

**Alamosa springsnail**  
*(Tryonia alamosae)*

**5-Year Review:  
Summary and Evaluation**

**U.S. Fish and Wildlife Service  
New Mexico Ecological Services Field Office  
Albuquerque, New Mexico**

## **5-YEAR REVIEW**

### **Alamosa springsnail (*Tryonia alamosae*)**

#### **1.0 GENERAL INFORMATION**

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##### **1.1 Methodology used to complete the review:**

This review was conducted through public review notification and a comprehensive review of documents regarding Alamosa springsnail available to the U.S. Fish and Wildlife Service's (Service) New Mexico Ecological Services Field Office (NMESFO). A Federal Register notice (75 FR 15454) announcing this review was published on March 29, 2010 and a 90-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 1991 final listing rule (56 FR 49646), the final recovery plan (Service 1994), peer reviewed scientific publications, published and unpublished reports and information and communications from other qualified biologists or experts.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.

##### **1.2 Reviewers**

###### **Lead Regional 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.

##### **1.3 Background:**

###### **1.3.1 Federal Register Notice citation announcing initiation of this review:**

A Federal Register notice (75 FR 15454) announcing this review was published on March 29, 2010 and a 90-day comment period was open. A subsequent notice of initiation was published in the Federal Register on May 31, 2018 (83 FR 25034). These notices 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.

###### **1.3.2 Listing history:**

Original Listing

**FR notice:** 56 FR 49646

**Date listed:** September 30, 1991

**Entity listed:** species, Alamosa springsnail  
**Classification:** Endangered

**1.3.3 Associated rulemakings:**

There have been no associated rulemakings since the species was originally listed in 1991.

**1.3.4 Review History:**

This is the first 5-year review for this species since the species was listed in 1991.

**1.3.5 Species' Recovery Priority Number at start of 5-year review:**

The Service designated a recovery priority number of 14 for *Tryonia alamosae*, indicating that it has a low degree of threat and high recovery potential.

**1.3.6 Recovery Plan or Outline:**

**Name of plan:** Socorro and Alamosa springsnail recovery plan.

**Date issued:** August 31, 1994.

**Date of previous revisions:** The recovery plan has not been revised.

**2.0 REVIEW ANALYSIS**

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

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is an invertebrate, the DPS policy is not applicable.

**2.2 Recovery Criteria:**

**2.2.1 Does the species have a final, approved recovery plan?**

*Yes*  
 *No*

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

*Yes*  
 *No*

The recovery criteria need to be updated with objective, measurable criteria that reflect the most up-to-date information on

the species' biology and address all of the five listing factors that are relevant to the species. One criterion for delisting (translocating the springsnails to historically occupied springs) may not be a viable option.

## **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*  
 *No*

### **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*  
 *No*

Inability to conduct surveys and habitat assessments makes the identification and quantification of the threats difficult. Because water quality conditions can change quickly in small spring-fed aquatic systems becoming detrimental to invertebrate survival (NMDGF 2009), monitoring of these conditions is necessary. This wetland complex is under private ownership with site access restrictions. Due to this constraint, there have only been three visits to assess habitat and springsnail presence in the last eight years. Inability to protect the habitat is also a much greater threat than identified in the listing rule. In addition, the effects of climate change (e.g. reduced precipitation, increased frequency or duration of droughts, altered groundwater availability, flashfloods) are also seen as a potential threat to the species.

### **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.**

The Recovery Plan for the Alamosa springsnail (Plan) outlines objective criteria and recovery measures considered necessary for recovery and/or protection of this species. The Plan details the following criteria for reclassification from endangered to threatened status, and criteria for delisting.

Downlisting (Goals) for the Alamosa springsnail may be considered when the criteria have been met resulting in a habitat management plan (HMP) that provides protection of springsnails

and their habitat. The HMP must be in place for five years and demonstrate that the continued existence of the Alamosa springsnail population is assured under conditions of the HMP.

Met or Not Met: Not Met – Currently, there is no HMP in place. The New Mexico Department of Game and Fish (NMDGF) and Service are still in the process of trying to work with the landowners to accomplish a HMP.

Delisting (Goals) for the Alamosa springsnail may be considered when protection of the springsnail's habitat in perpetuity can be assured. Additional populations also must be successfully established, as evidenced by recruitment and persistence over a period of five consecutive years, in habitat that was likely to have been historically occupied by Alamosa springsnails. In addition to these two criteria, the HMP must continue to provide protection for the habitat of the original population.

Met or Not Met: Not Met – Springsnail habitat is currently not protected in perpetuity. No new populations of springsnails have been established.

### **Recovery Goal 1. Develop a habitat management plan.**

The Monticello Community Ditch Association (MCDA) is the owner and land steward of the Alamosa Creek wetland complex (including Ojo Caliente and another group of thermal springs about 800 meters to the west, Figure 1). The MCDA has conducted riparian corridor restoration in Alamosa Creek with the help of NMDGF and NMESFO (NMDGF 2002). However, since this restoration work was completed there have been no other agreements discussed or completed.

### **Recovery Goal 2. Monitor and evaluate existing population and their habitat.**

Landye (1981) noted “abundant” snail populations when he visited Ojo Caliente thermal spring. Taylor (1983) also noted an “abundant” population when he visited the Alamosa Creek wetland complex. Mehlhop (1993) visited the Alamosa Creek wetland complex and estimated snail densities of 840 to 14,700 individuals/m<sup>2</sup> over a five-month period. Since June 2000, the NMDGF has worked with the MCDA to establish a population monitoring program. Lang (2005) started using ‘5” dots’ (natural unfinished Saltillo clay tiles, Figure 2) for monthly population monitoring in 2000. From July 2000 to June 2002, mean estimated

snail densities at ten sample sites in the Alamosa Creek wetland complex ranged from  $0.0 \pm 0.0$  to  $3166.8 \pm 2253.5$  individuals/m<sup>2</sup>  $\pm$  standard deviation (Lang 2005). Three sample sites in the Alamosa Creek wetland complex were monitored from August – December 2010 (AMEC 2010) with mean estimated snail densities ranging from 71 to 2741 individuals/m<sup>2</sup>. There are no records of Alamosa springsnail monitoring from 2010 through 2016. In the summer of 2017, NMDGF biologists found springsnails in all previously detected sampled areas but no density estimates were taken.

**Recovery Goal 3. Determine biological and habitat needs for the Alamosa springsnail.**

The NMDGF (2000) reported on preliminary findings of population demographics and habitat affinities for the Alamosa springsnail in the Alamosa Creek wetland complex. Additional observations of microhabitat affinities were also conducted by NMDGF (2008). See Section 2.3.1 (below) for additional information on biology and habitat needs.

See Section 2.2.3 Recovery Goal 2 (this document) for information on snail densities estimates in the Alamosa Creek wetland.

**Recovery Goal 4. Attempt establishment of a second population of Alamosa springsnail within its likely historic range.**

The Alamosa springsnail recovery plan calls for establishment of a secondary population of the Alamosa springsnail "...within its likely historic range." This species is only known from the type locality, Ojo Caliente, and contiguous wetland habitat (Taylor 1987). Any effort to establish a secondary population elsewhere would represent an introduction outside of its known historic range (NMDGF 2002). To date, no effort has been made to introduce this species in another locality.

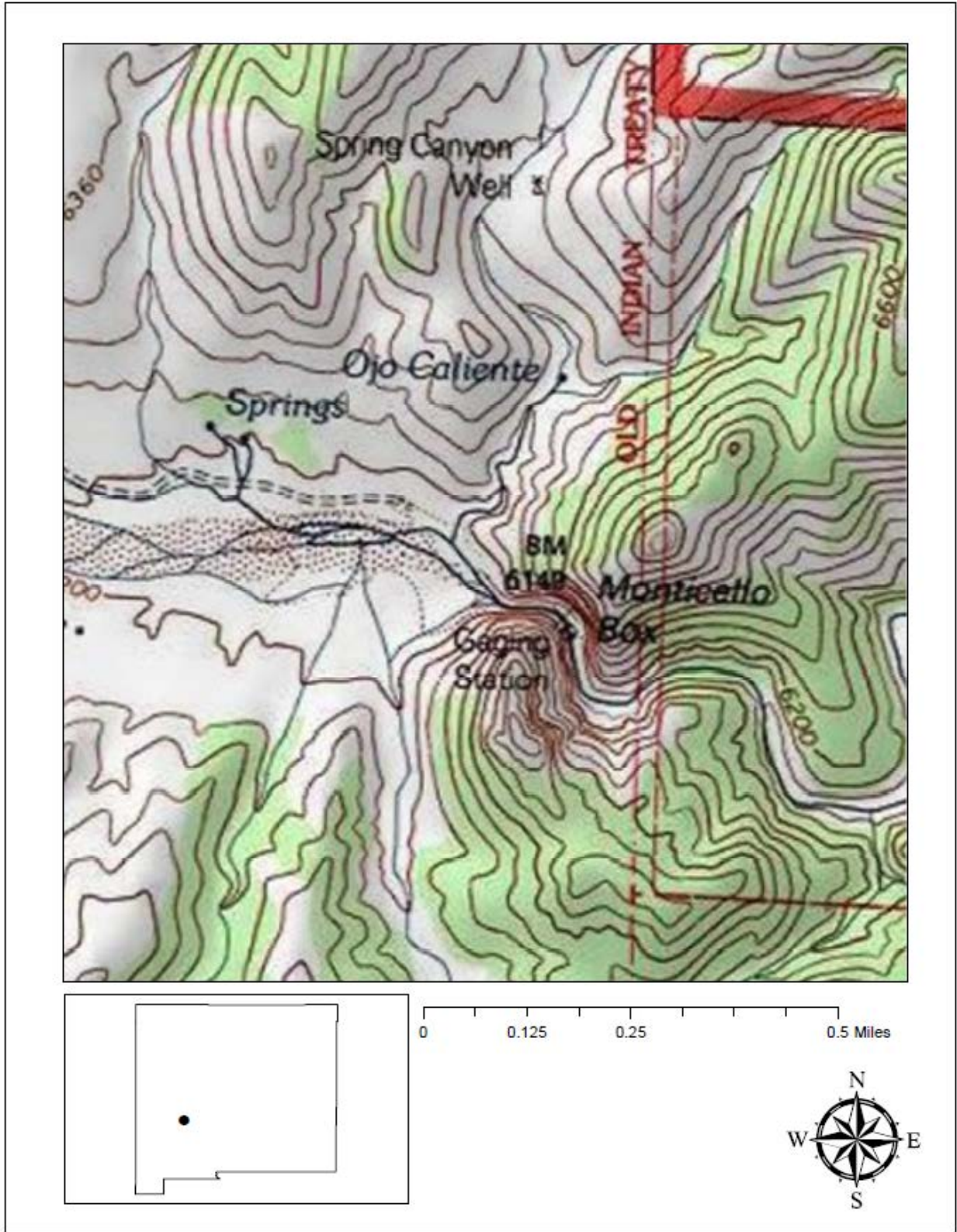


Figure 1. Alamosa Creek Canyon and wetland complex (including Ojo Caliente and another group of thermal springs about 800 meters to the west) in Socorro County, New Mexico.



Figure 2. Natural unfinished Saltillo clay tile with two larger *Physa* sp. snails and several small Alamosa springsnails (visible as small dots on the tiles edge, from AMEC 2010).

## **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 Alamosa springsnail (*Tryonia alamosae*) is endemic to a wetland complex of Ojo Caliente, a thermal spring located within Alamosa Creek Canyon in southwestern Socorro County, New Mexico (Figure 1). Taylor (1987) also documented additional springsnails from unnamed spring sources located approximately 800 meters west of Ojo Caliente. Within the range of Alamosa Creek's diverse aquatic habitats, NMDGF (2008) found springsnails in all stenothermal spring sources, and their associated spring runs, that are perennial tributaries of Alamosa Creek, including the main channel of the creek flowing along the north stream bank downstream to approximately 20-30 meters above the Monticello Box. Alamosa springsnails are only known to occur upstream of Monticello Box in Alamosa Creek (Figure 1). Upstream from Monticello Box, the species did not occur in colder, more thermally variable waters of the perennial channel of Alamosa Creek, or in intermittent flows along the south stream bank. These areas have a lower temperature range than waters occupied by this species and may represent habitats that are frequently disturbed by catastrophic flood events (NMDGF 2008).

During surveys, Taylor (1987) found Alamosa springsnail using rhyolitic gravels-cobbles, in shallow, low-velocity waters near springhead margins characterized by low-gradient spring runs. Reduced numbers of snails were noted by Taylor (1987) and Mehlhop (1993) in downstream high-velocity tributaries of Alamosa Creek. The NMDGF (2008) also noted higher abundance of Alamosa springsnail in the lowest velocity (0.05-0.50 meters/sec), warmest (21.1-28.1 °C) and most stenothermic microhabitats associated with thermal spring vents. Alamosa springsnail densities decreased notably at most downstream surveyed areas, but some downstream survey areas situated near springheads that were more thermally variable and slightly cooler also supported dense snail populations (NMDGF 2008). The NMDGF (2008) also noted newly hatched Alamosa springsnail (shell length ~0.5-0.75 mm) on study tiles throughout the year (March, June, September and November) which could imply reproduction occurring year-round.

Additional information regarding descriptions, ecology and life history can be found in the Socorro and Alamosa springsnail Recovery Plan (Service 1994).

**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:**

See Section 2.2.3 (this document) for information on snail densities estimates in the Alamosa Creek wetland complex.

On November 16, 2016 the Service visited the Ojo Caliente site with the NMDGF and discovered that only a few Alamosa springsnails were present. Locals report that a large flood event occurred on November 4, 2016. This event may have scoured, inundated, and deposited sediment into Ojo Caliente, adversely affecting the springsnails there. The springsnails in the thermal springs about 800 meters to the west appears unaffected from the flood event. On 21 December 2016, the Service and NMDGF revisited all sites to initiate monitoring. Springsnails appear to be slowly increasing in numbers at Ojo Caliente and unchanged in the western thermal springs.

**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 Alamosa springsnail was first discovered by Taylor (1979) and placed in the genus *Tryonia*. It was later described as *Tryonia alamosae* by Taylor (1987). Hershler et al. (1999) provided mtDNA evidence to support a new clade called *Pseudotryonia*. Hershler (2001) used this evidence and a combination of genitalic characters to reassign the genus to *Pseudotryonia*. However, the Alamosa springsnail is still classified as *Tryonia alamosae*.

#### **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 the Alamosa springsnail is found consists of five distinct springheads. The largest of the five springheads, and the most distinctive, is the only one identified by the U.S. Geological Survey (Ojo Caliente, type locality for Alamosa springsnail); the other four are unnamed and are located about 800 meters west (Figure 1). These four springheads may be physically connected to each other and receive water from the same source. A low ridge separates the largest spring Ojo Caliente, from these springs. These springs also contain Alamosa springsnails. They discharge into two forks, connect approximately 200 meters downstream and continue for another 400 meters. One fork has abundant springsnails and one fork has sporadic and sparse springsnails. Once the two forks meet, springsnail occurrence continues to be sporadic and sparse (Lang 2005, AMEC 2010).

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

The Monticello Community Ditch Association is the owner and land steward of the Alamosa Creek wetland complex (including Ojo Caliente and another group of thermal springs about 800 meters to the west) down through the Monticello Box. Upstream of the Monticello Box, the Alamosa Creek wetland complex consists of a series of thermal spring sources that rise on moderate to steep slopes along the north stream bank of Alamosa Canyon (Figure 1). Thermal groundwater issues from shallow (0.25 - 1.0 m) springhead pools located about 800 meters west of Ojo Caliente. Spring flows are conveyed by a series of narrow streams

flowing down-gradient (south) to Alamosa Creek. Ojo Caliente discharges high-velocity flows (1200 gallons/minute) to Alamosa Creek (Waring 1965). The broad floodplain of Alamosa Creek proper consists of a series of braided channels with perennial flows derived from the eurythermal spring sources described above and stenothermic springheads located near the adobe vestiges of the Warm Spring Apache Indians ruins located along the south stream bank about a mile upstream of the Monticello Box. Flows from these numerous spring sources are likely derived from a composite of shallow and deep groundwater source zones resulting from extensive fault zones known in this area (Waring 1965, Meeves 1966, Myers et al. 1994). The riparian corridor of Alamosa Creek is dominated by an emergent marsh plant community consisting of *Distichlis spicata*, *Eleocharis* spp., *Juncus* spp., *Scirpus* spp., and *Typha* sp. (NMDGF 2008). Substrates of this lotic system consist primarily of rhyolitic rock of mixed grain sizes (sand, gravel, cobble, and rubble).

#### **2.3.1.7 Other:**

In 2010, the New Mexico Mining and Minerals Division granted a permit to an applicant to drill exploration holes on property located within the upper Alamosa Creek Basin (approximately 900 meters downstream of Alamosa springsnail occupied areas). The property is situated on a mining lease. The hydrological exploration was related to the potential mining of bertrandite ore for beryllium in this location. If built, the mine could lead to potential degradation of habitat, and groundwater and surface water quality and quantity. The bore holes were drilled but the company announced it would be dropping the project and no further work is known to have occurred with the mine (McLemore 2014).

A property approximately 60 kilometers northwest of Alamosa Creek Basin has plans to pump 54,000 acre-feet per year from the Plains of San Agustin aquifer. The property's permit application was denied in 2012, but another application (April 2016) is under review by the Office of the State Engineer. Myers et al. (1994) did describe San Agustin and Alamosa Creek as basins and major aquifers within the geographic area of this proposed groundwater appropriation. These aquifers supply surface waters within the Rio Grande basin so pumping from the San Agustin aquifer may affect flows in Alamosa Creek.

#### **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:**

Inability to conduct surveys and habitat assessments makes identification and quantification of threats difficult. Because water quality conditions can change quickly in small spring-fed aquatic systems becoming detrimental to invertebrate survival (NMDGF 2009), monitoring of these conditions is necessary. This wetland complex is under private ownership with site access restrictions. Historically, this section of Alamosa Creek Basin was open to the public. In 2015, private landowners petitioned Socorro County to restrict access to the county road that runs through this area. Currently, only landowners and individuals possessing a \$25 land permit (from the New Mexico State Land Office) can use the road. Biologists with NMDGF have been given limited access to conduct monitoring. The road closure could have the unintended effect of minimizing off road vehicle issues including erosion and vegetation loss.

Currently, there is no HMP for this area. The properties mentioned in Section 2.3.1.7 (this document) may have unknown effects on hydrology in the future. In addition, the effects of climate change (See Section 2.3.2.5 [this document]) are also seen as a potential threat.

Activities associated with grazing including vegetation loss, stream bank trampling and destabilization, and erosion/siltation within the wetland could impact this species. The MCDA has taken proactive measures to fence-out feral cattle and have practiced low intensity seasonal grazing at this site. If these practices stay in place,

grazing should not be an issue.

In 2004, MCDA under a cooperative agreement with Partners for Fish and Wildlife Habitat Restoration Program (NMDGF 2002) was awarded a grant to restore 16 hectares of riparian habitat along Alamosa Creek by removing non-native invasive salt cedar (*Tamarix* spp.) to protect habitat for Alamosa springsnail and other imperiled species. This removal has continued annually to control sporadic stump sprouts and new growth. Currently, salt cedar has been kept in check in this area.

#### **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 Alamosa 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. Future permits for collecting Alamosa 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 Alamosa springsnail. We believe that disease is not likely to affect the species unless an unknown pathogen is transmitted to Alamosa springsnail. The introduction of non-native competing or predaceous organisms (including fishes) into Alamosa Creek wetland complex would be a potential threat to Alamosa springsnail.

#### **2.3.2.4 Inadequacy of existing regulatory mechanisms:**

The final rule listing the Alamosa springsnail as Endangered was passed in 1991 (Service 1991; 56 FR 49648). In the rule, it's noted that Alamosa springsnail is protected by the State Wildlife Conservation Act, Section 17-2-41. Under State law, there are prohibitions against destruction of the snails and excessive collecting, but the ability to protect habitat is limited. 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) The Endangered Species Act provides for possible land

acquisition, 2) prohibitions of the Act make it illegal to take a listed species, and 3) permits may be issued to carry out otherwise prohibited activities. Some of the conservation measures suggested in the listing rule have not provided protection. The Alamosa Creek Basin is still under private ownership and no permits for take have been issued to the landowners.

The recovery plan calls for a habitat management plan to be written, which presumably would protect the spring habitat and provide guidelines for acceptable management practices, but the plan has not been written. The spring is assumed to be managed the same as it was at the time of the springsnail's listing with the exception of the agreements described in Sections 2.2.3 and 2.3.2.1 (this document).

#### **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 Alamosa 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 Alamosa springsnail may be affected, we lack sufficient certainty to know how climate change specifically will affect Alamosa springsnail.

## **2.4 Synthesis:**

The Alamosa springsnail is a rare, hydrobiid snail that survives in a series of thermal spring sources located on private land in Socorro County, New Mexico. Critical habitat designation was determined to not be prudent at the time of listing because the threats of collection and vandalism outweighed benefits that designation may have bestowed. Population numbers appear to be rebounding to historic levels after a reported flood event. A habitat management plan has not been written for the species, as directed by the recovery plan. Translocation to other springs, a criterion for delisting, may not be a viable option. Surveys are being conducted infrequently so difficulties will continue 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 location where it could easily be extirpated by biological or environmental threats, we recommend that Alamosa springsnail remain listed as endangered.

### 3.0 RESULTS

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#### 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 17. The current recovery priority number of 14 indicates a low degree of threat and high recovery potential. A species with a low degree of threat is rare, or is facing a population decline which may be a short-term, self-correcting fluctuation, or the impacts of threats of the species' habitat are not fully known. We believe this species still has a low degree of threat because the reduction in one of the springs was short-term and snail numbers appear to be stable or increasing again. Additionally, threats including invasive vegetation, grazing and climate change still require more study. Because this species is restricted to this one wetland complex, 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

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- Revise and Update the recovery plan. The current recovery plan is associated with the Alamosa springsnail as well as the Socorro springsnail. Work with state wildlife biologists and other experts to determine if this multi-springsnail recovery plan is the best approach for management of these species. Additionally there is no habitat management plan in place (one of the downlisting criteria) and establishment of additional Alamosa springsnail populations within the historic range (one of the delisting criteria) may not be a viable option. Because of these reasons, it is recommended that revised recovery plan(s) be completed.
- Upon revision and updating of the recovery plan, incorporate recovery goals to address climate change (e.g. drought, monsoonal events, spring contamination).
- Continue efforts to work on habitat management plan or other forms of conservation agreements with the landowners.
- Work with landowners and state wildlife biologists to continue to implement frequent monitoring of the springs and springsnails.

- Work with state wildlife biologists and other experts to determine if it is feasible to establish a population outside of Alamosa springsnails' historic range.
- Work with state wildlife biologists and other experts to determine if a captive refugium population is needed.

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**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Alamosa springsnail (*Tryonia alamosae*)**

**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:** 17

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

**FIELD OFFICE APPROVAL:**

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

Approve Susan M. Kelly Date 26 July 2018