Status and Distribution of Terrestrial Snails in Southwest New Mexico

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Interim Report to:
New Mexico Department of Game and Fish
Share with Wildlife Program

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Oreohelix pilsbryi (Mineral Creek Mountain Snail)

J. Eric Wallace
3232 E. 2nd St.
Tucson AZ 85716

Project Objective

The objective of this project is to provide updated information on the status and distribution of terrestrial snails in southwest New Mexico that are considered Species of Greatest Conservation Need (SGCN) by New Mexico Department of Game and Fish.

Project Need

Southwestern New Mexico supports a diversity of land snail species, many of which are endemic to a relatively small area (e.g., an isolated mountain range or individual canyons or talus slopes within a mountain range; Pilsbry 1915, Pilsbry and Ferriss 1917, Thompson 1974, Miller 1976, Metcalf and Smartt 1997, Lang 2000). The New Mexico Department of Game and Fish (NMDGF 2016) lists 22 species[1] of land snails considered SGCN of which 17 (72%) occur in southwest New Mexico[2]. Fifteen of these 17 species (88%) are represented by larger, more conspicuous snails in the families Helminthoglyptidae (*Sonorella* spp.), Oreohelicidae (*Oreohelix* and *Radiocentrum* spp.), Polygyridae (*Ashmunella* spp.), and Urocoptidae (*Holospira* spp.). Four of these 17 SGCN are considered Threatened by NMDGF (2018), and USFWS (2009) determined that *Ashmunella macromphala, Oreohelix pilsbryi* and *Sonorella todseni* may be warranted for listing under the Endangered Species Act (ESA) and are currently “Under Review” (USFWS 2019).

The isolated nature and small population size of many of these species make them vulnerable to natural and human-caused disturbances that could lead to negative population-level effects, local extirpation, or extinction. Primary threats for terrestrial snails in southwestern New Mexico include: 1) natural stochastic events such as flooding or extended drought, 2) soil disturbance from recreational use and mining activities, 3) environmental contamination from historical or contemporary mining, 4) vegetation disturbance and removal, 5) wildland and prescribed fires, 6) livestock overgrazing, 7) erosion, sedimentation, and changes in soil moisture related to the aforementioned threats, and 8) human-mediated climate change and its interaction with threats listed above (Lang 2000, NMDGF 2016).

Due to the potential future listing of the three species under review (and other SGCN snails) in southwestern New Mexico, state and federal agencies, non-profit organizations, private land owners, and other potential stakeholders are moving towards a model that seeks to develop conservation agreements for species or species groups that identify and mitigate potential environmental stressors (e.g., CAPLSWG 2017, CPSXTWG 2018). Development of conservation agreements among stakeholders could potentially preclude listing of species under the ESA when they are evaluated in the future. Potential stakeholders in southwestern New Mexico that could benefit from conservation agreements include the NMDGF, U.S. Forest Service (USFS), Bureau of Land Management (BLM), Malpais Borderlands Group, the Animas

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[1] This list excludes the Florida mountainsnail (*Oreohelix florida*) that is listed as Endangered by NMDGF (2018) but is considered extinct based on recent field surveys by Metcalf and Smartt (1997) and Lang (2000).

[2] Southwestern New Mexico in this proposal is defined as Doña Ana, Grant, Hidalgo, Luna, and Sierra counties.

Foundation, the Nature Conservancy, and the Department of Defense (DOD; Fort Bliss and White Sands Missile Range[3]).

To formulate and develop conservation agreements, contemporary data on distribution, natural history, and population status, as well as an initial threats assessment, are required. These data can inform the subsequent development and implementation of monitoring programs that ensure conservation agreements are meeting defined goals. The majority of surveys for southwestern New Mexico land snails occurred during two disparate periods, i.e., during the early 20th century (e.g., Pilsbry 1915, Pilsbry and Ferriss 1917) and the late 20th century (Metcalf and Smartt 1997, Lang 2000). While these reports represent a foundational dataset, the recent work is already 20 years old. Therefore, in preparation for the eventual USFWS listing review of three species (mentioned above), as well as for potential future reviews of other SGCN snail species, I will gather updated status and distribution data on these species in southwest New Mexico.

Methods

I prepared for field surveys of SGCN terrestrial snails using a two-pronged process: 1) I compiled historical records based on primary reports and published articles and 2) I queried and compiled museum records from online natural history museums known to house New Mexico terrestrial snail specimens. Historical records from reports and articles and museum records have been compiled in Microsoft Excel spreadsheets.

I used results from publications and museum records to develop a survey approach that identified specific mountain ranges and sites within mountain ranges that maximized efficiency of field efforts. Mountain ranges identified included the Black and Cooke’s ranges, Doña Ana, Florida, Big Hatchet, and Little Hatchet mountains. A critical component of this approach was coordination with knowledgeable individuals from the U.S. Forest Service and the Bureau of Land Management familiar with the landscape regarding access to sites or lack thereof (e.g., private lands, locked gates, inaccessible roads, etc.).

Field surveys used visual encounter surveys (VES) that targeted micro-environments that support more mesic conditions (e.g., slopes with decomposing rock piles or talus slides and shaded canyon bottoms) to increase detectability of snails. This included flipping rocks and other potential cover objects (e.g., woody debris) and searching for snails or shells below or along the edges of cover objects. I also sifted through fine sediments, small rocks, and plant debris (e.g., decaying leaves, twigs, etc.) as snails and shells were often buried at a depth of approximately 1-2 centimeters. This occurs because some species of snails are burrowers (e.g., *Ashmunella* spp.) and because shells in general are often moved by wind, water, or gravity downslope and can accumulate in these “drift” piles. All data, including presence of snail species (including live snails, shells, or shell fragments) and GPS coordinates, will be entered in an Excel spreadsheet compatible with existing NMDGF databases. I photo-vouchered live specimens and shells collected and photographed representative habitat at each site.

[3] Currently no species occurring on these DOD lands are listed as SGCN but there is a diverse land snail fauna on these lands (Metcalf and Smartt 1997, Sullivan 1997, Kroll 2003).

At each survey site, I recorded a suite of habitat variables that included 1) dominant geology, 2) percent total rock cover, 3) elevation, 4) aspect, 5) air temperature, 6) soil temperature and moisture, 7) soil and litter accumulation, 8) dominant vegetation type, 9) distance to nearest shrub/tree species, and 10) overstory, midstory, and shrub canopy cover measured by ocular estimate. During June 2020 surveys, I tested the feasibility/applicability of these variables relative to survey sites and I am currently adjusting which variables will be recorded during future surveys.

Preliminary Results

Historical Records

I extracted over 200 records of terrestrial snail species from published reports and research articles (e.g., Pilsbry 1915, Pilsbry and Ferriss 1917, Pilsbry 1939, Pilsbry 1940, Thompson 1974, Vagvolgyi 1974, Miller 1976, Metcalf and Smartt 1997, Sullivan 1997, Lang 2000) and over 700 records from museums including The Academy of Natural Sciences of Philadelphia (ANSP), University of Texas at El Paso Biodiversity Collections (UTEPBC), and Santa Barbara Museum of Natural History (SBMNH). A majority of museum records came from ANSP due to the extensive work done in the state by Henry A. Pilsbry and James H. Ferris in the early 20th century and from UTEPBC due to the work of Dr. Artie Metcalf and Brian K. Lang, among other individuals, in the latter 20th century.

Mapping historical sites was a laborious process that often led to uncertain or imprecise results. Information related to a given locality ranged from descriptive text in older references, which often used archaic place names (i.e., names that could not be located on contemporary map sources; e.g., USGS 15 minute and/or 7.5 minute topographic maps), to the U.S. Public Land Survey System (i.e., Township, Range, Section; TRS) to latitude and longitude or Universal Transverse Mercator (UTM) coordinates. I interfaced available locality information with USGS topographic maps using National Geographic TOPO™ and satellite imagery from Google Earth™ in an iterative process to attempt to further refine and locate historical sites. This often entailed locating topographic map features described and/or landform or geologic features that could represent snail habitat and that could better direct field investigations. When latitude and longitude and UTM coordinates were provided (e.g., Metcalf and Smartt 1997, Lang 2000), these proved to be nearly useless as the coordinates, as listed, rarely mapped to areas that were consistent with the site or TRS descriptions. The reasons for these discrepancies are unclear but may be a result of GPS technology in the 1990's.

Mapped locality information was then printed for field use to inform access to potential survey areas. While in the field, I used these maps in combination with landform and geologic features to further locate potential historic snail localities. An important and informative result of the current survey will be more precise georeferenced localities that will greatly aid in future investigations.

Field Surveys

Field surveys occurred during 17-26 June 2020. Survey results are summarized in ***Table 1*** and representative photographs of snails, shells, and their respective habitat are in ***Appendix A***. I found snails and/or shells of target species at all survey areas with the exception of Howell's Ridge in the Little Hatchet Mtns. This was surprising as I surveyed one of the major exposed limestone escarpments that are described by Thompson (1974) and Metcalf and Smartt (1997) for *Holospira metcalfi* and that mapped relatively close to coordinates provided in the latter report. I surveyed abundant potential habitat along the base of the escarpment and yet observed

Table 1. Terrestrial snail survey results for target areas in southwest New Mexico, June 2020.

Locality	Mountain Range	County	Sites Surveyed[a]	Species Observed[b] (live snails/shells/fragments)
Spring Canyon	Black Range	Grant	5	*Ashmunella binneyi* (1/25/23); *Oreohelix metcalfei* (0/46/17); *Oreohelix* sp. (0/1/0)
Silver Creek	Black Range	Grant	4	*Ashmunella binneyi* (0/9/17); *Oreohelix* sp. (0/0/1)
Mineral Creek	Black Range	Sierra	1	*Oreohelix pilsbryi* (12/26/42); *Thysanophora horni* (0/2/0)
Doña Ana Peak	Doña Ana Mtns.	Doña Ana	4	*Sonorella todseni* (0/51/40)
Cooke's Peak	Cooke's Range	Luna	3	*Ashmunella macromphala* (1/4/12); *Pupilla* sp. (0/2/1)
Castle Dome Wash	Florida Mtns.	Luna	3	*Sonorella hatchitana flora* (0/4/1)
Baldy Peak, NW slope	Florida Mtns.	Luna	3	*Sonorella hatchitana flora* (0/8/13)
Howell's Ridge	Little Hatchet Mtns.	Grant	1	*Thysanophora horni* (0/1/0)
Thompson Canyon	Big Hatchet Mtns.	Hidalgo	5	*Holospira crossei* (0/131/80); *Thysanophora horni* (0/1/0); *Oreohelix* sp. (0/0/1)

[a] Sites surveyed relates to unique and/or separate habitat features within a given locality
[b] Species identifications are considered preliminary until further collections and comparisons are made.

no sign of this species. *Holospira* spp. are readily detectable based on their unique shape and shell sculpturing (see Photo 27-28 in ***Appendix A***). My current assumption is that the species does not occur on the escarpment that I surveyed. There are two similar limestone escarpments to the south of the one surveyed and these will be targeted during surveys later in the year.

I most often encountered shells or shell fragments, rather than live individuals, but this is expected during dry-season surveys in May-June. Surveys during the monsoon season from July through September should yield more live individuals, which should in turn allow for a better estimation of the current status of populations. I did find one live *Ashmunella binneyi* and one *A.*

macromphala in the Black Range and Cooke's Range, respectively. Species in this genus are known to burrow in loose soil and then to seal off the shell aperture with a dried mucous seal to reduce moisture loss (known as an epiphragm). I also encountered 12 live *Oreohelix pilsbryi* in Mineral Creek, three of which were attached to the rock face with an epiphragm and the remaining nine I found loose in leaf litter with sealed epiphragms.

Access to most of the public lands was relatively unhindered with the exception of Chaney Canyon in the northwest part of the Big Hatchet Mtns. Access to BLM lands in the upper part of the canyon are blocked by a locked gate on private land. Despite numerous attempts to contact the landowner (BLM provided me with his phone number) for access through his property, my calls were not returned. This canyon has several potential historical localities for *Ashmunella herbardi* and *Sonorella hatchitana* and I will continue to attempt to contact the landowner in order gain permission for access to survey in the future.

Preliminary Threats Assessment

Due to the steep, rocky terrain and general inaccessibility of snail localities, recreational use seems limited to intrepid hikers and mountain climbers and appears to be relatively low. This rough terrain also limits access by livestock, although sign of livestock was noted in and around the base of nearly every mountain range surveyed. One exception to this exclusion of cattle is Mineral Creek in the Black Range. The limestone outcrop where the population of *Oreohelix pilsbryi* occurs is in the canyon bottom, immediately adjacent to a wet, seep area that is heavily used by cattle. While most *O. pilsbryi* were observed in and amongst the steep-faced crevices and shelves on the outcrop, two individuals were found at the base of the outcrop 2 to 10 cm above ground level. Individuals in such a position could easily be trampled by cattle accessing the watering area.

The other potential threat that was noted during surveys was catastrophic wildfire. The Silver Fire of 2013 appears to have burned much of the upper watersheds where historic locations of *Ashmunella binneyi* and *Oreohelix metcalfei* are found. This resulted in a mosaic of unburned areas and areas where stand replacing fires occurred. The latter resulted in an obvious reduction in canopy cover and organic ground cover along large patches of canyon slopes (see Photo 4, ***Appendix A***). These conditions likely have increased the aridity of slopes previously inhabited by snails and may have resulted in a reduction in available habitat. Future surveys will target both burned and unburned areas to determine (to the extent possible) if snails are still found in burned areas.

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Appendix A: Photopages for SW New Mexico Snail Survey – June 2020

Photo 1. Spring Canyon, Black Range, limestone rock pile where live *Asmunella binneyi* was located.

Photo 2. *Ashmunella binneyi*, 4 representative shells and the one live individual (right); Spring Canyon, Black Range.

Photo 3. *Oreohelix metcalfei,* 4 representative shells; Spring Canyon, Black Range.

Photo 4. Silver Creek, Black Range, showing fire damage from the Silver Fire, 2013. Localityof *Ashmunella binneyi.*

Photo 5. Silver Creek, Black Range, talus slide where shells of *Ashmunella binneyi* were located.

Photo 6. Mineral Creek, Black Range, limestone outcrop where *Oreohelix pilsbry*i was located.

Photo 7. Mineral Creek, Black Range, limestone outcrop (close-up) where *Oreohelix pilsbry*i was located.

Photo 8. *Oreohelix pilsbryi*, live individual adhered to rock-face aestivating, Mineral Creek, Black Range.

Photo 9. *Oreohelix pilsbryi*, Representative live individuals, Mineral Creek, Black Range.

Photo 11. Doña Ana Peak, north slope. Rock pile where shells of *Sonorella todseni* were located.

Photo 10. Doña Ana Peak, north slope. Site of *Sonorella todseni*.

Photo 12. *Sonorella todseni*, representative shells. Doña Ana Peak, north slope.

Photo 13. Cooke's Peak, NNE slope showing large talus slides where *Ashmunella macromphala* is found. Cooke's Range.

Photo 14. Cooke's Peak, NNE slope showing large talus slides where *Ashmunella macromphala* is found. Cooke's Range.

Photo 15. Cooke's Peak, NNE slope showing large talus slide (close-up) where *Ashmunella macromphala* is found. Cooke's Range.

Photo 16. *Ashmunella macromphala,* representative shells. Cooke's Peak, Cooke's Range.

Photo 17. Castle Dome Wash, N facing slope, Florida Mtns. where *Sonorella hatchitana flora* shells were found.

Photo 18. Castle Dome Wash, N facing slope, Florida Mtns where *Sonorella hatchitana flora* shells were found.

Photo 19. Mount Baldy (in background), NW facing slope, Florida Mtns. where *Sonorella hatchitana flora* shells were found.

Photo 20. *Sonorella hatchitana flora*, representative shells. Florida Mtns.

Photo 21. Howell's Ridge, northern limestone escarpment surveyed for *Holospira metcalfi* (none found), Little Hatchet Mtns.

Photo 23. Thompson Cyn., Big Hatchet Mtns. Limestone escarpment (overview) where *Holospira crossei* was found.

Photo 22. Howell's Ridge, northern limestone escarpment (along base of cliff) surveyed for *Holospira metcalfi* (none found), Little Hatchet Mtns.

Photo 24. Thompson Cyn., Big Hatchet Mtns. Limestone escarpment where *Holospira crossei* was found.

Photo 25. Thompson Cyn., Big Hatchet Mtns. Limestone escarpment where *Holospira crossei* was found.

Photo 26. Thompson Cyn., Big Hatchet Mtns. Limestone escarpment with rocks at base where *Holospira crossei* was found underneath.

Photo 27. *Holospira crossei*, representative shells found along limestone escarpment, Thompson Cyn., Big Hatchet Mtns.

Photo 28. *Holospira crossei*, representative shells found along limestone escarpment, Thompson Cyn., Big Hatchet Mtns.