

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT FORM
FOR THE
SHASTA COMPLEX SALAMANDERS**

SCIENTIFIC NAMES: *Hydromantes samweli*, *Hydromantes shastae*, and *Hydromantes wintu*

COMMON NAMES: Samwel salamander, Shasta salamander, and Wintu salamander

LEAD REGION: California-Great Basin Interior Region 10 (Legacy Region 8)

DATE INFORMATION CURRENT AS OF: March 17, 2021

STATUS/ACTION

Species assessment—determined either we do not have sufficient information on threats or the information on the threats does not support a proposal to list the species and, therefore, it was not elevated to Candidate status

Listed species petitioned for uplisting for which we have made a warranted-but-precluded finding for uplisting (this is part of the annual resubmitted petition finding)

Candidate that received funding for a proposed listing determination; assessment not updated

New candidate

Continuing candidate

Listing priority number change

Former LPN: ____

New LPN: ____

Candidate removal: Former LPN: ____

A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

F – Range is no longer a U.S. territory.

I – Insufficient information exists on taxonomy, or biological vulnerability and threats, to support listing.

M – Taxon mistakenly included in past notice of review.

N – Taxon does not meet the Act’s definition of “species.”

X – Taxon believed to be extinct.

Date when the species first became a Candidate (as currently defined): N/A

Petition Information:

Non-petitioned

Petitioned; Date petition received: July 11, 2012

90-day substantial finding FR publication date: September 18, 2015 (80 FR 56423)

12-month warranted but precluded finding FR publication date: N/A

FOR PETITIONED CANDIDATE SPECIES: N/A

- a. Is listing warranted (if yes, see summary of threats below)?
- b. To date, has publication of a proposal to list been precluded by other higher priority listing actions?
- c. Why is listing precluded?

PREVIOUS FEDERAL ACTIONS:

On July 11, 2012, we received a petition from the Center for Biological Diversity to list 53 species of reptiles and amphibians, including the Shasta salamander (*Hydromantes shastae*), as endangered or threatened under the Act. On September 18, 2015, we published our 90-day finding and found that the petition presented substantial scientific or commercial information indicating that listing the Shasta salamander as endangered or threatened may be warranted based on impacts to the species' habitat (Factor A) and other natural or humanmade factors (Factor E) (80 FR 56423). On April 23, 2018, the petitioners supplied us with a publication regarding a taxonomic split of the Shasta salamander into three separate species: Samwel salamander (*H. samweli*), Shasta salamander (*H. shastae*), and Wintu salamander (*H. wintu*) (Bingham *et al.* 2018, entire), and requested that we consider this information in our status review. On November 29, 2018, we received a complaint for not completing the 12-month finding. Per a court approved settlement agreement, we agreed to submit a 12-month finding for the Shasta salamander to the *Federal Register* by April 30, 2021.

ANIMAL/PLANT GROUP AND FAMILY: Amphibia, Plethodontidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: CA, USA

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: CA, Shasta County

LAND OWNERSHIP: U.S. Forest Service, Bureau of Land Management, National Park Service, Bureau of Reclamation, State Lands, and private lands.

LEAD REGION CONTACT: Arnold Roessler, Arnold_Roessler@fws.gov (916) 414-6613

LEAD FIELD OFFICE CONTACT: Christine Jordan, Christine_Jordan@fws.gov (530) 841-3111

SPECIES STATUS ASSESSMENT REPORT

The biological and threat information discussed below summarizes the information presented in the Species Status Assessment (SSA) Report for the Shasta Salamander Complex (SSA Report) (Service 2021, entire). For a full discussion of the biological and threat information presented here, please see the SSA Report.

EVALUATION OF LISTABLE ENTITIES

As stated above, we were petitioned in 2012 to list the Shasta salamander (*Hydromantes shastae*) as a single species. Prior to our current analysis, we became aware of and the petitioners provided additional genetic information pertaining to the Shasta salamander. The additional information identified the Shasta salamander as three distinct species (Samwel salamander (*H. samweli*), Shasta salamander (*H. shastae*), and Wintu salamander (*H. wintu*)). Under section 3 of the Act, we may consider for listing any species, including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). Such entities are considered eligible for listing under the Act and are referred to as “listable entities.” The petitioners have requested to list all three species as endangered or threatened under the Act as appropriate.

After consideration of the best scientific and commercial data available, which includes recent genetic information (Bingham *et al.* 2018, entire) regarding the Shasta salamander and recognition of this genetic information by the scientific community, we have determined that the three recognized species (Samwel salamander (*Hydromantes samweli*), Shasta salamander (*H. shastae*), and Wintu salamander (*H. wintu*)) are three separate listable entities under the Act. Our determination is based on the scientific community’s acceptance of the information to separate *Hydromantes shastae* into three individual species and clear published support for this separation (Bingham *et al.* 2018, entire).

BIOLOGICAL INFORMATION

Species Description

Shasta salamander (*Hydromantes shastae*) was first described in 1953 (Gorman and Camp 1953, entire). Since that time, the scientific community has determined that the Shasta salamander is made up of three separate individual species (Bingham *et al.* 2018, entire). The three species are identified as the Samwel salamander (*Hydromantes samweli*), Shasta salamander (*H. shastae*), and Wintu salamander (*H. wintu*). We refer to the three species in this document and the SSA as the Shasta Salamander Complex. The three salamanders are lungless web-footed salamanders that breathe through their skin and the mucous membrane in their mouth and throat. The three species are very similar except that the Shasta salamander has a longer third digit on the pes (rear foot). The standard length is 55.3–62.2 millimeters (mm) (2.17–2.45 inches (in)) for males and 50.3–63.6 mm (1.98–2.50 in) for females. Tails are short, strongly tapered and generally blunt-tipped and heads are broad and flattened.

Taxonomy and Genetic Information

From 1953 to 2018, the Shasta salamander was recognized as a single species (Gorman and Camp 1953, entire; Gorman 1964, entire; Rovito 2010, entire). However, a high degree of variation in genetic structure and genetic divergence was found after both mitochondrial and nuclear DNA studies of the species were completed (Wake *et al.* 1978, entire; Wake and Papenfuss 2005, entire; Bingham 2007, entire). In 2018, the Shasta salamander was split into three separate species (Bingham *et al.* 2018, entire). Based on this study, there are three divergent lineages made up of five genetic clades (a group of organisms that evolved from a common ancestor) (Bingham *et al.* 2018, pp. 403, 407). *Hydromantes shastae* and *H. wintu* make up two of the clades, with *H.*

samweli having three genetic clades (Figure 2, Bingham *et al.* 2018, p. 408). This information has been published and the split of the Shasta salamander has been accepted by the scientific community.

Habitat/Life History

The three species are strictly terrestrial for their entire lives. The species must always remain moist in order for individuals to absorb oxygen through their skin. Consequently, salamanders are only found above ground when it is moist and cool. Historically, the three species were thought to occur only in and near limestone, specifically rock outcrops and caves. In the last 25 years, the three species have been found in a broader range of habitats away from limestone, including other types of rock outcrops, and even habitats with no rock outcrop associations, such as areas with thick vegetative litter (Lindstrand 2000, pp. 259–261; Nauman and Olson 2004, pp. 35–38; Lindstrand *et al.* 2012, pp. 236–241). The three species can move and climb within the spaces between rocks and uphill, and can move quickly when disturbed (Papenfuss 2019, entire).

Historical Range/Distribution

The three species have a relatively small range and have evolved under similar environmental conditions. The historical range of the three species is restricted to unglaciated and non-volcanized areas. The absence of glaciation and volcanic activity has maintained the limestone and other rock outcrops and subsurface characteristics within the lower McCloud River, Pit River, and Squaw Creek watersheds, with Samwel salamander extending further west. They are found entirely within Shasta County, California. Although current survey efforts have identified the distribution of the three species within their respective ranges, the exact distribution of the three species within the larger range of suitable geologic habitat around and near Shasta Lake is unknown because surveys in such areas are difficult to obtain given the physical restrictions of accessing the terrain.

Current Range

The current range of the three species is similar to their historical range with likely some loss due to the construction of Shasta Dam and subsequent inundation from Shasta Lake in the 1950s.

Population Estimates/Status

Currently, the three species are known from 22 general population areas, 11 for Samwel salamander, 10 for Shasta salamander, and 1 for Wintu salamander. We used these general population areas as our analytical units/metapopulations in the SSA, and the SSA contains a comprehensive explanation of how these areas/units were derived. There are no population size estimates for the three species. The highest densities known are from Samwel Cave where 306 individuals were marked (with 77 recaptured) in a 0.68 acres (ac) (0.275 hectares (ha)) area over two seasons (Herman 2003, entire). Based on the survey information we have, Samwel salamander has the highest number of records, but it should be noted that the survey information may not reflect the actual population size and distribution of the three species.

Based on the best scientific and commercial information available and after speaking with species experts, an accurate population estimate, or census, is currently impossible given the infeasibility of establishing a relationship between the number of salamanders observed and the actual number present (Papenfuss 2019, entire). As a result, population trends are difficult to measure. To the

extent possible, however, and based on past and recent survey efforts, we consider all three species' populations to be continually present with no indications of a reduction in the species' distribution outside of those historical losses from the creation of Shasta Dam in the 1950s.

Summary of Biological Information

The Shasta Salamander Complex is comprised of three species (the Samwel, Shasta, and Wintu salamanders) in Shasta County, California. The three species are strictly terrestrial. The range of the three species is near the confluences of the McCloud River, Pit River, and Squaw Creek with the Sacramento River, with Samwel salamander extending further west. Habitat for the three species includes limestone caves, rock outcroppings, and other moist areas such as vegetative litter and downed wood. The current distribution of the three species is similar to their historical distribution. Although population number and trend information are lacking, there has been no apparent reduction in where the salamanders are found during multiple survey efforts.

DISTINCT POPULATION SEGMENT (DPS): N/A

THREATS

We define “threat” as any action or condition that is known to or is reasonably likely to negatively affect individuals of a species. This includes those actions or conditions that have a direct impact on individuals, as well as those that affect individuals through alteration of their habitat or required resources. However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an endangered species or a threatened species. In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an endangered species or a threatened species only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

In our analysis of the three species' status, we identified (1) changing climatic conditions and (2) habitat loss or fragmentation as the two major influences on the three species' status (Factors A and E). Changing climate conditions include the potential for increased temperature and decreased precipitation. These changes in climate are expected to increase the frequency and duration of drought periods, reduce snowpack, shift precipitation timing to later heavier seasonal storms, and increase winter and summer temperatures. These climatic changes will also likely lead to increases in the frequency and severity of wildfire. Habitat loss and fragmentation is associated with vegetation management activities (Factor A) and potential future actions associated with increasing the storage capacity of Shasta Dam (Factor E).

Future Conditions Timeframe

We used the best available information to evaluate and forecast the future condition and viability of

the Samwel, Shasta, and Wintu salamanders. For the purpose of our analysis, we looked at the ability of the three species to maintain their populations in their terrestrial ecosystems within biologically meaningful timeframes. In this case, we selected 15, 30, and 50 years. These timeframes were selected because they encompass the projections for each factor influencing species viability. The nearer term of 15 years accounts for the potential raise and associated impacts of Shasta Dam. It also encompasses the average lifespan of an individual salamander. The 30 and 50 year timeframes provide a longer temporal extent to assess the influences of changing climate and the associated fluctuations in temperature, precipitation, and wildfire, based on current wildfire data and climate change prediction models.

Changing Climatic Conditions

The climate related changes identified above have the potential to remove, reduce, and degrade the vegetative cover the three species need for moisture and protection from predators when active above ground. The changes will also affect the vegetation and food used by prey (Stebbins 2003, pp. 196–197). Leaf litter and downed wood helps to retain moist conditions and supports the insects and other invertebrates on which the three species feed. Loss of downed wood, leaf litter, and overstory cover (if present) from more frequent and intense wildfire will create warmer and drier conditions above and below ground (at least near the surface).

Wildfire. Wildfire is a normal occurrence within the range of the three species; but as noted above, climatic changes are anticipated to be a factor in increasing the frequency and severity of wildfire. Since 1990, fires have occurred within the range of both the Shasta and Samwel salamanders. The Wintu salamander, with its more limited range, has not been impacted by recent fires, but the potential remains for the future. The historical fire return interval for the area is estimated at every 6 to 15 years (Taylor and Skinner 2003, pp. 704, 709–710; Skinner *et al.* 2006, pp. 182, 187). Since 1990, wildfires have occurred almost annually within the range of the three species. And since the early 1980s, the frequency of autumn days with extreme fire weather conditions has more than doubled in California (Goss *et al.* 2020, p. 7), contributing to more frequent, higher severity fires.

Large, stand-replacing wildfires likely reduce habitat quality for the three Shasta salamanders. A loss of downed wood, leaf litter, and overstory cover (if present) from more frequent and intense wildfire is likely to result in warmer and drier conditions both on the surface and below ground (at least near the surface). This likely creates some unsuitable habitat and certainly further limits the time available for the species to be above ground (Bunnell and Houde 2010, pp. 398, 405–409). Because vegetation is lost, wildfires cause the subsequent erosion of soil and rock material. This erosion could have a larger influence on rock outcrops than cave and cliff sites (Lindstrand and Papenfuss 2019, p. 13).

However, the effects of wildfire on salamander habitat are temporary and populations appear to persist after wildfires and as vegetation recovers (Lindstrand *et al.* 2012, pp. 237–239; Lindstrand 2019, p. 13). Burn severity and the degree to which vegetation is removed within the footprint of a wildfire is variable. Additionally, wildfires typically burn during the dry summer and fall months when the salamanders are below ground, and narrow spaces in deeper rock habitats likely provide underground refugia.

Although salamanders are found in very specific habitats, the extent to which their subterranean habitat conditions will be influenced by changing climate is expected to be low. We base our

conclusion on the species' evolutionary history and their apparent persistence throughout multiple climate shifts, the species' seasonal cycles that protect them in underground refugia, and the species' documented persistence in their current habitats.

Habitat Loss

Habitat loss and disturbance from current and future vegetation management activities are threats to the three species. Vegetation management activities include timber harvest, prescribed fire, hazard tree mitigation, and mechanical fuels reduction activities. The potential raising of Shasta Dam, if implemented, has also been identified as contributing to habitat loss for the Shasta Salamander Complex in the future.

Timber Harvest. Timber harvest activities can accelerate the drying of moist habitats (downed wood, leaf litter, moss, and surface rock). However, we conclude that timber harvest activities are not a primary threat to the three species, based on the following reasons. First, surveys typically do not find salamanders in forest habitats. Rock outcrops or rock fissures where the salamanders are likely to occur are typically avoided during timber harvest activities (Johnson 2019, p. 15; Lindstrand 2019, p. 15). Second, most of the range of the three species occurs within the Shasta Lake National Recreation Area (NRA) and the Devil's Rock Hosselkus Research Natural Area (RNA). Management guidelines and land allocations in these areas mostly prohibit large-scale timber harvest activity from occurring. Third, the range of the three species is located on steep terrain with little access, which is also prohibitive to timber harvest activities.

The Forest Service, Bureau of Land Management (BLM), and National Park Service do conduct some timber management activities (mechanical fuels reduction and hazard tree mitigation), but these are mostly associated with areas within and surrounding recreation sites and along main roads. On private lands, the California Department of Fish and wildlife (CDFW) completes about one consultation a year for actions carried out under Timber Harvest Plans (THP) that may affect Samwel or Shasta salamander (Wintu salamander does not occur on private lands), but these incorporate mitigation or avoidance measures for impacts to habitat used by the two species since the species, as a single entity, is listed by the State (see Existing Regulatory Mechanisms and Conservation Measures Planned or Implemented).

Prescribed Fire. Prescribed fire activities are less intense and less destructive than wildfire. Prescribed fire is used to remove understory and overgrown fuel to reduce the impact of wildfire or to achieve other resource management goals (NPS 2020, entire). Prior to implementing a prescribed fire, a prescription plan is developed and approved by land managers that incorporates protection measures for habitat of sensitive species including the Shasta Salamander Complex (Service 2012, entire). For areas under Forest Service or BLM management, they use measures identified in the Northwest Forest Plan's Survey and Manage and Sensitive Species Programs to conserve sensitive species and their habitats when conducting prescribed burns (USDA-FS and USDI-BLM 1994, entire; 2001, entire).

Prescribed fire activities, such as pile burning or underburning, can occur during spring or late fall when salamanders are active above ground. Some habitat disturbance occurs (reduced downed wood, leaf litter, vegetation cover, and prey habitat) with burning and associated controllines. The impacts to amphibians from fire depends partly on the species' ability to move and avoid the fire. These three salamander species stay close to their subsurface refugia and can move quickly

(Service 2021, p. 23).

During the time when it is wet enough for salamanders to be active above ground, avoidance measures include constructing control lines at least 100 ft (30 m) from limestone or other rock outcrops prior to initiating prescribed burns. While the burn is occurring, it is assumed that individual salamanders retreat into rock crevices, holes, under the wood or rock cover objects, or simply move away from the site (Herman 2003, pp. 9, 32; Papenfuss 2019, p. 16; Herman 2020, p. 1). Given the avoidance measures, and the salamanders' ability to move away or disperse into underground refugia, the effects of prescribed fire are expected to be minimal to the three species.

Mechanical Fuels Treatment. Mechanical fuels reduction through the mechanical chipping (mastication) of shrubs or small trees can reduce vegetative cover, leaf litter, and downed wood. This activity usually results in large quantities of wood chips on the surface that can remain for a season or up to 2 years, depending on the thickness of chips. Mastication treatments are typically focused in dense shrublands. They are not typically large or continuous and they do not impact downed wood or leaf litter used as habitat for the three salamanders. The equipment used for mastication may disturb soil and rock cover. Because of the limited nature of this activity, it is not considered a primary threat to the three species. If mastication is completed in habitat areas or during conditions when salamanders are active above ground, they can retreat to subsurface areas (Herman 2003, pp. 9, 32; Papenfuss 2019, p. 16; Herman 2020, p. 1).

As discussed above, surveys typically do not find salamanders in forested timberlands but in or near rock outcrops or fissures within or at the margins of these areas (Johnson 2019, p. 15; Lindstrand 2019, p. 15). Although these vegetation management activities may be harmful if they are done when salamanders are active above ground (Olson and Lewendal 2000, pp. 177–178), surveys after timber harvest find salamanders are still present after treatment (Lindstrand 2019, p. 15). These activities do not appear to affect the moist, cool subterranean habitat of caves, rock crevices, or rock fissures used for thermal refugia or depositing eggs (oviposition) for the three species.

Vegetation management and other Federal and State land management actions can help to reduce the effects of larger, more frequent, higher severity wildfires by reducing fuels loads which can reduce fire severity and even limit the spread of wildfire. By following existing conservation measures and best management practices, the potential negative consequences of mechanical fuels treatments, timber harvest, and prescribed fire are reduced or eliminated. These measures and practices are primarily found in species and habitat protections described in the management recommendations and guidelines under the Northwest Forest Plan (NWFP) Survey and Manage program, and the Forest Service and BLM Sensitive Species programs.

In addition, because the Shasta salamander was listed as a threatened species under the California Endangered Species Act (CESA) (before it was split into three separate species), CDFW imposes regulatory guidelines through the CESA as well as the California Environmental Quality Act (CEQA) for the retention of suitable habitat during timber management activities and vegetation management actions on private lands. They also do this for the Surface Mining and Reclamation Act (SMARA) and conduct CEQA for mines on private property (see Existing Regulatory Mechanisms and Conservation Measures Planned or Implemented).

Raising of Shasta Dam. We reviewed the potential future threats associated with increasing the storage capacity of the Shasta Dam by raising the dam by approximately 18.5 feet (ft) (5.6 meters

(m)) (Factor E). If completed, the raise will inundate habitat and fragment existing salamander habitat. Although the certainty of the action is unknown, the Bureau of Reclamation recently finalized a Supplemental Environmental Impact Statement (Final SEIS) for the raising of Shasta Dam (Reclamation 2015, entire as revised; Reclamation 2020, entire).

Potential habitat (vegetation and cover objects on the surface, rock fissures, caves, and other subsurface refugia) for all three species would be inundated by the raise in the lake level or impacted by infrastructure relocation. The total estimated area potentially affected from the inundation and construction of new infrastructure is approximately 4,630 ac (1,874 ha) (Reclamation 2019, pp. 16–39). Based on our analysis of information of the dam raise, we have identified that portions of 3 of the 11 populations of Samwel salamander and 4 of the 10 populations of Shasta salamander could be affected by the potential raising of Shasta Dam. A small proportion of the habitat in the Wintu salamander’s population may be affected, but no known occurrence sites will be affected.

Reclamation’s 2015 EIS determined that for raising the existing dam, constructing new infrastructure (as planned at that time), and completing full inundation, approximately 15 ac (6 ha) of limestone outcroppings would be affected (Reclamation 2015, pp. 13–182, Table 13-35). This is less than one percent of the known limestone habitat in the geographic areas for the three species. Most of the currently known salamander sites and potential habitat extends above the current and proposed new lakeshore (Lindstrand and Papenfuss 2019, pp. 6, 16; CNDDDB 2020, entire; Johnson 2020, entire).

Cumulative Effects

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the three species, but we have also analyzed their potential cumulative effects. We incorporated the cumulative effects into our SSA analysis when we characterized the current and future condition of the three species. To assess the current and future condition of the three species, we undertook an iterative analysis that encompassed and incorporated the threats individually and then accumulated and evaluated the effects of all the factors that may be influencing the three species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Impacts of Threats on the Current and Future Resilience, Redundancy, and Representation

In our analysis of current and future conditions, we used the best scientific and commercial information available to assess the resilience, redundancy, and representation of the current populations for the three species. To assess the three species’ resiliency, redundancy and representation we looked to the known existing occurrence information and divided those locations into 22 analytical units for the three species (11 units for Samwel salamander, 10 units for Shasta salamander, and 1 unit for the Wintu salamander) (see Table 1).

Resiliency: Our determination of resiliency is based on the available habitat for each species (used as a proxy for supporting individuals), including habitat within and between each analytical unit. We determined that all three species currently maintain “high” resiliency. Known declines are not

occurring and there does not appear to be a decrease in habitat that supports reproduction, subterranean refugia, surface cover, or prey at large scales within the three species' ranges.

Representation: We do not have data to support that each species exhibits different physical, behavioral, or developmental characteristics based on their environmental setting; the experts agree that the sole difference between the three species is their genetic structure (Wake *et al.* 1978, pp. 529–539; Bingham 2007, entire; Bingham *et al.* 2018, entire). Because of its reliance on subterranean refugia, and its ability to remain sub-surface over long periods of time, vegetative habitat loss and degradation on the surface is not likely to significantly compromise representation. This has been demonstrated, at least, by the continued occupancy of these species in the landscape over long periods of time along with more recent observations of species occurrence and surface activity and prey abundance immediately after wildfires (Lindstrand 2019, entire; Johnson 2019, entire; Johnson 2020, entire; Lindstrand 2020a, entire).

Redundancy: We measured redundancy by the spatial extent of the metapopulations as defined by the analytical units and their degree of connectivity.

In addition, we assessed the extent and availability of habitat and other factors such as existing information on basic biology and the limited mobility for the known populations of Samwel, Shasta, and Wintu salamanders across their range. We then looked at the factors influencing the three species' current condition and looked to the expected future impacts of those and any other factors on the three species. The timeframe for our analysis for future conditions was based on the effects of climate condition changes projected out approximately 30 and 50 years under the moderate representative concentration pathways (RCP 4.5) and high (RCP 8.5) emission concentrations, respectively. We considered this our foreseeable future timeframe for our analysis of threats into the future.

We assessed the habitat and demographic factors for the 11 populations of Samwel salamander, 10 populations of Shasta salamander, and 1 population of Wintu salamander. In our analysis we found the current extent of the populations of each of the three species exist in an intact, mostly unfragmented landscape. Further, the 22 populations of the 3 species currently maintain an overall high condition for resiliency (Service 2021, pp. v–viii, 57–61) due to the relatively intact habitat conditions throughout most of their current ranges, which will allow the three species to continue to withstand annual environmental variation and stochastic events.

The results of our future condition analysis found some decreases in resilience, representation, and redundancy for each species due to changing climatic conditions and habitat loss, but not to the extent or magnitude to influence the Shasta salamander complex at the species level. As a result, based on projected future conditions, we expect the three species to continue to withstand annual environmental variation and stochastic events into the foreseeable future.

In our SSA Report for the Shasta Salamander Complex, we reviewed all factors under section 4(a)(1) of the Act. We considered but did not find that overutilization for commercial, recreational, scientific, or educational purposes (Factor B); and disease or predation (Factor C) to be influences to the three species at this time or into the future, based on the best scientific or commercial information. See the SSA Report for the Shasta Salamander Complex (Service 2021, entire) for additional discussion of these factors.

Table 1. Species Status Assessment Summary for the Shasta Salamander Complex

3Rs	Needs	Current Condition	Future Condition (Viability)
Resiliency: Large populations able to withstand stochastic events	Moist, cool habitat for reproduction and sheltering Cover habitat for predator avoidance Prey, rainfall and temperature Connectivity between populations and metapopulations	11 analytical units for Samwel salamander – <i>High Resiliency</i> One analytical unit for Wintu salamander – <i>High Resiliency</i> 10 analytical units for Shasta salamander – <i>High Resiliency</i>	Projections based on Future Scenarios for 22 Analytical Units Scenario 1: High in 18 and moderate in 4 Scenario 2: Moderate in 19 and low in 3 Scenario 3: High in 15, moderate in 6, 1 low Scenario 3a: High in 11, moderate in 5, 6 low Scenario 3b: High in 12 and 10 low
Redundancy: Number and distribution of populations to withstand catastrophic events	Multiple populations or metapopulations in each area of ecological representation	Samwel salamander has high redundancy in six analytical units, and moderate redundancy in five Wintu salamander has moderate redundancy across its one analytical unit Shasta salamander has high redundancy across five analytical units and moderate redundancy across five	Projections based on Future Scenarios for 22 Analytical Units Scenario 1: High in 12, moderate in 11, 1 low Scenario 2: Moderate in 10 and low in 12 Scenario 3: High in 5, moderate in 16, 1 low Scenario 3a: High in 4, moderate in 11, 7 low Scenario 3b: Moderate in 4 and low in 18
Representation: Genetic and ecological diversity to maintain adaptive potential	Genetic variation is well known Ecological representation exists throughout each species range	Ecological representation is present and high for Samwel and Shasta salamander and moderate for Wintu salamander	Projections based on Future Scenarios for 22 Analytical Units All Scenarios: All are expected to persist and none are at risk of extirpation, even with minor reductions in representation

Existing Regulatory Mechanisms and Conservation Measures Planned or Implemented

The Shasta salamander was listed as a State threatened species under CESA prior to the species being split into three species. The State CESA regulations provide measures to protect and conserve all three species. Any road construction or maintenance actions associated with timber harvest plans (THPs) or other roadways managed by Caltrans, the counties, or other private landowners undergo environmental compliance review with the State under CESA and CEQA, to assure that impacts to the State threatened species are mitigated. We expect these State measures to remain in place into the future.

The three species are listed as sensitive species for the U.S. Forest Service and BLM, and currently receive protection through conservation measures and best management practices under the NWFP Survey and Manage program and Sensitive Species programs. These measures reduce or eliminate impacts to rock outcrops, limestone areas, and known sites during road construction or maintenance activities as well as any vegetation management actions. We expect the Forest Service and BLM to continue these programs into the future.

Determination of Status for the Three Salamander Species

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of endangered species or threatened species. The Act defines an “endangered species” as a species that is “in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as a species that is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The Act requires that we determine whether a species meets the definition of “endangered species” or “threatened species” because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

Status Throughout All of the Three Species’ Range

After evaluating the threats to the three species and assessing the cumulative effects of the threats under the section 4(a)(1) factors, we determined that the primary threats impacting the Samwel, Shasta, and Wintu salamanders and their habitat throughout their range are changing climatic and environmental conditions (Factor A) and the potential for raising of Shasta Dam in the future (Factors E) (Service 2021, pp. 43–53). We also considered the impact of existing conservation measures on influencing the magnitude and extent of existing and future threats. We considered but did not find that overutilization for commercial, recreational, scientific, or educational purposes (Factor B); and disease or predation (Factor C) to be influences to the three species at this time or into the future, based on the best available scientific or commercial information. We considered existing regulatory mechanisms (Factor D) in light of their effect on the threats to the species. For example, habitat impacts associated with timber harvest were evaluated in light of the regulatory framework of State THPs and other Federal regulatory requirements such as the NWFP and how such mechanisms may assist in managing or ameliorating any threats.

We conclude that habitat loss or disturbance from various threats (*e.g.*, vegetation management activities, wildfire) within the range of Samwel, Shasta, and Wintu salamanders have likely impacted individuals of each species. However, the magnitude and extent of these impacts up to the present time have not impacted the resiliency, representation, or redundancy for each species or resulted in a decline in the overall distribution or general demographic condition of any of the three species such that they are in danger of extinction now throughout all of their ranges. The current extent of vegetation management activities (timber harvest, prescribed fire, and mechanical fuels treatments) within the range of the three species is limited due to the areas being part of a National Recreation Area and limitations due to access and topography. In addition, loss of habitat from wildfire has not significantly impacted the three species due to the type of habitat they occupy (rock outcrops and limestone caves), the ability of the species to escape to underground refugia, and recorded presence and occupancy after wildfire events.

Further, our evaluation of these currently existing threats, in combination with anticipated effects from the potential raising of Shasta Dam, leads us to similarly conclude that the magnitude and extent of anticipated future impacts will not result in a decline in the condition of any of the three species such that they are likely to become in danger of extinction throughout their respective ranges in the foreseeable future. We anticipate that existing vegetation management activities and

wildfire impacts will have a similar degree of impact into the future as they do currently, and that they will not result in the three species meeting the definition of threatened species. Although the potential of raising Shasta Dam would affect individuals and inundate or remove additional habitat for the three species, the extent of loss to both individuals and habitat areas is limited. Thus, after assessing the best available information, we determine that the Samwel, Shasta, and Wintu salamanders are not in danger of extinction now or likely to become so in the foreseeable future throughout all of their ranges.

Status Throughout a Significant Portion of the Three Species' Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Having determined that the Samwel, Shasta, and Wintu salamanders are not in danger of extinction or likely to become so in the foreseeable future throughout all of their ranges, we now consider whether they may be in danger of extinction or likely to become so in the foreseeable future in a significant portion of their individual ranges—that is, whether there is any portion of the three species' ranges for which it is true that both (1) the portion is significant; and (2) the species is in danger of extinction now or likely to become so in the foreseeable future in that portion. Depending on the case, it might be more efficient for us to address the “significance” question or the “status” question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

In undertaking this analysis for the Samwel, Shasta, and Wintu salamanders, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the three species face to identify any portions of the range of the three species where they are endangered or threatened. For the three species, we considered whether the threats are geographically concentrated in any portion of the three species' range at a biologically meaningful scale.

In Danger of Extinction in Any Portion

In undertaking this analysis for the Samwel, Shasta, and Wintu salamanders, we consider information pertaining to the geographic distribution of both the species and the threats that the species currently faces to identify any portions of the range where the three species may be endangered. For the Samwel, Shasta, and Wintu salamanders we examined the following threats: habitat loss and the current effects of climate change, including cumulative effects. The threat of habitat loss is associated with vegetation management and wildfire. These activities and events currently occur throughout the range of the three species to varying degrees and are limited in extent due to the three species' distribution and use of underground and subsurface habitat. Similarly, climatic changes (increased temperatures and changes to precipitation trends) will affect the entire geographic region of all three species. As a result, we found no concentration of threats in any portion of the Samwel, Shasta, and Wintu salamanders' range from these threats at a biologically meaningful scale. Therefore, no portion of the three species' ranges can provide a basis for determining that any one of the three species are in danger of extinction now in a significant portion of their ranges.

Likely to Become in Danger of Extinction in the Foreseeable Future in Any Portion

For our analysis of threats the three species are likely to face in the foreseeable future to identify any portions of the range where any of the three species may be threatened, we examined the same threats currently acting on the species as well as the threat associated with the potential Shasta Dam raise. We expect that impacts from vegetation management, wildfire, and changing climatic conditions, including cumulative effects will continue into the future. However, we do not expect that the threats will be concentrated in any portion such that they would impact any one of the three species at a biologically meaningful scale. As a result, we found no concentration of future threats in any portion of the Samwel, Shasta, and Wintu salamanders' range from vegetation management, wildfire, and changing climatic conditions.

The potential future dam raise and lake inundation would result in a loss of additional habitat occupied by the Samwel, Shasta, and Wintu salamanders. If the Shasta Dam raise happens, the lake level will rise approximately 20 feet (6 meters) above the current high-water level of the lake. The impacts associated with the raise include vegetation removal to reduce future navigation hazards, relocation of roads and other recreational facilities, and ultimately inundation of existing rock outcroppings and other habitat known to be occupied by the three species. In our examination, we found one area within the McCloud River arm of Lake Shasta that potentially would have a concentration of threats from the potential dam raise.

All three species are known to occur within or adjacent to the McCloud River arm to differing degrees. The Shasta and Wintu salamanders are least impacted by direct and indirect impacts of the raise due to their occupancy of areas farther away from the lake or in areas not identified for future development. The number of identified Samwel salamander locations would proportionally be impacted the most from the raise. However, the Samwel salamander currently also has the largest number of known occurrence locations and habitat. As a result, the vast majority of available habitat adjacent to the McCloud River arm will remain after inundation. We therefore consider the impacts from the potential dam raise to Samwel salamander to not be at a biologically meaningful scale due to the fact the known occurrences and their distribution for the species will remain high, extensive habitat will remain, and many areas within the McCloud River that have not been surveyed are considered by species experts to contain additional occurrences. As a result, we have determined that future potential impacts to the Samwel, Shasta, and Wintu salamanders in this portion of their ranges would not be at a biologically meaningful scale for the species. Therefore, no portion of the species' range can provide a basis for determining that the species are in danger of extinction now or likely to become so in the foreseeable future in a significant portion of its range, and we find that none of the species are in danger of extinction now or likely to become so in the foreseeable future in any significant portion of its range.

This is consistent with the courts' holdings in *Desert Survivors v. Department of the Interior*, No. 16-cv-01165-JCS, 2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

FINDING

Determination of Status

After evaluating threats to the Samwel, Shasta, and Wintu salamanders under the section 4(a)(1) factors, we find, based on the best scientific and commercial information that the Samwel, Shasta,

and Wintu salamanders do not meet the definition of endangered or threatened species in accordance with sections 3(6) and 3(20) of the Act. Therefore, we find that listing the Samwel, Shasta, and Wintu salamanders as endangered or threatened species under the Act is not warranted at this time.

COORDINATION WITH STATES

We coordinated with the State of California through the California Department of Fish and Wildlife in the development of the SSA for the Shasta Salamander Complex.

REFERENCES CITED

- Bingham, R. E. 2007. Differentiation across multiple spatial scales in three Californian amphibians [dissertation]. Berkeley, California: University of California.
- Bingham, R. E., Papenfuss, T. J., Lindstrand III, L., and D. B. Wake. 2018. Phylogeography and species boundaries in the *Hydromantes shastae* complex, with description of two new species (Amphibia; Caudata; Plethodontidae). *Bulletin of the Museum of Comparative Zoology* 161(10). Harvard University, Cambridge MA, USA.
- Bunnell, F. L. and I. Houde. 2010. Down wood and biodiversity- implications to forest practices. *Environmental Reviews*. 18: 397–421.
- California Natural Diversity Database [CNDDDB]. 2020. Detection data from the RareFind-CNDDDB Database. California Department of Fish and Wildlife. Sacramento, CA. accessed April and August 2020.
- Center for Biological Diversity. 2012. Petition to List 53 Amphibians and reptiles in the United States as Threatened or Endangered Species under the Endangered Species Act. Pages: 1–86, 313, 362–368. Dated July 11, 2012.
- _____. 2018. Information from the Center for Biological Diversity regarding research on species split of Shasta salamanders into three species. April 23, 2018.
- Gorman, J. 1964. *Hydromantes brunus*, *H. platycephalus*, and *H. shastae*. *Cat. Am. Amphibians and Reptiles* 11.
- Gorman J. and C. L. Camp. 1953. A New Cave Species of Salamander of the Genus *Hydromantes* from California, with Notes on Habits and Habitat. *Copeia*. 1953(1): pp. 39–43. Feb. 26, 1953.
- Goss, M., Swain, D.L., Abatzoglou, J.T., Sarhadi, A., Kolden, C.A., Williams, A.P. and N.S. Diffenbaugh. 2020. Climate change is increasing the likelihood of extreme autumn wildfire conditions across California. *Environmental Research Letters*. 15: 094016.
- Herman, A. E. 2003. Aspects of the ecology of the Shasta salamander, *Hydromantes shastae*, near Samwell Cave, Shasta County, California. Thesis, Humboldt State University, Arcata, California, USA.
- Herman, A. E. 2020. Peer Review comments for the Draft Species Status Assessment. Shasta Salamander Complex.
- Johnson, T. 2019. Feedback and Notes for the March 2019 Rapid Assessment for the Shasta Salamander 12-Month Listing Review.
- Johnson, T. 2020. Peer Review comments for the Draft Species Status Assessment. Shasta Salamander Complex.
- Lindstrand III, L. 2019. Feedback and Notes for the March 2019 Rapid Assessment for the Shasta Salamander 12-Month Listing Review.
- Lindstrand III, L. 2020a. Peer Review comments for the Draft Species Status Assessment. Shasta Salamander Complex.

- Lindstrand III, L. 2000. Discovery of Shasta salamanders in atypical habitat. *California Fish and Game*. 86: 259–261.
- Lindstrand III, L. and T. Papenfuss. 2019. Feedback and Notes for the March 2019 Rapid Assessment for the Shasta Salamander 12-Month Listing Review. Lindstrand III, L., K. Bainbridge, and G. Youngblood. 2012. Habitat characteristics, a range extension, and an elevational record for Shasta salamanders. *California Fish and Game*. 98: 236–241.
- Nauman, R. S., and D. H. Olson. 2004. Surveys for terrestrial amphibians in Shasta County, California, with notes on the distribution of Shasta salamanders (*Hydromantes shastae*). *Northwestern Naturalist*. 85: 35–38.
- National Park Service. 2020. Wildland Fire: What is a Prescribed Fire? National Park Service webpage: <https://www.nps.gov/articles/what-is-a-prescribed-fire.htm>. Dated March 19, 2020. [Accessed 12/15/2020].
- Olson, D.H. and P.C. Lewendal. 2000. Management Recommendations for the Shasta salamander (*Hydromantes shastae*). USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR.
- Papenfuss, T. 2019. Feedback and notes from the March 2019 Rapid Assessment for the Shasta Salamander 12-Month Listing Review.
- Rovito, S. M. 2010. Lineage divergence and speciation in the web-toed salamanders (Plethodontidae) of the Sierra Nevada, California. *Molecular Ecology*. 19: 4554–4571.
- Skinner, C., A. H. Taylor, J. K. Agee. 2006. Klamath Mountains Bioregion (Chapter 9). Pp. 170–194, *In: Fire in California's Ecosystems*. Edited by N.G. Sugihara, J.W. van Wagtenonk, J. Fites- Kaufman, K.E. Shaffer, A.E. Thode. University of California Press, Berkeley, CA.
- Stebbins, R. C. 2003. *A Field Guide to Western Reptiles and Amphibians*. 3rd Edition. Houghton Mifflin Company, 2003.
- Taylor, A.H., and C.N. Skinner. 2003. Spatial Patterns and Controls on Historical Fire Regimes and Forest Structure in the Klamath Mountains. *Ecological Applications*. 13(3): 704–719.
- U.S. Department of Agriculture–U.S. Department of Interior (Forest Service–Bureau of Land Management). 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl. April 1994.
- _____. 2001. Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. January 2001.
- U.S. Bureau of Reclamation [Reclamation]. 2015. Final Environmental Impact Statement for the Shasta Lake Water Resources Investigation. Shasta County, California. U.S. Department of the Interior Bureau of Reclamation, Mid-Pacific Region. July 29, 2015.
- _____. 2019. Biological Assessment for Threatened, Endangered, and Proposed Species that May be Affected by the Shasta Dam Raise Project. Shasta County, California. U.S. Department of the Interior Bureau of Reclamation, Mid-Pacific Region. March 2019.

- U.S. Fish and Wildlife Service [Service]. 2015. Endangered and Threatened Wildlife and Plants; 90-day Findings on 25 Petitions. Notice of petition findings and initiation of status reviews. Dated September 18, 2015. Published in the *Federal Register*: 80:56423–90d 80 FR 56423–56432.
- _____. 2012. Fire Management. Prescribed Fire. Service Fire Management webpage:https://www.fws.gov/fire/what_we_do/prescribed_fire.shtml. Dated June 2, 2012. [Accessed 12/15/2020].
- _____. 2021. Species Status Assessment Report for the Shasta Salamander Complex (*Hydromantes shastae*, *H. wintu*, and *H. samweli*), Version 1.3. February 2021. Sacramento, CA.
- Wake, D.B., L.R. Maxson, and G. Z. Wurst. 1978. Genetic differentiation, albumin evolution, and their biogeographic implications in plethodontid salamanders of California and southern Europe. *Evolution* 32: 529–539.
- Wake, D.B., and T.J. Papenfuss. 2005. *Hydromantes shastae*. Shasta salamander, Pp. 784–785. *In* M. Lannoo, editor. *Amphibian Declines: The Conservation Status of United States Species*. Berkeley, California: University of California Press.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

PAUL
SOUZA

Digitally signed by PAUL
SOUZA
Date: 2021.03.23
15:30:11 -07'00'

Approve: _____

Regional Director, Fish and Wildlife Service

Concur: _____

Director, Fish and Wildlife Service

Director's Remarks:

Date of review: March 17, 2021

Conducted by: Service staff in Yreka Fish and Wildlife Office and California-Great Basin Interior Regional Office, Region 10