

Chupadera springsnail
(Pyrgulopsis chupaderae)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
Albuquerque, New Mexico
October 18, 2019

5-YEAR REVIEW
Chupadera springsnail (*Pyrgulopsis chupaderae*)

1.0 GENERAL INFORMATION

1.1. Reviewers:

Lead Regional or Headquarters Office:

Southwest Regional Office, Albuquerque, New Mexico

Lead Field Office:

New Mexico Ecological Services Field Office
Clinton P. Smith, Fish and Wildlife Biologist, 505-761-4743

Cooperating Field Office(s):

NA

Cooperating Regional Office(s):

NA

1.2. Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service or USFWS) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing as endangered or threatened is based on the species' status considering the five threat factors described in section 4(a)(1) of the Act. These same five factors are considered in any subsequent reclassification or delisting decisions. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process including public review and comment.

1.3. Methodology used to complete the review:

This review was conducted through public review notification and a comprehensive review of documents regarding Chupadera springsnail available to the U.S. Fish and Wildlife Service's (Service) New Mexico Ecological Services Field Office (NMESFO). A Federal Register notice (84 FR 36113) announcing this review was published on July 26, 2019 and a 30-day comment period was open. The notice solicited new information about species biology, habitat conditions, conservation measures implemented, threats, and trends, from other agencies, both Federal and State, nongovernmental organizations, academia, and the

general public. The primary sources of information used in this analysis were the 2012 final listing rule (77 FR 41088), peer reviewed scientific publications, published and unpublished reports and information and communications from other qualified biologists or experts. Comments received were evaluated and incorporated as appropriate.

1.4. Background:

1.4.1. Federal Register Notice citation announcing initiation of this review:

A Federal Register notice (84 FR 36113) announcing this review was published on July 26, 2019 and a 30-day comment period was open. This notice solicited new information about species biology, habitat conditions, conservation measures implemented, threats, and trends, from other agencies, both Federal and State, nongovernmental organizations, academia, and the general public.

1.4.2. Listing history:

Original Listing

FR notice: 77 FR 41088

Date listed: July 12, 2012

Entity listed: species, Chupadera springsnail

Classification: Endangered

1.4.3. Associated rulemakings:

Critical Habitat Designated

FR notice: 77 FR 41088

1.4.4. Review History:

This is the first 5-year review for this species since the species was listed in 2012.

1.4.5. Species' Recovery Priority Number at start of 5-year review:

The Service designated a recovery priority number of 2 for *Pyrgulopsis chupaderae*, indicating that threats are both imminent and high in magnitude.

1.4.6. Recovery Plan or Outline

Not applicable.

2.0 REVIEW ANALYSIS

2.1. Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1. Is the species under review a vertebrate?

- Yes, go to section 2.1.2.
 No, go to section 2.2.

2.1.2. Is the species under review listed as a DPS?

- Yes, go to section 2.1.3.
 No, go to section 2.1.4

2.1.3. Was the DPS listed prior to 1996?

- Yes, give date and go to section 2.1.3.1.
 No, go to section 2.1.4.

2.1.3.1. Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

- Yes, provide citation and go to section 2.1.4.
 No, go to section 2.1.3.2.

2.1.3.2. Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

- Yes, discuss how it meets the DPS policy, and go to section 2.1.4.
 No, discuss how it is not consistent with DPS policy and go to section 2.4.

2.1.4. Is there relevant new information for this species regarding the application of the DPS policy?

- Yes, provide citation(s) and a brief summary of the new information. If the DPS listing remains valid, go to section 2.2. If the new information indicates the DPS listing is no longer valid, go to section 2.4.
 No, go to section 2.2.

2.2. Recovery Criteria

2.2.1. Does the species have a final, approved recovery plan¹?

- Yes, go to section 2.2.1.1.

¹ Although the guidance generally directs the reviewer to consider criteria from final approved recovery plans, criteria in published draft recovery plans may be considered at the reviewer's discretion.

No, consider recommending development of a recovery plan in section 4, and go to section 2.3.

2.2.1.1. Does the recovery plan contain objective, measurable criteria?

Yes, go to section 2.2.2.

No, consider recommending development of objective, measurable, threats based recovery criteria in section 4, and go to section 2.3.

2.2.2. Adequacy of recovery criteria.

2.2.2.1. Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes, go to section 2.2.2.2.

No, consider recommending development of recommendation for revising recovery criteria and go to section 2.2.3.

2.2.2.2. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

Yes, go to section 2.2.3.

No, go to section 2.2.3, and note which factors do not have corresponding criteria. Consider developing recommendations for revising recovery criteria in section 4.0.

2.2.3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

If you answered yes to both 2.2.2.1. and 2.2.2.2., evaluating whether recovery and/or downlisting criteria have been met in section 2.2.3 may be sufficient to evaluate the species listing classification and no further analysis may be necessary; go to section 2.4.

If you answered no to either 2.2.2.1 or 2.2.2.2, continue to section 2.3. and consider adding update recovery criteria in section 4.

2.3. Updated Information and Current Species Status

2.3.1. Biology and Habitat*

2.3.1.1. New information on the species' biology and life history:

The Chupadera springsnail (*Pyrgulopsis chupaderae*) is a tiny (1.6 to 3.0 millimeters (0.06 to 0.12 inches) tall) freshwater snail in the family Hydrobiidae (Taylor 1987; Hershler 1994). Hydrobiid snails are strictly aquatic and occur in

springs, seeps, marshes, spring pools, outflows, and diverse flowing water habitats. Chupadera springsnails are endemic to Willow Spring and an unnamed spring of similar size 0.5 kilometers (0.3 miles) north of Willow Spring at the southeast end of the Chupadera Mountains in Socorro County, New Mexico (Taylor 1987; Mehlhop 1993; Lang 1998; Figure 1). Springsnails are sensitive to water quality, and each species is usually found within relatively narrow habitat parameters (Sada 2008). Chupadera springsnail specific habitat conditions for Willow Spring are discussed in further detail in Section 2.3.1.6.

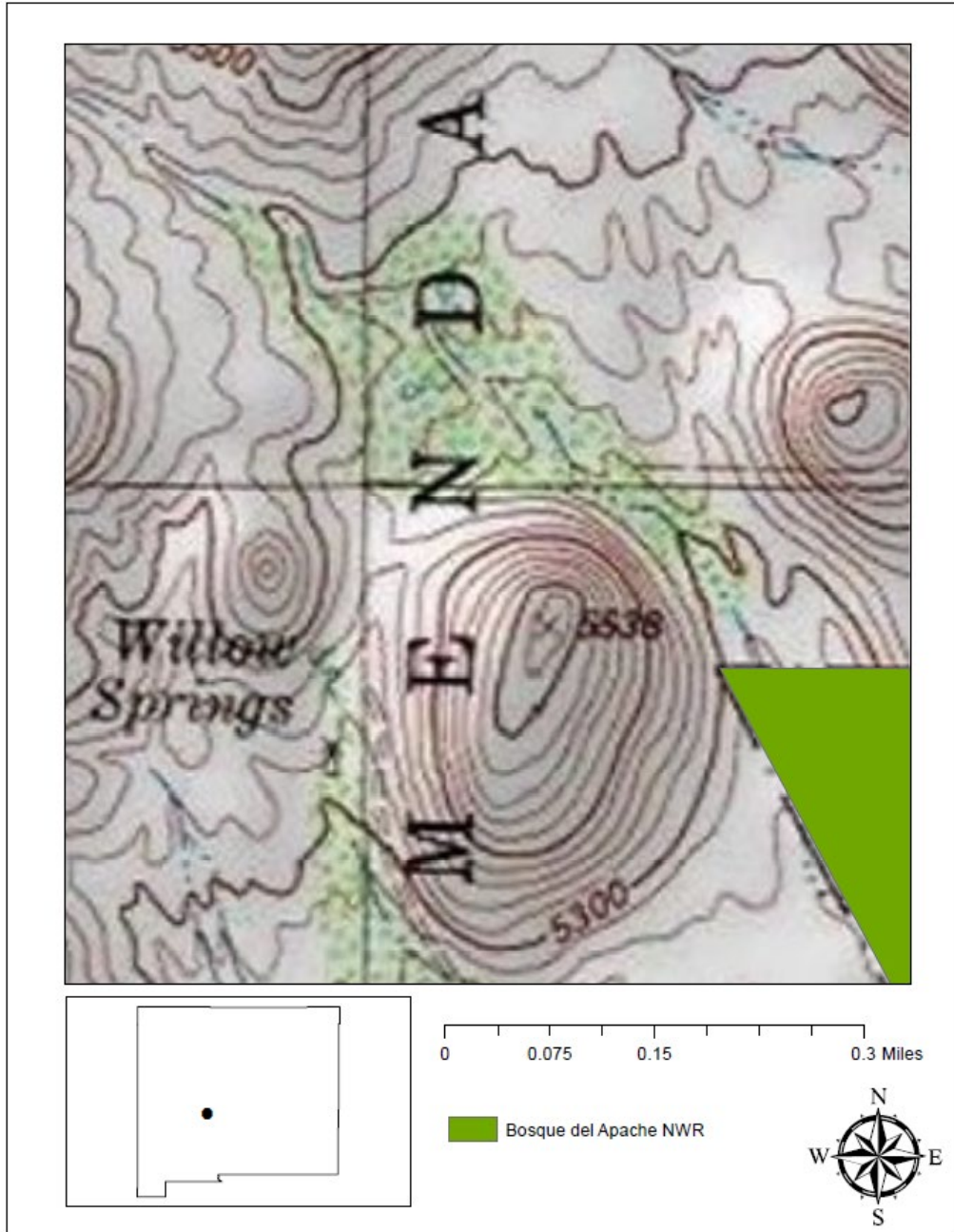


Figure 1. Willow Spring and an unnamed spring (about 0.5 kilometers [0.3 miles] north of Willow Spring) at the southeast end of the Chupadera Mountains, just outside Bosque del Apache National Wildlife Refuge, in Socorro County, New Mexico.

Chupadera springsnail pigmentation of the body and operculum (covering over the shell opening) is much more intense than in any other species in the genus *Pyrgulopsis* (Taylor 1987). Specific details on Chupadera springsnail's biology and life history is largely unknown but details on Hydrobiid snail reproduction (Hershler 1998), gender characteristics (Brusca and Brusca 1990, Hershler and Sada 2002), diet (Mladenka 1992, Allan 1995, Hershler and Sada 2002, Lysne et al. 2007) and lifespan (Pennak 1989) have been documented previously.

2.3.1.2. Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Historic surveys using '5" dots' (natural unfinished Saltillo clay tiles, Figure 2) show that springsnail populations were locally abundant and stable at Willow Spring through 1999 (Lang 1998; 1999), with average densities in 1997–1998 of $23,803 \pm 17,431$ per square meter (m^2 ; $2,211 \pm 1,619$ per square foot) (NMDGF 2011). From 1999 through 2011, springsnail population status at Willow Spring was unknown (Carman 2004, 2005; NMDGF 2007). Qualitative information from the landowner was provided in response to the 2011 proposed rule (76 FR 46218). A springsnail according to the landowner (presumed to be the Chupadera springsnail) continued to occur at the springhead, although not in high numbers, and was abundant in the springbrook (Highland Springs Ranch, LLC 2011). Biologists from Turner Endangered Species Fund (TESF) were able to conduct surveys in November 2012. They detected springsnails at Willow Spring but not at the unnamed spring (McCaffery and Phillips 2012). Surveys conducted at Willow Spring in 2017, 2018 and 2019 by TESF and NMDGF using stratified transects counts saw similar numbers (20,183 per m^2 in March 2017, 62,200 per m^2 in May 2017, 32,383 per m^2 in August 2017, 43,383 per m^2 in November 2017, 31,000 per m^2 in March 2018, 25,630 per m^2 in June 2018, 24,380 per m^2 in August 2018, and 22,450 per m^2 in January 2019) to what Lang recorded back in the late 90s surveys (23,803 per m^2 ; Table 1).



Figure 2. Natural unfinished Saltillo clay tile (large red circle) in springbrook vegetation with small Chupadera springsnails (small dark spots, some in smaller blue circle).

Table 1. Chupadera springsnail count data from Willow and unnamed springs located in Socorro County, New Mexico. Historic data (1997 – 1998) consists of ‘5” dot’ tile abundance counts while more current data (2017 – 2019) consists of stratified transect counts.

| Location | Date | Count | |
|----------------|------------------------|--|---|
| Willow Spring | 1979 ¹ | Discovered/Present | |
| Unnamed Spring | 1986 ² | Sampled, Present | |
| Willow Spring | 1992-1993 ³ | Sampled, Present | |
| Unnamed Spring | 1995-1997 ⁴ | Sampled, Not Present | |
| Willow Spring | 1997 ⁵ | 13,050 (05/30) 32,967 (06/25) 69,717 (07/30) 70,156 (08/27) 49,271 (09/29) 84,650 (10/27) 75,914 (11/21) 72,413 (12/18) | |
| | 1998 ⁵ | 68,457 (01/29) 80,843 (02/27) 76,943 (03/27) 85,388 (05/06) 49,288 (05/29) 75,800 (06/30) 70,250 (07/28) | |
| Unnamed Spring | 1999 - 2011 | Not Sampled, Unknown | |
| Willow Spring | 1999 - 2011 | Not Sampled, Unknown | |
| Unnamed Spring | 2012 ⁶ | Sampled, Not Present | |
| Willow Spring | 2012 ⁶ | Sampled, Present | |
| | 2017 ⁷ | 20,183 (03/06) 62,220 (05/04) 32,383 (08/14) 43,383 (11/14) | |
| | | 2018 ⁷ | 31,000 (03/20) 25,630 (06/08) 24,380 (08/06) Present (11/15) |
| | | | 2019 ⁷ |

¹ Originally collected on April 23, 1979 at Willow Spring by D. W. Taylor and R. H. Weber.

² December 8, 1986 collection record from unnamed Spring by J. Stefferud, G. Schmidt, and C. Couret.

³ Mehlop, P. 1993. Establishment of a Rare Mollusc Inventory and Monitoring Program for New Mexico. New Mexico Department of Game and Fish (NMDGF) Contract No. 80-519-52.

⁴ NMDGF 1999 report (Status of Aquatic Mollusks of New Mexico) and 2006 report (Conservation and Recovery of New Mexico Threatened and Endangered Species, Project # T-8-P-1, Appendix D).

⁵ B. Lang ‘5” dot’ tile abundance count survey data from 1997 to 1998.

⁶ Turner Endangered Species Fund (TESF) survey information from November 2012.

⁷ TEF and NMDGF stratified transect count survey information from 2017-2019 (November 15, 2018 springbrook habitat near max waterflow/full and difficult to estimate snail abundance).

The Chupadera springsnail was first documented at the unnamed spring by Stefferud (1986). Unfortunately, sampling conducted between 1995 and 1997 found no springsnails and significantly degraded spring habitat (Lang 1998, 1999). Biologists with TESH were able to survey the unnamed spring in November 2012, but no springsnails were observed (McCaffery and Phillips 2012). Springsnails are likely extirpated from this location (NMDGF 1996; Lang 1999).



Figure 3. Photo of unnamed spring (about 0.5 kilometers [0.3 miles] north of Willow Spring) (from McCaffery and Phillips 2016).

2.3.1.3. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

There is no new information.

2.3.1.4. Taxonomic classification or changes in nomenclature:

The Chupadera springsnail was first collected by Taylor in 1979 and later described as *Fontelicella chupaderae* by Taylor (1987). Hershler (1994) in his review of the genus *Pyrgulopsis*, found that the species previously assigned to the genus *Fontelicella* had the appropriate morphological characteristics for inclusion in the genus *Pyrgulopsis* and formally placed them within that genus (Service 2012).

2.3.1.5. Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

The site where Chupadera springsnail are found consists of two springbrooks, Willow Spring and an unnamed spring of similar size 0.5 kilometers (0.3 miles) north of Willow Spring at the southeast end of the Chupadera Mountains in Socorro County, New Mexico. Willow Spring is the only spring identified by

the U.S. Geological Survey (Figure 1). A site visit to Willow Spring in 2015 (including B. Lang, a NMDGF biologist who surveyed the site in the late 90s) found that Chupadera springsnails had colonized further up the spring and water flow appeared to have increased. Water quality and chemistry were also similar to those last collected in the late 90s (see Section 2.3.1.6; NMDGF 2011, McCaffery and Phillips 2016). Chupadera springsnail are still present in Willow Spring (from surveys conducted in Jan. 2019, Table 1). No springsnails have been recorded from the unnamed spring since the mid-90s (Lang 1998, 1999; McCaffery and Phillips 2012).

2.3.1.6. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The two springs where Chupadera springsnails have been documented are on two hillsides where groundwater discharges flow through volcanic gravels containing sand, mud, and aquatic plants (Taylor 1987). Water temperatures in the Willow Spring springbrook (the stream flowing from the springhead) occupied by the springsnail ranged from 15 to 25 degrees Celsius (°C) (59 to 77 degrees Fahrenheit (°F)) over all seasons (as measured in 1997 to 1998). Water velocities ranged from 0.01 to 0.19 meters per second (0.03 to 0.60 feet per second) (Lang 2009). In 1998, when Willow Spring was visited by NMDGF biologists, the springbrook was 0.5 to 2.0 meters (1.6 to 6.6 feet) wide, 6 to 15 centimeters (2.4 to 6.0 inches) deep, and approximately 38 meters (125 feet) long, upstream of where it entered a pond created by a berm (small earthen dam) across the springbrook (Lang 2009).

In January 2002, a fire at Willow Spring was reported to NMDGF but biologists could not gain access to the property or verify habitat conditions. The property owners informed NMDGF that no cattle grazing was occurring on Willow Spring in 2011, but biologists could not gain access to the property to verify this or existing habitat conditions (historically, cattle grazing has been noted for both springbrooks). Biologists with TESH were able to conduct a field reconnaissance of both springbrooks in November 2012. Willow Spring consisted of a trickling run of warm water, macrophytic vegetation, with cobble embedded in the substrate. Springsnails (assumed to be Chupadera springsnails) were found on the underside of the cobble. The unnamed spring consisted of cold water, grasses and sediment, with no cobble. No springsnails were found during surveys of the unnamed spring (McCaffery and Phillips 2012). In 2016, TESH biologists working with the current land manager erected fencing around Willow Spring to exclude cattle from the springhead (Figure 4). Since the exclusion, TESH biologists noted that it appears as if riparian vegetation growth is increasing within the springbrook and out competing invasive grasses that had come in when the springbrook was open for cattle grazing (Long 2017; Figure 5). Springsnail surveys and habitat assessments at Willow Spring continued in 2017, 2018 and 2019 (Table 1).



Figure 4. Photo of Willow Spring prior to fence erection to exclude cattle (taken late fall 2016 by D. Long, TESF).



Figure 5. Photo of Willow Spring after fence erection to exclude cattle (taken August 2017 by D. Long, TESF).

2.3.1.7. Other:

Both Willow Spring and the unnamed spring are currently on private property. Biologists with NMDGF have historically conducted surveys on the property that contains Willow Spring and the unnamed spring (called Cienega Ranch). However in 1999, the Cienega Ranch was sold to a development company (Highland Springs Ranch [a subsidiary of Arizona-based Brooks Companies]) and small parcels were placed under land auction. From 1999 until 2015,

NMDGF biologists continued communications with the new owners (in person and with correspondence) regarding springsnails and habitat but could not gain access to the property (Lang 2000, NMDGF 2006).

In 2012, TESH contacted the land manager (and the development group that employs the land manager) about developing a useful collaborative relationship that would allow TESH to implement a long-term monitoring plan to help instruct future management (McCaffery and Phillips 2012). TESH biologists also obtained permission to conduct field reconnaissance of the springbrooks (see Section 2.3.1.6). Since 2012, the local land manager (and the development group that owns the property) have worked with TESH and NMDGF on allowing access to the property. In 2014, TESH executed an agreement with Highland Springs Ranch, which allowed TESH biologists access to the Willow Spring site to conduct conservation activities (McCaffery and Phillips 2015).

2.3.1.8. Conservation Measures:

Willow Spring was fenced off to exclude cattle in 2016 by TESH biologists and the current land manager. Since the exclusion, TESH biologists have noted that native riparian vegetation growth appears to be increasing within the springbrook, out competing invasive grasses that had come in when the springbrook was open for cattle grazing. Fencing off the spring appears to have improved native riparian vegetation, which future surveys may corroborate.

2.3.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

According to Section 4(c)(2) of the Act, the Secretary of Interior shall conduct a status review every five years of species that are listed as threatened or endangered under the Act in accordance with section 4(a) and (b). The Secretary shall make a determination on the basis of the best scientific and commercial data available after conducting a review of the status of the species and after taking into account those efforts being made by the State to protect such species within any area under its jurisdiction [section 4(b)]. As part of this review, we will determine whether this species shall continue to be listed as endangered (or threatened species) based on a five factor analysis [section 4(a)(1)] that addresses: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) over-utilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence.

2.3.2.1. Present or threatened destruction, modification or curtailment of its habitat or range:

Threats to Chupadera springsnails in Willow Spring includes regional and local groundwater depletion, springrun dewatering, diversion or impoundment of

spring flow, and riparian habitat degradation or loss (Taylor 1983, NMDGF 1988, 1996, Lang 2002). Natural stochastic events, such as prolonged drought, could also impact this population by reducing flow through the system (NMDGF 1999). These threats could be exacerbated by subdivision development on range lands surrounding Willow Spring (NMDGF 2011). Beginning in 1999, Highland Springs Ranch (a subdivision in the immediate vicinity of Chupadera springsnail habitat) was being developed in four phases with approximately 650 lots ranging from 8 to 57 hectares (20 to 140 acres). No central water system was reported, so each homeowner would be responsible for drilling individual water wells. In Highland Springs Ranch, homeowners are entitled to 629 cubic meters (0.51 acre-feet) of water per year (NMOSE 2009).

The New Mexico Office of State Engineer (NMOSE) offered a positive opinion determining that sufficient groundwater is available to supply the needs of the subdivision for 40 years (Highland Springs, LLC 2011); the NMOSE based that decision on water availability, not on ensuring spring flow. Because of the proximity of the subdivision to Willow Spring (the northern boundary of one of the lots (42A) of Mountain Shadows, a phase of Highland Springs Ranch, is approximately 91 meters (300 feet) from Willow Spring), it appears likely that groundwater pumping could affect the discharge from the spring through depletion of groundwater. Under normal conditions, Willow Spring has a very small discharge (Lang 2009), and, therefore, any reduction in available habitat from declining spring flows would be detrimental to the Chupadera springsnail. Given the proximity of the unnamed spring (0.5 kilometers (0.3 miles)) to Willow Spring, and because both were historically occupied by Chupadera springsnail, it is believed that both springs are fed by the same groundwater aquifer. Thus, groundwater depletion that would affect spring flow at Willow Spring would likely affect the unnamed spring (Service 2012).

Dewatering and diversions of spring flow have already been observed. In 1996, Lang noted efforts to maintain pump facilities and improve water delivery systems in Willow Spring (NMDGF 1999). From May 1997 to July 1998 in Willow Spring, Lang noted that water was diverted from an artesian springhead adjacent (i.e., within 4 m (13 feet)) to the spring source. Diverted water was then returned to a pond down-gradient of the natural spring run. This diversion did not appear to affect Chupadera springsnail habitat or population numbers at that time (Lang 2000). In November 1998, the springrun and wetted riparian corridor in Willow Spring was reduced notably to approximately 1/3 to 1/2 the width observed during previous visits (see Section 2.3.1.6). It is unknown whether this reduced spring discharge was attributed to ground water withdrawals up-gradient, seasonally diminished flows, or a combination of these factors. This reduction in spring discharge did not appear to affect Chupadera springsnail habitat or population numbers at that time (NMDGF 2002).

Activities associated with cattle grazing including riparian vegetation

degradation or loss and erosion/siltation within the springbrooks have also impacted Chupadera springsnails. Grazing impacts were noted at both springbrooks in 1996 (NMDGF 1999). During sampling in the unnamed spring in 1995 and 1997, Lang (1998, NMDGF 1999) reported finding no springsnails and noted that cattle grazing appeared to have significantly degraded the springbrook habitat (riparian vegetation gone, soil and cattle manure covering the gravel in the springbrook). Impacts from cattle grazing at Willow Spring were also reported during surveys from May 1997 to July 1998 but the riparian corridor was still intact at the time (Lang 2000).

Lang (1998) stated that the Chupadera springsnail was uplisted from state threatened to endangered due to “over-grazing of habitat in the northernmost unnamed spring.” The unnamed spring might support reintroduction of Chupadera springsnails but this would require a contiguous marsh emergent plant community to redevelop and possibly involve cattle grazing exclusion for the plant community to redevelop and remain (Lang 1998). In 2016, cattle were excluded from Willow Spring (Long 2017). If the exclusion at Willow Spring continues, then grazing should not be an issue for this springbrook.

2.3.2.2. Overutilization for commercial, recreational, scientific, or educational purposes:

The data indicate that overutilization of this species is not a threat to the continued existence of Chupadera springsnail. There is no known commercial or recreational use of the species, and collection for scientific or educational purposes is subject to permitting by the Service and therefore highly controlled. As of 2019, there is only one known permit for Chupadera springsnail (with TESH). This permit is for TESH to conduct population surveys and collect specimens for genetic evaluation. Additionally, TESH is working with NMDGF and Service biologists to assemble a captive breeding and holding facility for Chupadera springsnails so that TESH can assist with establishing and maintaining a refuge population. Any additional future permits for collecting Chupadera springsnail will likely be contingent upon more detailed collection and reporting requirements to facilitate improved species occurrence and distribution information.

2.3.2.3. Disease or predation:

There is currently no information regarding the threat of disease to the continued existence of Chupadera springsnail. We believe that disease is not likely to affect the species unless an unknown pathogen is transmitted to Chupadera springsnail. The Chupadera springsnail has an extremely small and reduced range, and introduction of a nonnative predator or competitor carries an increased risk of resulting in extinction of the Chupadera springsnail.

2.3.2.4. Inadequacy of existing regulatory mechanisms:

The final rule listing the Chupadera springsnail as endangered was passed in 2012 (77 FR 41088). In the rule, it's noted that Chupadera springsnail is listed as a New Mexico State endangered species and is protected by the New Mexico Wildlife Conservation Act of 1974 (19 NMAC 33.6.8). Under State law, the Chupadera springsnail is protected but only prohibits direct take of species, except under issuance of a scientific collection permit. New Mexico state status as an endangered species only conveys protection from collection or intentional harm to the animals themselves but does not provide habitat protection. The final rule also stated that listing the species would provide additional protection and encourage active management through the "Available Conservation Measures". The conservation measures were: 1) Increase public awareness and conservation recognition by Federal, State, Tribal, and local agencies, private organizations, and individuals, 2) Encourage cooperation between Federal and State agencies on recovery planning and require that recovery actions be carried out for listed species, 3) Require Federal agencies to confer with the Service on any action (they authorize, fund, or carry out) that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat, and 4) Identify prohibited activities and exceptions (where permits can be issued) for listed species. Some of the conservation measures suggested in the listing rule have not provided protection. The Chupadera springsnail do not currently have a recovery plan, Willow Spring and the unnamed spring are both under private ownership and no permits for take have been issued to the landowners.

2.3.2.5. Other natural or manmade factors affecting its continued existence:

Several biological traits have been identified as putting a species at risk of extinction (McKinney 1997, O'Grady et. al. 2004). Some of these characteristics include having a localized range, limited mobility, and fragmented habitat (Noss et al. 2006, Fagan et al. 2002). The Chupadera springsnail has all of these characteristics. Having a small, localized range means that any perturbation (e.g., drought, water contamination) can eliminate the species. Having a high number of individuals at a site provides no protection against extinction. Noel (1954) noted that an amphipod (another aquatic invertebrate) in Lander Spring, New Mexico was the most abundant animal present when she did her research. The species was extirpated from that site when the spring dried up (Cole 1985). Extremely limited dispersal capability effectively eliminates the ability of this springsnail to find and disperse to other suitable habitats or to move out of habitat that becomes unsuitable. Consequently, they are unable to avoid contaminants or other unfavorable changes to their habitat. Severe drought, monsoonal event, spring contamination, fire, or spring development (impoundment, dredging, piping, riparian management) could result in the extinction of the species.

The effect climate change will have on springs in the southwest is unknown. A review of climatic models indicates that an increase in drying of the southwestern U.S. and northwestern Mexico will likely occur throughout this century (Christensen et al. 2007; Seager and Vecchi 2010; Glick et al. 2011; Prinn et al. 2011). Long-term climatic patterns in the southwestern U.S. regularly cause periodic droughts, but the effects of greenhouse gases will compound these events and increase their intensity (Seager and Vecchi 2010).

Average global surface air temperature is increasing and will continue for many decades (e.g., Meehl et al. 2007; Ruhl 2008; Church et al. 2010; Gillett et al. 2011). The overall projected air temperature trend in the Rio Grande Basin is one of increased warming compared to current conditions (Meehl et al. 2007; Glick et al. 2011; Prinn et al. 2011; Garfin et al. 2013; Pinson 2013; USBR 2013, 2016).

NMOSE (2006) listed the following impacts of climate change in New Mexico: a) warming trends in the southwest are expected to continue to be greater than global averages by about 50 percent; b) modeling suggests that even moderate increases in precipitation would not offset the negative impacts to the water supply caused by increased temperature; c) increased temperatures will increase growing seasons, resulting in increased plant and human use of decreasing water supplies; d) there will likely be alterations in the arrival of snow, acceleration of spring snow melt, increased variation in the proportion of rain, all contributing to rapid and earlier seasonal runoff events; and e) the intensity, frequency, and duration of drought may increase.

Therefore, while it appears reasonable to assume that *Chupadera* springsnail may be affected, we lack sufficient certainty to know how climate change specifically will affect *Chupadera* springsnail.

2.4. Synthesis

The *Chupadera* springsnail is a rare, hydrobiid snail that survives in one thermal spring source located on private land in Socorro County, New Mexico. Critical habitat was also designated at the time of listing. Population numbers in Willow Spring appear to be similar to historic levels however, no springsnails have been detected at the unnamed spring in over two decades. A habitat management plan nor recovery plan has not been written for the species. Limited access and surveys have been allowed since 2017 (for Willow Spring), so current population status and habitat conditions are known but difficulties could arise in regards to assessing the status of the species. If the effects of climate change include widespread drought, decreased spring discharge, or a change in water chemistry, it would be considered a newly recognized threat that could eliminate the species. Because this species only occurs in one current location where it could easily be extirpated by biological or environmental threats, we recommend that *Chupadera* springsnail remain listed as endangered.

3.0 RESULTS

3.1. Recommended Classification:

- Downlist to Threatened**
 Uplist to Endangered
 Delist (*Indicate reasons for delisting per 50 CFR 424.11*):
 Extinction
 Recovery
 Original data for classification in error
 No change is needed

3.2. New Recovery Priority Number:

We recommend updating the recovery priority number to 5. The current recovery priority number of 2 indicates a high degree of threat and high recovery potential. A species with a high degree of threat means extinction is almost certain in the immediate future because of a rapid population decline or habitat destruction. We believe this species still has a high degree of threat because of the loss in springsnail at one of the springs and it is unknown if that spring is still unoccupied. Additionally, threats including grazing and climate change still require more study. Because this species is currently restricted to one spring, the potential for range expansion or population replication is limited. Additional studies are needed on the biological and ecological factors for this species. Because of these reasons, we recommend changing the recovery potential from high to low.

3.3. Listing and Reclassification Priority Number: Not applicable

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Draft a recovery plan (or include this species in a multi-species springsnail recovery plan). Work with state wildlife biologists and other experts to determine recovery criteria and if including this springsnail in a multi-species recovery plan is the best approach for management of these species.
- Address climate change in the recovery plan, incorporate recovery goals to address climate change.
- Continue efforts to work on habitat management plan (including TESH work) or other forms of conservation agreements with the landowners.
- Work with landowners, state wildlife biologists and others to continue to implement frequent monitoring of the springs and springsnails.
- Work with landowners, state wildlife biologists and others on restoration efforts at the unnamed spring so that it could again support the species.
- Work with state wildlife biologists and others to investigate the species' genetics.
- Work with state wildlife biologists, TESH biologists and other experts to determine if captive refugium population is needed.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Chupadera Springsnail (*Pyrgulopsis chupaderae*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:

Review Conducted By: Clinton P. Smith, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office

Approve Susan S. Mills Date 22 Oct 2019