

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



Photo: Susie Fork and Kerstin Wasson, Elkhorn Slough National Estuarine Research Reserve

**October 2019**

## **GENERAL INFORMATION:**

**Species:** *Ambystoma macrodactylum croceum*

**Date listed:** March 11, 1967 under the Endangered Species Preservation Act of 1966

**FR citation(s):** 32 FR 4001

**Classification:** Endangered

## **BACKGROUND:**

**Most recent status review:** U.S. Fish and Wildlife Service. 2009. Santa Cruz Long-Toed Salamander (*Ambystoma macrodactylum croceum*) 5-Year Review: Summary and Evaluation. USFWS. Ventura Field Office. Ventura, California.

**FR Notice citation announcing this status review:** U.S. Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status Reviews of 58 Species in California, Nevada, and the Klamath Basin of Oregon. Federal Register 84:36116-36118.

## **ASSESSMENT:**

### **Information acquired since the last status review:**

This 5-year review was conducted by the U.S. Fish and Wildlife Service's (Service) Ventura Fish and Wildlife Office. Data for this review were solicited from interested parties through a Federal Register notice announcing this review on July 26, 2019. We also contacted State agencies, local agencies, partners, stakeholders, and species experts 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.

New information collected since the most recent 5-year review (Service 2009), which is discussed in the following paragraphs, includes: the functional loss of known breeding ponds; a decline in population numbers at breeding sites; the enhancement of breeding ponds; the creation of new breeding ponds; the discovery of previously unknown breeding ponds; information on salinity tolerances; and mosquito abatement activities as a threat to the species throughout its range.

The Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*) inhabits temporary ponds for breeding and adjacent upland scrub and woodland areas during the nonbreeding season. These ponds and adjacent scrub and woodland habitats occur in relatively few areas along the central coast of California. This subspecies is restricted to southern Santa Cruz and northern Monterey Counties across four metapopulations in Santa Cruz County, and two metapopulations within Monterey County. The entire distribution spans no more than 25 kilometers (~15 miles).

Since 1954, 32 breeding sites for the Santa Cruz long-toed salamander have been identified; 22 of which occur in southern Santa Cruz County, and 10 in northern Monterey County (Table 1).

As of this 5-year review, 23 sites are known or assumed to have successful breeding, with 18 of those sites located in Santa Cruz County and five in Monterey County. When compared with known or assumed successful breeding sites at the time of the last 5-year review (Service 2009), this is an increase of two sites, both being in Santa Cruz County. The subspecies has likely been extirpated from at least four locations; Bennett Slough/Struve Pond and Zmudowski Pond in Monterey County and Rancho Road Pond and Anderson's Pond in Santa Cruz County. Although some breeding sites have been lost, some have also been gained, therefore, we believe that the species distribution remains the same as described in the species previous 5-year review (Service 2009). See Table 1 below for a summary of new information.

### **Functional loss of known breeding ponds**

Monterey County breeding ponds in both metapopulations are being functionally lost due to salt water intrusion. This information confirms that the threat of increased salinity, as stated in the previous 5-year review (Service 2009), remains on-going for these metapopulations.

In the McClusky metapopulation area, during heavy winter storms of 2016, ocean water overtopped the barrier beach adjacent to Zmudowski Pond. This overtopping resulted in the influx of marine water throughout Zmudowski Pond and potentially McClusky Slough as well.

In the Elkhorn metapopulation area, recent mechanical failures at a tide-gate near the mouth of Moro Cojo Slough in Monterey County resulted in tidal (ocean) water flowing upstream to the Southern Moro Cojo Slough breeding site, resulting in high salinity levels. Although Monterey County is planning to repair the tide-gate once funding has been allocated and permitting is complete, the effects of increasing tidal influence at this location are likely to result in the loss of Southern Moro Cojo Slough breeding site until tidal water is excluded from this area. Currently, the Service is partnering with Moss Landing Marine Labs and the Resource Conservation District of Monterey County to install a temporary weir structure within Moro Cojo Slough, to prevent water from flowing upstream to the known breeding site. We anticipate that the temporary weir structure will be installed in 2020.

High salinity levels have also been reported at Lower Cattail Swale, located at Elkhorn Slough National Estuarine Research Reserve (ESNERR) in Monterey County. During the winter of 2017-2018, high salinity levels were detected, and upon further investigation, it was revealed that a structural failure of the tide-gate which separates Lower Cattail Swale from estuarine habitat was the cause. ESNERR, in partnership with the Service, anticipates conducting repairs to the subject tide-gate in 2019. Fortunately, ESNERR recently enhanced (deepened) Upper Cattail Swale, which is located adjacent upstream from Lower Cattail Swale. The enhancement of this pond is expected to offset the potential loss of Lower Cattail Swale in this metapopulation.

### **Decline in population numbers at breeding sites**

Population monitoring data are not available for most Santa Cruz long-toed salamander breeding ponds. Where monitoring does occur, data provided by Laabs, D (Biosearch 2019) indicate that population numbers at all three Seascape Ponds in Santa Cruz County have been declining over the last decade. It is believed that periodic drought conditions and increased sediment deposition at this location are likely the prime contributing factors of this decline.

In 2015 and 2016, the rough-skinned newt (*Taricha granulosa*) breeding population at Tucker Pond in Santa Cruz County increased dramatically. During aquatic sampling in 2016, high numbers of adult newts that arrived to breed in the winter remained in the pond through the summer and no other larval amphibians were detected. Newts likely preyed on eggs, larvae and adults of sympatric amphibians, including the Santa Cruz long-toed salamander. Prior to the 2016-2017 winter field study (Biosearch 2018) a newt exclusion fence was installed in an attempt to allow unimpeded Santa Cruz long-toed salamander breeding and metamorphosis. In early June 2017, for the first time in four years, late-stage Santa Cruz long-toed salamander larvae were present, suggesting that excluding a portion of the newt population resulted in survival of Santa Cruz long-toed salamander larvae. Newt exclusion efforts continued during the 2017-2018 season. Aquatic sampling in 2018 revealed the highest number of Santa Cruz long-toed salamander larvae detected since monitoring began in 2007. Low numbers of adult and larval rough-skinned newts were also present. Unfortunately, during the 2018-2019 breeding season, aquatic sampling efforts found that rough-skinned newts were able to enter the pond in high numbers, resulting in no Santa Cruz long-toed salamander larval detections. It is presumed that smaller sized newts were able to breach the exclusion fencing, in addition to all size classes of newts entering the pond via small mammal burrows. Discussions regarding newt management are ongoing, and it is anticipated that hydroperiod manipulation may be the next best course of action to reduce the newt population.

### **Enhancement of breeding ponds**

Two existing breeding ponds in Santa Cruz County (Ellicott and Buena Vista Ponds), which are located on lands owned by the California Department of Fish and Wildlife (CDFW), were enhanced in 2014 to retain water longer into the dry summer months. Over the last decade, pond monitoring conducted by Service personnel identified increasingly inconsistent rainfall patterns and periodic drought conditions, resulting in water levels that are insufficient to support metamorphosis of Santa Cruz long-toed salamanders. Pond enhancement activities consisted of deepening a portion of Ellicott Pond to a depth of 4 feet, and lining a portion of Buena Vista Pond with sodium bentonite. Although recently implemented, subsequent monitoring of these ponds indicate that both enhancement projects were successful in increasing water retention. As indicated in the previous 5-year review (Service 2009), we anticipate that the ongoing effects of drought will continue to threaten the species throughout its range.

### **Creation of new breeding ponds**

In 2012, a derelict pond (Prospect Pond) was reconstructed at Ellicott Slough National Wildlife Refuge (Refuge) in Santa Cruz County; and in 2015, two new ponds were created at CDFW owned properties in Aptos, one at the Willow Canyon Property (Willow Canyon Pond) and one at the Millsap Property (Millsap Pond II). All three breeding ponds were constructed to bolster existing populations in locations where the species is known to occur. As of 2019, breeding has been confirmed at Prospect Pond and Willow Canyon Pond. Hydrological monitoring at Millsap Pond II indicates insufficient water levels to support recruitment of Santa Cruz long-toed salamanders at this location. The Service, CDFW, and local partners are in the planning stage of rectifying this issue.

### **Discovery of previously unknown breeding ponds**

In 2013, two new breeding ponds were discovered in Santa Cruz County. Breeding was confirmed in Delaney Pond, which is located on private property adjacent to the Refuge in the Ellicott-Buena Vista metapopulation. The species was also confirmed breeding at a private property located on Winterwind Way (Winterwind Way Pond), which is located in Larkin Valley (Larkin Valley metapopulation).

In 2019, the Santa Cruz long-toed salamander was also confirmed breeding at two new ponds in Monterey County. Larval individuals were found during aquatic surveys at Central Pond, which is located on lands owned by the North Monterey County High School (NMCHS), and at Howell Pond, which is located on lands owned by CDFW.

### **Salinity tolerances**

Howell Pond is connected hydrologically with tidally (marine) influenced marsh, prompting weekly monitoring of salinity levels by ESNERR staff (Fork, pers. comm.) to determine if and when larval individuals should be captured and translocated to less saline aquatic habitat to complete their metamorphosis. We observed approximately 110 larval individuals in Howell Pond during informal aquatic surveys on April 29, making this the single largest density of larval individuals at any surveyed breeding site over, at least, the last decade in Monterey County. Additionally, the Howell Pond observation was one of only four locations in Monterey County where the species was confirmed breeding in 2019. Salinity levels of approximately 2 to 3 parts per thousand (ppt) were detected at the time of the initial aquatic survey. Although accurate information on salinity tolerances for the Santa Cruz long-toed salamander is not known, it is estimated that the upper limit of salinity tolerances for the California red-legged frog is approximately 5 to 6 ppt (Biosearch, 2003). By mid-May, salinity levels reached over 3 ppt. On June 5, a dead larvae was observed floating on the surface, with no physical signs of predation. Salinity levels on June 5 were 3.3 ppt around the margins of the pond in shallow water, and 4.1 ppt at a depth of approximately 5 feet. On June 7, staff from ESNERR, CDFW, and the Service conducted aquatic surveys in order to translocate remaining individuals. Salinity levels at this time reached approximately 3.3 ppt along the pond margins, and 5.1 ppt in the deeper areas of the approximately 5-foot depth pond. Unfortunately, only 15 larvae were observed and captured during intense surveys of the pond. These larvae were translocated to Upper Cattail Pond at ESNERR. This information indicates a dramatic decline in larval individuals once salinity levels around the pond margin increased to over 3 ppt. In the future, we recommend that larval translocations be conducted prior to salinity levels reaching 3 ppt, or as soon as possible if occupied breeding habitats are threatened by quickly rising salinity levels. It should also be noted that abundant numbers of mosquitofish were captured during aquatic surveys on June 7, indicating the need for collaboration between CDFW and the Northern Salinas Valley Mosquito Abatement District, to ensure that mosquitofish are not introduced into aquatic habitats with sensitive species.

### **Mosquito abatement activities as a threat to the species**

Concerns about public health and safety have resulted in broad treatment of most freshwater habitats to reduce or eliminate nuisance and health threats associated with mosquitos within the range of the Santa Cruz long-toed salamander. Although we recognize the importance of

addressing the threats mosquitos present, we also recognize that governmentally implemented mosquito abatement activities can have unintended consequences on non-target insects and wildlife, with particularly negative effects on native amphibians. To achieve metamorphosis, larval amphibians depend on the food web that healthy wetland habitats provide. When this web is altered, reduced, or eliminated through mosquito abatement activities, breeding and recruitment of amphibian species can be drastically reduced or eliminated. Mosquito abatement activities present an on-going threat to the Santa Cruz long-toed salamander throughout its range.

**Table 1.** Status of and threats to Santa Cruz long-toed salamanders at the 32 known breeding locations in Santa Cruz County (Valencia-Seascape, Ellicott-Buena Vista, Freedom, Larkin Valley complexes) and Monterey County (McClusky and Elkhorn complexes), California. (Status: P = present; AP = assumed present; X = likely extirpated; ? = unknown, N/A = not applicable). Acronyms for land ownership are as follows: CDFW = California Department of Fish and Wildlife; CDPR = California Department of Parks and Recreation; CNLM = Center for Natural Lands Management; ESNERR = Elkhorn Slough National Estuarine Research Reserve; TNC = Nature Conservancy; ESF = Elkhorn Slough Foundation; NMCHS = North Monterey County High School; SFBNWR = San Francisco Bay National Wildlife Refuge

Breeding Site	2009 Status	2019 Status	Ownership	Most recent confirmed breeding	Threats: 2009 Review	Additional Threats Update: 2019 Review
<b>Valencia-Seascape Complex</b>						
Valencia Lagoon	P	P	CDFW	2019	Urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants	Mosquito abatement activities
Seascape Pond 1	P	P	CNLM	2019	Urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities
Seascape Pond 2	P	P	CNLM	2019	Urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Seascape Pond 3	P	P	CNLM	2019	Urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Willow Canyon Pond	N/A	P	CDFW	2019	N/A	Mosquito abatement activities, exotic animals, exotic plants, disease/infection, sedimentation, recreation
<b>Ellicott-Buena Vista Complex</b>						
Ellicott Pond	P	P	CDFW	2019	Agriculture, urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Green's Pond	P	AP	Private	2015	Agriculture, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities
Buena Vista Pond	P	P	CDFW	2019	Exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Rancho Road Pond	X	X	Private	1996	Urbanization	N/A
Anderson's Pond	P	X	Private	1960s	Agriculture, urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities
Prospect Pond	N/A	P	SFBNWR	2019	N/A	Mosquito abatement activities, agriculture, urbanization, exotic animals,

						exotic plants, disease/infection, sedimentation, drought
Delaney Pond	N/A	P	Private	2019	N/A	Mosquito abatement activities, agriculture, urbanization, exotic animals, exotic plants, disease/infection, drought, sedimentation
<b>Freedom Complex</b>						
Palmer Pond	P	?	Private	2004	Urbanization, exotic plants, disease/infection, sedimentation, drought	No Change
Tucker Pond	P	P	Private	2019	Urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities
Millsap Pond	P	P	CDFW	2019	Urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Millsap Pond II	N/A	N/A	CDFW	N/A	N/A	Mosquito abatement activities, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought
Merk Pond	P	AP	Private	2004	Agriculture, urbanization, exotic animals, exotic plants, sedimentation, contaminants, drought	Mosquito abatement activities
Racehorse Lane Pond	P	AP	Private	2004	Urbanization, exotic plants, disease/infection, sedimentation, contaminants, drought	Mosquito abatement activities, exotic animals
<b>Larkin Valley Complex</b>						
Calabasas Pond	P	P	SFBNWR	2019	Urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Suess Pond	P	AP	Private	2004	Urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Olives Pond	P	AP	Private	2004	Grazing, urbanization, exotic plants, disease/infection, sedimentation, drought	Mosquito abatement activities, exotic animals
Winterwind Way	?	AP	Private	2016	N/A	Mosquito abatement activities, grazing, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, drought

<b>McClusky Complex</b>						
McClusky Slough	P	AP	Private	2004	Agriculture, exotic animals, exotic plants, disease/infection, sedimentation, contaminants, salinization	Mosquito abatement activities
Zmudowski Pond	?	X	CDPR, Private	2004	Agriculture, exotic plants, disease/infection, sedimentation, contaminants, salinization	Mosquito abatement activities
Bennett Slough/Struve Slough	X	X	TNC	1985	Salinization	Mosquito abatement activities
<b>Elkhorn Complex</b>						
Oxbow Pond	P	AP	Private	2019	Agriculture, urbanization, exotic animals, disease/infection, sedimentation, contaminants, drought	Mosquito abatement activities
Lower Cattail Swale	P	N/A	ESNERR	2017	Agriculture, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants, salinization, drought	Mosquito abatement activities
Northern Moro Cojo Slough	P	?	Private	2004	Agriculture, grazing, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants	Mosquito abatement activities, salinization
Southern Moro Cojo Slough	P	N/A	Private	2015	Agriculture, grazing, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants	Mosquito abatement activities, salinization
Upper Cattail Swale	N/A	P	ESNERR	2019	N/A	Mosquito abatement activities, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants, salinization, drought
Howell Pond	N/A	P	ESF	2019	N/A	Mosquito abatement activities, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants, salinization, drought
Central Pond	N/A	P	NMCHS	2019	N/A	Mosquito abatement activities, urbanization, exotic animals, exotic plants, disease/infection, sedimentation, contaminants, salinization, drought

**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)(1) of the Act and analysis of the status of the species in our Santa Cruz Long-Toed Salamander 5-Year Review (Service 2009) remains an accurate reflection of the species current status.

**RECOMMENDATIONS FOR FUTURE ACTIONS:**

- Locate and conserve (through acquisition, conservation easements, or other mechanisms) suitable upland and breeding habitat for the species
- Enhance existing and potential breeding ponds, as necessary, through the removal of excess sedimentation, the removal of exotic plants and animals, the deepening or lining of ponds, the planting of native vegetation, or other actions deemed necessary by the Service
- Maintain and/or restore upland habitat in proximity to all current breeding sites and translocation sites
- Create new breeding ponds and restore upland and dispersal habitats for the species
- Investigate and implement a population augmentation program, including controlled crossing experiments, strategic translocations to suitable breeding habitats, genetic analyses, and captive propagation
- Trap out individuals at McClusky pond to conserve genetic uniqueness in the face of extirpation
- Increase population survey efforts to better understand population dynamics
- Coordinate with mosquito abatement districts to reduce application of pesticides and herbicides in areas that contain Santa Cruz long-toed salamanders. Landowners and land managers should accompany mosquito abatement district staff during monitoring and treatment activities. Coordination should involve dissemination of information regarding monitoring and treatment dates and pesticide (adulticide/larvacide) application (amounts and areal extent).
- Investigate and implement potential road crossings or under-road tunnel locations to reduce impacts from vehicle strike and to assist in metapopulation connectivity

**Lead Field Supervisor, Fish and Wildlife Service**

Approve



Date

10/7/19

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**Personal Communications (pers. comm.)**

Fork, S. 2019. Electronic mail correspondence, dated June 10, 2019. Susie Fork, Elkhorn Slough National Estuarine Research Reserve, with Chad Mitcham, biologist, Ventura Fish and Wildlife Office.