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamander breeding was confirmed at Carneros Pond 2 in 2023, 2024, and 2025 (O'Brien 2024, in litt.; Fork 2025, in litt.; Fox 2025b, in litt.).

Carneros Pond 2 could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

H Pond. H Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. H Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were detected at H Pond in the 2023–2024 season (Fork 2025, in litt.).

H Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

N Pond. N Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. N Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at N Pond in 2021, 2022, 2023, and 2024 (O'Brien 2024, in litt.; Fork 2025, in litt.).

N Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

O Pond. O Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. O Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at O Pond in 2023 and 2024 (O'Brien 2024, in litt.; Fork 2025, in litt.).

O Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

R Pond. R Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. R Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at R Pond in 2021, 2023, and 2024 (O'Brien 2024, in litt.; Fork 2025, in litt.).

R Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

S Pond. S Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. S Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were observed at S Pond in 2021, 2023, and 2024 (O'Brien 2024, in litt.; Fork 2025, in litt.).

S Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

W Pond. W Pond occurs on Triple M Ranch, which is held under a conservation easement by the Elkhorn Slough Foundation. W Pond is a new Santa Cruz long-toed salamander breeding site since the 2019 5-year review. The Santa Cruz long-toed salamander is considered present at this site.

Santa Cruz long-toed salamanders were recently discovered at W Pond in 2025 (Fork 2025, in litt.).

Hix Pond. Hix Pond occurs on lands owned by ESNERR. Hix Pond was created in 2020 and is a potential Santa Cruz long-toed salamander breeding site, but Santa Cruz long-toed salamanders have not been observed. Currently, the status of Hix Pond is N/A.

Hix Pond could be affected under the high scenario for sea level rise (NOAA 2025) and could become non-functional as a Santa Cruz long-toed salamander breeding site.

Unidentified Pond(s). Santa Cruz long-toed salamanders were detected with eDNA sampling at newly discovered breeding sites in the Carneros Creek area (Ralson et al. 2025, p. 12). At this time, we have not received specific location information to identify these sites and are not aware of visual observations of Santa Cruz long-toed salamanders at these sites.

Summary of Distribution and Abundance

Historically, Santa Cruz long-toed salamander distribution has been limited and fragmented along the central coast of California where it occurs in six metapopulation areas in southern Santa Cruz County and northern Monterey County. No range-wide monitoring program is conducted for Santa Cruz long-toed salamanders. Some sites are regularly surveyed while others are not. As such, abundance information is variable and can be limited or lacking entirely. Where local population estimates have been made over multiple timeframes, Santa Cruz long-toed salamander abundance has remained low or declined. Where abundance of larval Santa Cruz long-toed salamanders has been recorded, numbers of individuals are low, typically in the 10s to 100s.

Table 1. Santa Cruz long-toed salamander metapopulations and breeding sites: status in 2009 and 2019 5-year reviews, and current status (Current status: P = present, Santa Cruz long-toed salamanders have been observed in aquatic habitat or uplands since 2020; AP = assumed present, Santa Cruz long-toed salamanders have not been observed in aquatic habitat or uplands since 2020 but suitable habitat exits and we have no information to consider status to be otherwise; X = likely extirpated, Santa Cruz long-toed salamanders have not been observed since 2020 and suitable habitat is not present; UNK = unknown, Santa Cruz long-toed salamanders have been observed prior to 2020 at this breeding site but current status of Santa Cruz long-toed salamanders and habitat is not known; N/A = not applicable, was not known to serve as a Santa Cruz long-toed salamander breeding site, or not a Santa Cruz long-toed salamander breeding site but has potential to become one through colonization (based on proximity to other breeding sites, need for restoration, or both).

Breeding Site	2009 Status	2019 Status	Current Status
Valencia-Seascape Metapopulation, Santa Cruz County			
Valencia Lagoon	P	P	P
Seascape Pond 1	P	P	P
Seascape Pond 2	P	P	P
Seascape Pond 3	P	P	P
Willow Canyon Pond	-	P	P
Weelili Pond	-	-	P

Breeding Site	2009 Status	2019 Status	Current Status
Ellicott-Buena Vista Metapopulation, Santa Cruz County			
Ellicott Pond	P	P	P
Green's Pond	P	AP	AP
Buena Vista Pond 1	P	P	P
Buena Vista Pond 2	-	-	P
Rancho Road Pond	X	X	X
Anderson's Pond	P	X	X
Prospect Pond	N/A	P	P
Delaney Pond	N/A	P	P
Freedom Metapopulation, Santa Cruz County			
Palmer Pond	P	UNK	UNK
Tucker Pond	P	P	P
Millsap Pond 1	P	P	AP
Millsap Pond 2	-	N/A	P
Merk Pond	P	AP	P
Racehorse Lane Pond	P	AP	P
Shadowmere Pond	-	-	P
Larkin Valley Metapopulation, Santa Cruz County			
Calabasas Pond	P	P	P
Suess Pond	P	AP	P
Olives Pond	P	AP	AP
Winterwind Way Pond	UNK	AP	P
Dusty Trail Pond	-	-	P
McClusky Metapopulation, Monterey County			
McClusky Slough	P	AP	P
Zmudowski Pond	UNK	X	P
Bennett Slough/Struve Slough	X	X	X
Dragonfly Pond*	-	-	*
Ray's Pond^	-	-	-

Breeding Site	2009 Status	2019 Status	Current Status
Elkhorn Metapopulation, Monterey County			
Oxbow Pond	P	AP	P
Upper Cattail Pond	N/A	P	P
Lower Cattail Pond	P	N/A	P
Northern Moro Cojo Slough	P	UNK	UNK
Southern Moro Cojo Slough	P	N/A	P
Howell Pond	N/A	P	AP
Central Pond	N/A	P	P
Visitor Center Pond	-	-	N/A
Swimming Pool Pond	-	-	N/A
Long Valley Pond	-	-	P
Hidden Pond*	-	-	*
Rush Pond	-	-	P
Monterey County Park Pond	-	-	P
Cecil Pond*	-	-	P
Pig Pond	-	-	N/A
Carneros Pond 1	-	-	P
Carneros Pond 2	-	-	P
H Pond	-	-	P
N Pond	-	-	P
O Pond	-	-	P
R Pond	-	-	P
S Pond	-	-	P
W Pond	-	-	P
Hix Pond	-	-	N/A

*Translocations to this breeding site planned summer 2025
^Planned to be constructed summer 2025

Threats:
Because the Santa Cruz long-toed salamander was listed under the Endangered Species Preservation Act of 1966, the precursor to the Endangered Species Act of 1973, threats were not identified at listing. The threats to the Santa Cruz long-toed salamander identified in the 2019 5-year review included: habitat fragmentation and destruction due to urban development and agriculture; habitat degradation due to sedimentation, grazing, and invasion of nonnative vegetation; contaminants; disease; predation and competition from nonnative aquatic animals, including mosquito abatement activities; recreation; salinization; and drought (Service 2019, table 1, pp. 7–9). These threats to the Santa Cruz long-toed salamander remain with additional information on the effects of habitat loss, potential for increased salinization associated with sea level rise, and low recruitment and effects due to small population size . We now have a more comprehensive understanding of how habitat loss has affected Santa Cruz long-toed salamander viability. The threat of sea level rise is of increased concern, primarily to breeding sites that occur near sloughs and in low lying areas in Monterey County. We have concerns about

persistent low recruitment in Santa Cruz long-toed salamander and declining populations. Additionally, a novel Chlamydiales bacterium is a new concern in this 5-year review.

Habitat fragmentation and destruction due to urban development and agriculture
Researchers conducted a range-wide analysis for the Santa Cruz long-toed salamander, including Santa Cruz long-toed salamander migration distances, amount of suitable upland habitat, and estimated amount of future suitable upland habitat (Stemle et al. 2025, entire). From the edge of a pond, a distance of 643 feet (196 meters) would encompass 50% of a local Santa Cruz long-toed salamander population, 1,962 feet (598 meters) would encompass 95%, and 2,779 feet (847 meters) would encompass 99% (Stemle et al. 2025, pp. 6, 8). Using the 1,962-foot (598-meter) dispersal buffer, a range wide average of 64.5% of current upland habitat is suitable (Stemle et al. 2025, p. 8). The researchers determined that only 9 of 38 (24%) Santa Cruz long-toed salamander breeding sites in their study would provide long-term viability (Stemle et al. 2025, pp. 9–10, 14). This low amount of estimated suitable habitat primarily results from the loss of habitat due to urban and agricultural development, construction of roads that has fragmented habitat and created barriers to dispersal, and sea level rise.

Road Undercrossing Projects
Urban development has resulted in the creation of roads within the Santa Cruz long-toed salamander range that have disrupted dispersal and associated connectivity among breeding sites. Two projects are in planning phases to construct wildlife undercrossings along California State Route 1 in Santa Cruz County. Included in planning considerations are designs intended to allow for and increase connectivity among Santa Cruz long-toed salamander metapopulations that are currently bisected by California State Route 1.

Salinization
In the 2019 5-year review, we identified that two tide gates had failed in the Elkhorn metapopulation area (Monterey County) resulting in high salinity levels at breeding sites (Service 2019, p. 3). One tide gate failure was near the mouth of Moro Cojo Slough affecting the Southern Moro Cojo Slough breeding site (Service 2019, p. 3). Since that time, the tide gate has been repaired and a weir was installed approximately 2.4 miles (3.9 kilometers) from the tide gate to prevent saltwater intrusion (O'Connor 2025, pers. comm.). The weir has decreased salinity levels to some degree, but salinity remains a concern at two out of the three known breeding sites above the weir and continual salinity monitoring is needed – salinity appears to not be an issue at Monterey County Park Pond, but salinity levels are a concern at Northern Moro Cojo and Southern Moro Cojo breeding sites (O'Connor 2025, pers. comm.). The second tide gate, located at Elkhorn Slough National Estuarine Research Reserve (ESNERR) in Monterey County, experienced structural failure and no longer separated Lower Cattail Pond from estuarine habitat (Service 2019, p. 3). Since that time, the tide gate has been temporarily/partially repaired and salinity has been found to fluctuate (O'Connor 2025, pers. comm.). In certain years with high rainfall events, salinity remains low and is acceptable for Santa Cruz long-toed salamander breeding. Santa Cruz long-toed salamanders were observed at Lower Cattail Pond in 2023 (Service 2023, p. 7), a year with higher rainfall. However, in years with lower rainfall, salinity levels can be an issue and rise above levels acceptable for Santa Cruz long-toed salamander breeding. Because of fluctuating salinity levels in Lower Cattail Pond, salinity monitoring is needed.

Within the past decade, at least three breeding sites in Monterey County have been affected by tidal influence and experienced salinity issues (Camara et al. 2019, p. 7). Researchers projected sea level rise for Monterey, California under various scenarios (NOAA 2025). Under the low scenario, sea level is projected to increase 0.33 feet (0.10 meter) by 2040 and 0.75 feet (0.23 meter) by 2100 (NOAA 2025). Under the high scenario, sea level is projected to increase 0.69 feet (0.21 meter) by 2040 and 6.43 feet (1.96 meter) by 2100 (NOAA 2025). Based upon these sea level rise projections, an increase of 0.33 feet (0.10 meter) by 2040 is anticipated to potentially affect 7 Santa Cruz long-toed salamander breeding sites; while an increase of 6.43 feet (1.96 meter) by 2100 is anticipated to potentially affect the same 7 breeding sites plus an additional 13 breeding sites (20 total). The threat to Santa Cruz long-toed salamander breeding sites in Monterey County becoming affected by salinity, saltwater intrusion, coastal flooding, or potentially inundated with saltwater and lost continues.

The effects from small population size is a new threat to the Santa Cruz long-toed salamander in this review. Over the past decade or longer, Santa Cruz long-toed salamander metapopulations have experienced declines in abundance and distribution. Recent research finding persistent low recruitment at breeding sites may help to explain one factor contributing to declining local populations (Searcy and O'Brien 2025). Researchers provided recommendations to consider for physical pond properties (distance between ponds, water depth in spring) that are associated with ponds that have higher recruitment. More details are provided in the section "Santa Cruz long-toed salamander research since the 2019 5-year review."

Disease

A novel Chlamydiales bacterium is a new concern in this 5-year review, which appears to be widespread across the range of the Santa Cruz long-toed salamander. Over the past 4–5 years (and occasionally, but less frequently, in prior years), individual Santa Cruz long-toed salamanders from multiple breeding sites have been observed with abnormal bloating in the abdominal region. These individual were discovered to be infected with a novel Chlamydiales bacterium (Spranger 2025, in litt.). Sampling discovered that the novel bacterium infects other amphibian species and is not limited to Santa Cruz long-toed salamanders. This novel bacterium has been detected in every pond that was tested, and it's assumed to be present in all Santa Cruz long-toed salamander metapopulations and a majority, if not all, of the breeding sites. Currently, we have no data to suggest that this novel bacterium rises to the level of a threat to the Santa Cruz long-toed salamander. Mass mortalities of individuals have not occurred and survival of infected individuals at most breeding sites is high. Additional work is needed to better understand this novel bacterium and its effects on the Santa Cruz long-toed salamander.

Conserved Lands:

Within the range of the Santa Cruz long-toed salamander, multiple breeding sites and adjacent uplands occur on lands that are conserved and managed for the species. Below we identify lands conserved and entities owning and managing them for the Santa Cruz long-toed salamander:

- The Service's 168-acre (68-hectare) Ellicott Slough National Wildlife Refuge was established in 1975 to protect habitat for the Santa Cruz long-toed salamander in Santa

Cruz County. Ellicott Slough National Wildlife Refuge is managed as part of the San Francisco Bay National Wildlife Refuge Complex.

- The Santa Cruz long-toed salamander Ecological Reserve is owned by CDFW and was created to protect and provide breeding, upland and dispersal habitat for Santa Cruz long-toed salamanders. The Santa Cruz long-toed salamander Ecological Reserve is comprised of multiple units:
    - 9-acre (4-hectare) Valencia Lagoon Unit, established 1973;
    - 29-acre (12-hectare) Ellicott Unit, established 1973;
    - 42-acre (17-hectare) McClusky Unit, established 1996;
    - 103-acre (42-hectare) Larkin Valley Unit, established 2007; and
    - 68-acre (28-hectare) Willow Canyon Unit, established 2009.

- The 589-acre (238-hectare) Watsonville Slough Ecological Reserve was established in 1998 to protect wetland habits. The Watsonville Slough Ecological Reserve is owned and managed by CDFW.

- The 1,739-acre (704-hectare) Elkhorn Slough National Estuarine Research Reserve (ESNERR) was established in 1979. The reserve is administered by NOAA, owned and managed by CDFW, and supported by its partnership with the Elkhorn Slough Foundation.

- The Elkhorn Slough Foundation is a nonprofit land trust founded in 1982 to conserve and restore Elkhorn Slough and its watershed. The Elkhorn Slough Foundation restores habitat, protects native species, improves water quality, supports healthy farms and ranches, and nurtures connections between people and nature. The Elkhorn Slough Foundation is a partner with state and federal agencies to support the Elkhorn Slough Reserve.

- The Land Trust of Santa Cruz County has protected 162 acres (66 hectares) for the Santa Cruz long-toed salamander in Santa Cruz County. Additionally, by the end of 2025 the Land Trust of Santa Cruz County plans to protect another 111 acres (45 hectares) for Santa Cruz long-toed salamanders.

- The 147-acre (59 hectare) Seascape Uplands Preserve is located in Santa Cruz County and was established in 1997 (CNLM 2025, in litt.). The majority of the property (136 acres (55 hectares)) is owned and managed by the CNLM, while a smaller portion (11 acres (4 hectares)) is managed by CNLM and is under a conservation easement (CNLM 2025, in litt.).

- The 36-acre (15-hectare) Tucker Pond Preserve is located in Santa Cruz County and was established under a conservation easement in 2007 (CNLM 2025, in litt.). CNLM oversees compliance with the conservation easement (CNLM 2025, in litt.).

Santa Cruz long-toed salamander research since the 2019 5-year review

The Service funded, through a section 6 grant, a research project to assess the use of eDNA in surveying for Santa Cruz long-toed salamanders, among other coastal California wetland amphibian species (Goldberg et al. 2023, entire; Ralson et al. 2025, entire). Field sampling during this project using both eDNA and standard field surveys occurred during 2021–2022. The researchers found eDNA to be reliable in detecting the presence of Santa Cruz long-toed salamanders (Goldberg et al. 2023, pp. 13–14; Ralson et al. 2025, pp. 5–12).

In collaboration with the Service and CDFW, researchers at University of California at Santa Cruz (UCSC) initiated a pilot project to address concerns regarding local population declines and low genetic diversity in Santa Cruz long-toed salamanders. Santa Cruz long-toed salamanders from Monterey County show inbreeding depression, whereas Santa Cruz long-toed salamanders in Santa Cruz County had higher genetic diversity (UCSC 2023, p. 19). As part of the pilot program, in 2020–2021 a controlled crossing experiment was initiated to assess outbreeding depression. Based on successful results from the crossing experiment, the captive-reared larvae were reintroduced into breeding sites, as discussed in Appendix A. In the season following this pilot project, a controlled propagation and reintroduction program began and is ongoing as of this 5-year review (2025). Additionally, genetic sampling to determine differentiation across local populations is underway. Researchers at UCSC were awarded a Recovery Challenge Grant to carry out this work through the 2026 breeding season. The Wildlife Care Center is also a partner in the controlled propagation and reintroduction program. See Appendix A for details.

During the 2021–2024 breeding seasons, researchers monitored metamorphs emerging from natal ponds at 11 breeding sites across 4 metapopulations in both Santa Cruz and Monterey Counties (Searcy and O'Brien 2025, unpaginated). Their study aimed to better understand Santa Cruz long-toed salamander recruitment and if certain conditions favor increased recruitment. At several breeding sites, recruitment appears to be consistently low in most years, which is a concern for longevity of local Santa Cruz long-toed salamander populations. In their study, Ellicott Pond had the highest productivity by more than double that of the next most productive ponds, which were Upper Cattail Pond, Seascape Pond 1, Prospect Pond, and Calabasas Pond, respectively (Searcy and O'Brien 2025, unpaginated). The researchers found that the ideal distance between ponds to maximize productivity is approximately 230–2,550 feet (70–778 meters) and the more productive ponds were shallower, with water depths ranging between 14–70 inches (35–177 cm) in mid-May (Searcy and O'Brien 2025, unpaginated; O'Brien 2025, in litt.). Additionally, their results supported that larval densities may be a good indicator of Santa Cruz long-toed salamander recruitment counts (Searcy and O'Brien 2025, unpaginated). Also, monitored populations had lower recruitment in the low-rain years of 2021 and 2022 while recruitment increased in 2023 with higher rainfall (Searcy and Stemle 2024, in litt.).

In a study investigating use of land cover type by Santa Cruz long-toed salamanders, researchers tracked emerging metamorphs making their first movements from their natal pond into upland habitat. Individuals selected areas with more trees, higher soil moisture, and greater canopy cover relative to other available habitat (Stemle et al. 2024, in litt. p. 16).

In another study, researchers conducted a range-wide geospatial analysis for the Santa Cruz long-toed salamander. Their analysis included determining buffer distances coinciding with

reproductive values around a breeding site, the area of suitable upland habitat surrounding a breeding site, and anticipated levels of sea level rise (Stemle et al. 2024, pp. 4–6). Their results estimated that 24% of these breeding sites have sufficient upland habitat for long-term viability (Stemle et al. 2024, p. 9; Stemle et al. 2025, p. 14). These findings support that habitat loss is a threat to the species, which is compounded with the threat of increased salinity.

Evaluation of Recovery Criteria:
In 1999, the Service developed a draft revised recovery plan for the Santa Cruz long-toed salamander (Service 19999, entire); the draft has not been finalized. The draft revised plan contains draft recovery criteria for downlisting and delisting of the species (Service 1999, pp. 42–44), summarized below:

Draft criteria for downlisting to threatened (Service 1999, p. 42):

- The following four metapopulations are protected and managed such that habitat is conserved, maintained, and/or restored: Valencia-Seascape, Larkin Valley, Ellicott-Buena Vista, and McClusky Slough.
- Each complex must contain at least two functional breeding ponds or sites, as well as sufficient upland habitat to support self-sustaining populations.
- Self-sustaining populations or subpopulations are supported for a minimum of 20 years, as evidenced by an age structure indicative of a stable or growing population.

Draft criteria for delisting (Service 1999, p. 44):

- Downlisting criteria are met, plus at least three functional breeding ponds or sites in each metapopulation, and at least two additional self-sustaining populations and their associated habitats are protected with at least one population located in Monterey County.

Currently, the Santa Cruz long-toed salamander is known to be present, or assumed to be present, at 43 breeding sites and the surrounding uplands within six metapopulations. While there has been an increase in the number of known breeding sites and protected habitat since time of listing, evidence of stable or growing populations is lacking. Threats at time of listing remain and new threats include a lack of adequate upland habitat to support self-sustaining populations and increasing salinity at several breeding sites. In light of new information on threats, population viability, and genetics, the draft criteria from 1999 may need to be reconsidered.

Conclusion:
After reviewing the best available scientific information, we conclude that the Santa Cruz long-toed salamander remains an endangered species. The evaluation of threats affecting the species under the factors in 4(a)(l)of the Endangered Species Act and analysis of the status of the species in our Santa Cruz long-toed salamander 5-year reviews (Service 2009, Service 2019) remain an accurate reflection of the species current status. Habitat loss has affected Santa Cruz long-toed salamanders and the current amount of suitable upland habitat surrounding Santa Cruz long-toed salamander breeding sites is limited and may not support minimum viable population sizes. The threat from the effects of sea level rise is increasing and apparent. Over the past decade, some Santa Cruz long-toed salamander breeding sites have experienced effects from saltwater intrusion and high salinity and multiple breeding sites are projected to be affected in

the future as sea levels rise. Small population effects and persistent low recruitment of Santa Cruz long-toed salamanders has only magnified concerns of declining local populations.

RECOMMENDATIONS FOR FUTURE ACTIONS:

Below we present recommendations to inform and implement recovery of the Santa Cruz long-toed salamander.

- Continue the controlled propagation and reintroduction program.
- Locate and conserve (through acquisition, conservation easements, or other mechanisms) suitable upland and breeding habitat for the species. Prioritize land with sufficient area of suitable upland habitat that is not projected to be affected by sea level rise.
- Create new breeding ponds for the species and enhance existing and potential breeding ponds, as necessary. Prioritize land with sufficient area of suitable upland habitat that is not projected to be affected by sea level rise.
- Maintain and/or restore upland habitat in proximity to all current breeding sites and translocation sites.
- Conduct research into ways to ameliorate low recruitment and increase local population abundance.
- Investigate and implement potential road crossings or under-road tunnel locations to reduce impacts from habitat fragmentation and to assist in metapopulation connectivity.

Lead Field Supervisor, Ventura Fish and Wildlife Office

Approved CATHERINE DARST Digitally signed by CATHERINE DARST Date: 2025.08.06 12:07:49 -07'00'

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Appendix A. Santa Cruz long-toed salamander Controlled Propagation and Reintroduction Project

The information below related to the Santa Cruz long-toed salamander controlled propagation and reintroduction project is summarized from Service 2023 and Spranger and Parandhaman 2024, in litt.

In 2020–2021 (Year 1), researchers at University of California Santa Cruz (UCSC) began controlled crossing experiments with Santa Cruz long-toed salamanders from Santa Cruz County and Monterey County. The purpose was to test if individuals cross-bred from the two counties could reproduce successfully with no outbreeding depression effects. Adults were sourced from three breeding sites. Offspring larvae were found to be healthy from each of the various crosses and released back into the wild. The approximate number and location of larvae released in spring 2021 includes: 201 at Swimming Pool Pond, 500 at Upper Cattail Pond, 502 at Long Valley Pond, and 782 at McClusky Slough. Fifty larvae that completed metamorphosis were released at Rush Pond. Ten adults sourced from McClusky were kept in captivity after breeding to use in future controlled propagation in 2021–2022. See Table A-1.

In 2021–2022 (Year 2), a total of 36 adult Santa Cruz long-toed salamanders, from both Monterey and Santa Cruz counties, were captured from the wild for controlled propagation to boost population sizes. The number of larvae released at a breeding site in spring 2022 includes: 300 at Rush, 200 at Upper Cattail, and 230 at Long Valley. See Table A-1.

The project paused in 2022–2023, controlled breeding resumed in 2023–2024 (Year 3). A total of 35 adult Santa Cruz long-toed salamanders, from both Monterey and Santa Cruz counties, were captured from the wild for breeding purposes. Seven McClusky adults remained alive in captivity. The number of larvae released at a breeding site in spring 2023 includes: 423 at Rush and 399 at Cecil. See Table A-1.

A total of 3,587 Santa Cruz long-toed salamander larvae were released into the wild during project Years 1–3. All releases under the controlled propagation and reintroduction program occurred at Monterey County breeding sites in an attempt to increase genetic diversity and bolster local populations.

In 2024–2025 (Year 4), controlled propagation is planned to continue and carry on for two additional years (Year 5 and Year 6).

Table A-1. Number of Santa Cruz long-toed salamanders reintroduced at a breeding site by project year.

Project Year	Swimming Pool*	Upper Cattail*	Long Valley*	McClusky^	Rush*	Cecil*
1	201	500	502	782	50	
2		200	230		300	
3					423	399

*Breeding site in Elkhorn Metapopulation.
^Breeding tie in McClusky Metapopulation.

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