San Bernardino Springsnail
(*Pyrgulopsis bernardinia*)
5-Year Review:
Summary and Evaluation

Photo Credit: Howard Byrne, Arizona-Sonora Desert Museum

U.S. Fish and Wildlife Service
Arizona Ecological Services Office
Tucson, Arizona

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5-YEAR REVIEW
San Bernardino Springsnail (*Pyrgulopsis bernardinia*)

1.0 GENERAL INFORMATION

1.1 Listing History

Species: San Bernardino Springsnail (*Pyrgulopsis bernardinia*)
Date listed: April 17, 2012
FR citation: 77 FR 23060
Classification: Threatened

Critical habitat rule: Critical habitat for the San Bernardino springsnail was designated at the time of listing on April 17, 2012.

1.2 Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a 5-year review is to assess each threatened species and endangered species to determine whether its status has changed and it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants. The U.S. Fish and Wildlife Service (Service) evaluated the biology and status of the San Bernardino springsnail as part of a draft Species Status Assessment (SSA; USFWS 2024, entire) to inform a recovery plan revision and this 5-year review.

The Service examined whether new information was available and whether that new information would alter or affect analyses and conclusions made in the previous status review. We provided notice of status reviews in the Federal Register and requests new information on the status of the species (*e.g.*, life history, habitat conditions, and threats). We solicited data for this status review from interested parties through a Federal Register notice on July 26, 2019 (84 FR 36113), and again on January 25, 2024 (89 FR 4966). We received no responses.

The Service coordinated with partner representatives and species experts to develop and review the draft SSA report. Additionally, we conducted a literature search and a review of information in our files.

1.3 FR Notice citation announcing the species is under active review:

89 FR 4966, Initiation of 5-Year Status Reviews of 22 Species in the Southwest, January 25, 2024.

2.0 REVIEW ANALYSIS

Section 4 of the ESA (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 ESA 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 ESA requires that we determine whether a species meets the definition of "endangered species" or "threatened species" due to any of the five factors described below.

Section 4(a) of the ESA describes five factors that may lead to endangered or threatened status for a species. These include 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.

The 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 assessing whether a species meets either definition, we must evaluate all identified threats by considering the expected response of 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 Service recommends 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.

2.1 Distinct Population Segment (DPS) policy (1996):

Not applicable.

2.2 Updated Information and Current Species Status

The draft SSA report contains an extensive review of the species’ taxonomy, biology, habitat, trends, and threats (USFWS 2024).

2.2.1 Biology and Habitat:

The San Bernardino springsnail (*Pyrgulopsis bernardina*) is a small springsnail in the Hydrobiidae family that is currently found in the U.S. in one artificial spring box in Cochise County, Arizona. The San Bernardino springsnail is a fully aquatic snail, and like most other species of springsnails all life stages occur within watered environments. The San Bernardino springsnail is endemic to Cochise County, Arizona and parts of northern Sonora, Mexico and has been associated with rheocrene springs (water discharging from the ground into a stream channel; per Stevens (2021 p. 19). The habitat of the San Bernardino springsnail regardless of aquatic ecosystem type is characterized by various aquatic and emergent plant species that occur within the Chihuahuan desertscrub and semidesert grassland ecoregions of the San Bernardino Valley (Brown 1994 pp. 7–14) and Cajón Bonito (Varela-Romero et al. 2013 p. 46). Many of the spring sites mostly exist under substantial tree canopy, which may serve to

regulate water temperatures through shading and contribute organic nutrients in the form of leaf litter. The best habitats for *Pyrgulopsis* species are typically unmodified spring ecosystems exhibiting natural integrity and are generally free flowing. In Arizona, springsnails are generally associated with headwaters, springheads, and spring runs (Hurt 2004 p. 1173, Hershler et al. 2014 pp. 693–694).

Periphyton is a complex mixture of algae, detiritus, bacteria, and other microbes that occur on submerged surfaces in aquatic environments. As grazers of periphyton, springsnails are dependent on the growth of these algal communities throughout the year. Spring runs and streams experience seasonal sunlight abundance patterns in terms of sunlight duration and canopy cover that can influence food availability for springsnails. Hill et al. (2001 pp. 2313–2316) showed that periphyton photoefficiency during leaf-on conditions was considerably less than during leaf-off conditions, however the increased efficiency did not fully compensate for the shading effect of riparian vegetation. Further, the study indicated that invertebrate herbivore growth rates were highly tied to periphyton productivity and are thus indirectly influenced by riparian vegetation effects (Hill et al. 2001 pp. 2316–2317). Additional research has suggested that periphyton growth forms (i.e. filamentous vs. non-filamentous algae) influence invertebrate grazer diversity (Pyron and Brown 2015 p. 399).

Springsnails have been described as indicator species of water community health as their narrow niche requirements make them sensitive to changes in the environment (Mehlhop and Vaughn 1993). Based on our current knowledge of springsnails, and assuming that the San Bernardino springsnail shows similar habitat-relationships, important individual needs, from coarse to fine scale, appear to include: 1) perennial, shallow, and low-velocity spring flow, 2) substrate composition and complexity, 3) water chemistry and dissolved minerals, 4) water quality, and 5) food availability.

The range of the San Bernardino springsnail encompasses southeast Arizona and parts of southwest New Mexico with nearly equal area occurring in Sonora, specifically the San Bernardino and Guadalupe Canyon basins (Figure 1). Given the close association of the San Bernardino springsnail with deep aquifer water from both basins, the range of the species likely does not extend past these basin boundaries.

In the U.S., the species was known from three locations: Snail Spring, House Spring, and Goat Tank Spring. Currently, within the United States, the species exists only in Goat Tank Spring on the John Slaughter Historical Ranch. Goat Tank is a spring box located 25 ft. (7.6 m) south from House Spring and approximately 75 ft. (22.9 m) south of House Pond. The spring box is made of concrete, roughly 3 ft. (.9 m) x 3ft (.9 m) and has a depth of around 3 ft. (.9m). Substrate consists of a muddy/silty bottom with concrete spring box walls, detritus and ceramic tiles for structure. Regarding abundance estimates at Goat Tank Spring, in 1973 Landye (1995 pp.1-2) noted that the species as “abundant.” Surveys by Myers (2016 p. 25) in 2016 estimated abundance at approximately 500 individuals.

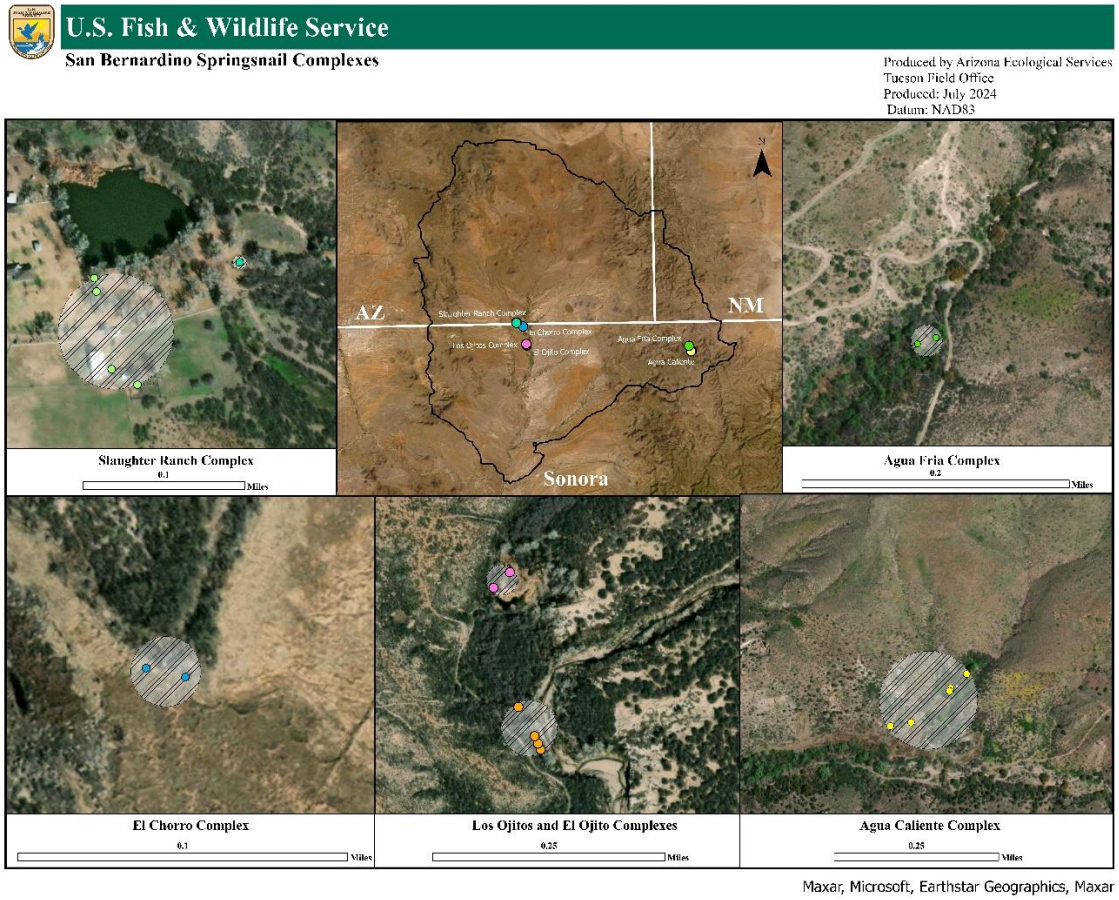

Figure 1. *Current geographical range of the San Bernardino springsnail including the 6 known complex locations of occupied sites.*

Clear, long-term abundance trends for any site occupied by the San Bernardino springsnail are lacking, with the most complete data consisting of monthly counts at Goat Tank Spring initiated in March 2020. The number of springsnails comprising the Goat Tank population are not completely known as the number of individuals at any given time is tied to the environmental and habitat conditions within Goat Tank Spring. Monthly counts of encountered individual springsnails indicate that the observed number of individual springsnails generally falls between approximately 100 to 500 (see Figure 2). The proportion of the population sampled during monthly surveys is unknown but estimated to be between 60-80% given the observable surfaces within the spring-box. Data from the past few years suggests that the Goat Tank population of the San Bernardino springsnail is stable.

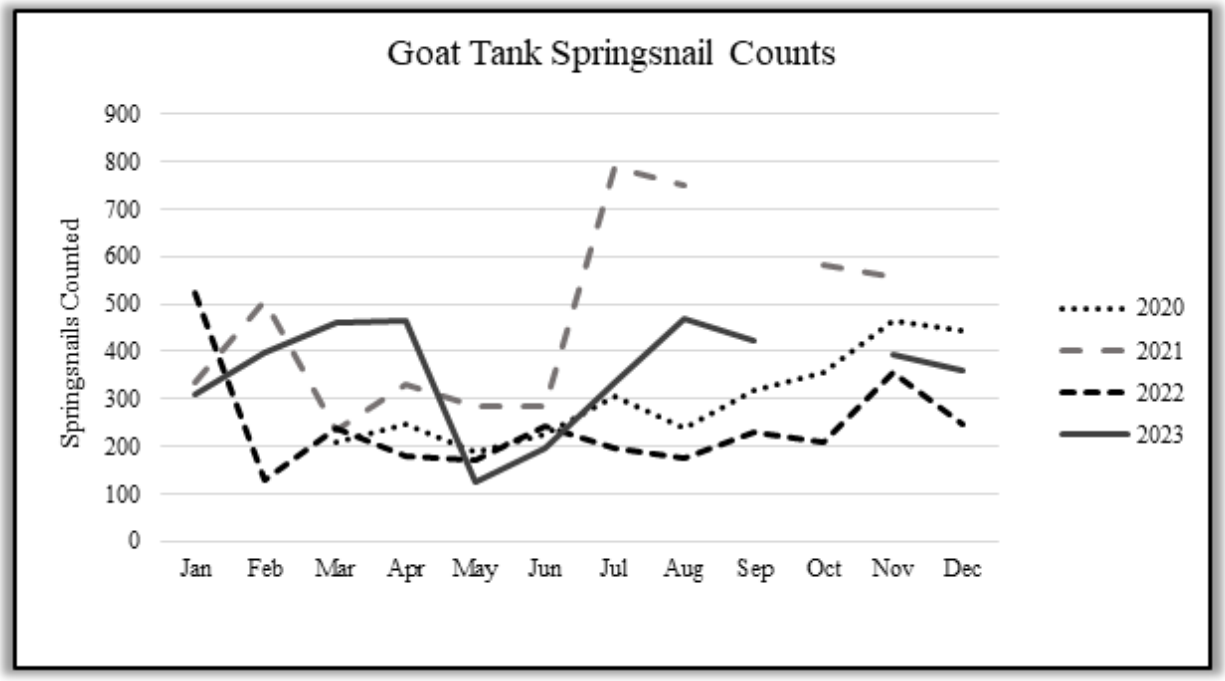

Figure 2. *Monthly counts of individual springsnails observed in Goat Tank. Months with multiple counts are averaged.*

In 2002, three new occupied sites were discovered in Sonora, Mexico on the Rancho San Bernardino (USFWS 2003 p. 37) and since then, an additional four occupied sites were discovered at Cajon Bonito in Sonora, Mexico. Other springs within the region have yet to be surveyed for the San Bernardino springsnail. Abundance estimates for sites in Mexico are unknown.

2.2.2 Threats Analysis (threats, conservation measures, and regulatory mechanisms):

The San Bernardino springsnail was listed as threatened with critical habitat in 2012 with threats to the species identified as: springhead inundation, groundwater depletion, pesticides, inadequacy of existing regulatory mechanisms, nonnative competitors, climate change, and factors attributed to high endemism (restricted distribution, poor dispersal, small population size, and life history specialization) (USFWS 2011 p. entire). This current analysis has identified three main threats to the viability of the San Bernardino springsnail: 1) reduction of spring discharge, 2) spring modification, and 3) climate change. These threats interact together and in combination with minor threats not included in the assessment pose significant changes to habitat for the San Bernardino springsnail.

These endemic species are threatened by limited distribution, lack of mobility, and the isolation of populations. As a result, any impact from increasing threats (such as loss of spring flow, or contaminants) is likely to result in declines in the species' populations. Stressors on the San Bernardino springsnail include habitat destruction from loss of

spring flow, contamination, predation, and endemism. Endemic species (organisms with narrowly distributed isolated populations) are susceptible to extinction from natural or human caused events. Biological and ecological factors that put a species at risk of extinction include specialized habitat preference, restricted distribution, poor dispersal ability, population size, fragmentation of range, and life history specialization (McKinney 1997, p. 497; O'Grady et al. 2004, p. 514), all of which characterize the San Bernardino springsnails. This species has suffered substantial reductions in overall numbers and populations. Although rarity itself is not a threat, rarity coupled with existing threats puts them at risk of decreased population viability, loss of genetic diversity.

2.3 **Synthesis:**

The San Bernardino springsnail is known from approximately six complex locations (containing multiple occupied sites) across it range. The six complexes include: the Slaughter Ranch, El Chorro, El Ojito, Los Ojitos, Agua Caliente, and Agua Fria Complexes. The only complex location in the U.S. is the Slaughter Ranch Complex.

The distribution of these six complexes is spatially bimodal with multiple populations existing across just two small regions without any presently or historically known occurrences located between. Dispersal between populations within each of the two regions (San Bernardino Vally and Cajon Bonito) is supported by shared haplotypes, but dispersal across the two regions appears negligible, if at all. The San Bernardino springsnail populations that are highly resilient will continue to occupy habitat of sufficient size to sustain self-sufficient populations. For many populations demographic information does not exist and collecting this information is difficult (at Sonoran sites), given this, limited information is available to assess population resiliency.

We assessed the current condition of the San Bernardino springsnail across the six complexes identified above. Our assessment included metrics on stability, security, diversity, and connectivity. We combined information on site occupation length, threats, and a published genetic analysis to evaluate the current condition (see Table 1).

Table 1. *Current condition of the San Bernardino springsnail measured with regard to complex occupation stability, complex occupation security, complex genetic diversity, and complex connectivity.*

Locations	STABILITY	SECURITY	DIVERSITY	CONNECTIVITY
United States				
Slaughter Ranch Complex	Stable	Insecure	Similar	Connected
Sonora				
El Chorro Complex	Unstable	Secure	Similar	Connected
El Ojito Complex	Unstable	Insecure	Similar	Connected
Los Ojitos Complex	Unstable	Secure	Similar	Connected
Agua Caliente Complex	Unstable	Secure	Diverse	Isolated
Agua Fria Complex	Unstable	Insecure	Diverse	Isolated

We found that the Slaughter Ranch complex exhibited the most population stability due to a longer documented occupation history, however the complex experiences multiple threats such

as loss of spring discharge, and since connectivity with southern sites in Sonora exists, unique haplotypes are minimal. The El Chorro complex is the closest location to the Slaughter Ranch location, however this site is identified as less stable due to the shorter documented occupation history, however fewer threats make it a more secure location despite reduced haplotype diversity due to its connectivity with three other sites. The Los Ojitos and El Ojito complexes are adjacent to each other and show similar status, with shorter documented occupation histories. Los Ojitos is ranked as more secure than El Ojito due to fewer threats presented at this location. Both Los Ojitos and El Ojito share haplotypes with El Chorro and Slaughter Ranch, with these four complex locations comprising the San Bernardino Valley population.

The Cajon Bonito population (Agua Fria and Agua Caliente complexes) share no haplotypes between themselves nor do they share any with the San Bernardino population suggesting high haplotype uniqueness. Both sites also demonstrate similar occupation stability but Agua Caliente is categorized as more secure.

After reviewing the best available scientific information, we conclude that the San Bernardino springsnail remains a threatened species. Pursuant to the 2012 listing determination, the current range of the species in the United States is now believed to be limited to two springs. Further, the San Bernardino springsnail was recently discovered to occur at five sites in Sonora, Mexico, in at least nine springs. Thus, 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 the draft SSA remains an accurate reflection of the species current status.

3.0 RESULTS

3.1 Recommended Classification:

No change is needed.

3.2 New Recovery Priority Number:

We recommend no change it the Recovery Priority Number of 8.

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

We will identify actions in our recovery plan revision and will specify recovery activities in a recovery implementation strategy. We emphasize that the following, once completed, will inform other recovery actions:

For Populations within the U.S: (1) protect, manage, and improve the snail population at Goat Tank Spring; (2) manage or eliminate the threats to the snail; (3) assess reintroducing snails into Snail Spring, House Spring Seep, Horse Trough Spring, and Garden Spring; (4) continued use of standard monitoring protocols for estimating populations numbers and trends; (5) continue to support efforts to captively propagate snails, i.e. support efforts at the Phoenix Zoo and; (6) assess the need to include other organizations and facilities for captive propagation efforts.

For Populations in Sonora, Mexico: (1) work with Sonora partners to protect extant snail sites at the five complex locations in Sonora (El Chorro, El Ojito, Los Ojitos , Agua Calientes and Agua Fria).

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of San Bernadino springsnail

Current Classification:

Threatened

Recommendation resulting from the 5-Year Review:

No change needed.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service, Arizona Ecological Services Office

Approve HEATHER WHITLAW Digitally signed by HEATHER WHITLAW Date: 2024.08.29 17:25:21 -07'00'