

**PETITION TO LIST TWO TALUS SNAIL SPECIES
FROM THE SKY ISLANDS OF ARIZONA
AS THREATENED OR ENDANGERED UNDER THE
ENDANGERED SPECIES ACT**



Mating *Sonorella* © Alan Cressler

CENTER FOR BIOLOGICAL DIVERSITY

June 24, 2010



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TO: Mr. Ken Salazar
Secretary of the Interior
18th and "C" Street, N.W.
Washington, D.C. 20240

CC: Dr. Benjamin Tuggle
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Dear Secretary Salazar:

Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. §1533(b), Section 553(3) of the Administrative Procedures Act, 5 U.S.C. § 553(e), and 50 C.F.R. §424.14(a), the Center for Biological Diversity, Tierra Curry, and Noah Greenwald hereby formally petition the Secretary of Interior to list the Rosemont talussnail (*Sonorella rosemontensis*), and the Sonoran talussnail (*Sonorella magdalenensis*), two species from the Madrean Sky Islands of Arizona, as Threatened or Endangered species and to designate critical habitat concurrent with listing. Petitioners file this petition under the Endangered Species Act, 16 U.S.C. sections 1531-1543 (1982). This petition is filed under 5 U.S.C. section 553(e), and 50 C.F.R. part 424.14 (1990), which grants interested parties the right to petition for issuance of a rule from the Assistant Secretary of the Interior. The petitioners request that Critical Habitat be designated as required by 16 U.S.C. 1533(b)(6)(C) and 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553). Petitioners realize this petition sets in motion a specific process placing definite response requirements on the FWS and very specific time constraints upon those responses.

The Rosemont talussnail occurs only in the Rosemont area of the Santa Rita Mountains in Pima County and is imminently threatened with extinction due to a proposed open-pit copper mine. The Sonoran talussnail likewise occurs within the footprint of the proposed mine, and also occurs in several other mountain ranges where it faces multiple threats including recreational impacts, real estate development, smuggling and Border Patrol activities, and other factors. There are no existing regulatory mechanisms which protect these rare species, and both merit protection under the Endangered Species Act.

PETITIONER:

The Center for Biological Diversity is a nonprofit conservation organization with 255,000 members and online activists dedicated to the protection of endangered species and wild places. <http://www.biologicaldiversity.org>

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Sonorella rosemontensis UAZ 1456
Courtesy of Dr. Peter Reinthal, University of Arizona Museum of Natural History

EXECUTIVE SUMMARY

The Rosemont talussnail (*Sonorella rosemontensis*) and Sonoran talussnail (*Sonorella magdalenensis*) are in dire need of Federal protection due to imminent threats facing the species and their habitats. The Rosemont talussnail has an extremely limited range occurring only on the north ridge of the Santa Rita Mountains near Tucson. This rare snail occurs within the footprint of a proposed open-pit copper mine (WestLand Resources 2010) and currently lacks any form of protection. The Sonoran talussnail also occurs within the proposed mine footprint. In addition to the threat the snails face from habitat destruction due to the mine, they are now also threatened by overcollection as every live snail encountered was collected by the mining company's consultants in 2008 surveys (WestLand Resources 2009). Elsewhere in Pima County, the Sonoran talussnail is known from the southern end of the Tucson Mountains, the Roskrige Mountains, Cerro Colorado, and Tumamoc Hill (AGFD 2008b), where it faces a diverse array of threats including recreational impacts, talus collecting for landscaping, and buffelgrass control efforts, among other factors (Fonseca 2009). In Santa Cruz County, the Sonoran talussnail is found in the San Cayetano and Tumacacori mountains where it is threatened by sprawling real estate development, livestock grazing, smuggling, and Border Patrol activities. These two rare Arizona invertebrate species clearly warrant timely protection under the Endangered Species Act. The Arizona Ecological Services Field Office of the U.S. Fish and Wildlife Service has already acknowledged that the Rosemont talussnail "may warrant listing as threatened or endangered under the Endangered Species Act" (Spangle 2009).

INTRODUCTION

The Sky Islands of southeastern Arizona host a variety of species found nowhere else on earth. The deserts and plains surrounding the mountain ranges have allowed species to diversify over time, with many of the ranges hosting a unique suite of flora and fauna. The 80 species of talus snails that occur in the Sky Islands are icons of this diversity. Most of the Sky Islands harbor unique species of talus snails, and some host several species. Weaver et al. (2010) studied the genetic relationships among talus snails in several Sky Island ranges and found that talussnail species in the Pinaleños are more closely related to each other than they are to talus snails in adjacent ranges. This suggests that diversification within each mountain range resulted from a single common ancestor and that endemism is widespread across the Sky Islands. Unfortunately, occurrence in only a limited area and very limited ability to disperse makes talussnail species highly vulnerable to habitat disturbance and population extirpation or extinction. Such is the plight of the two petitioned species.

The Rosemont talussnail (*Sonorella rosemontensis*) occurs only in the Rosemont area of the Santa Rita Mountains, the same area that has been targeted by a mining corporation for the development of an open-pit copper mine which could drive this snail, the product of millions of years of evolution, to extinction in a mere 20 year time-span, the estimated life of the mine. The Sonoran talussnail (*Sonorella magdalenensis*) also has the misfortune of falling within the proposed mine footprint. In addition to mining, the Sonoran talussnail is threatened in other parts of its range, the San Cayetano, Tumacacori, Tucson, and Roskrige mountains, by recreation, talus removal, development, livestock grazing, and other factors. The Rosemont talussnail and Sonoran talussnail are unique components of the natural heritage of the southwest United States. These endearing terrestrial snails survive in moist patches of microhabitat surrounded by an arid landscape. Due to human-caused threats to their existence, these rare Arizona species now need Endangered Species Act protection to ensure their continued survival.

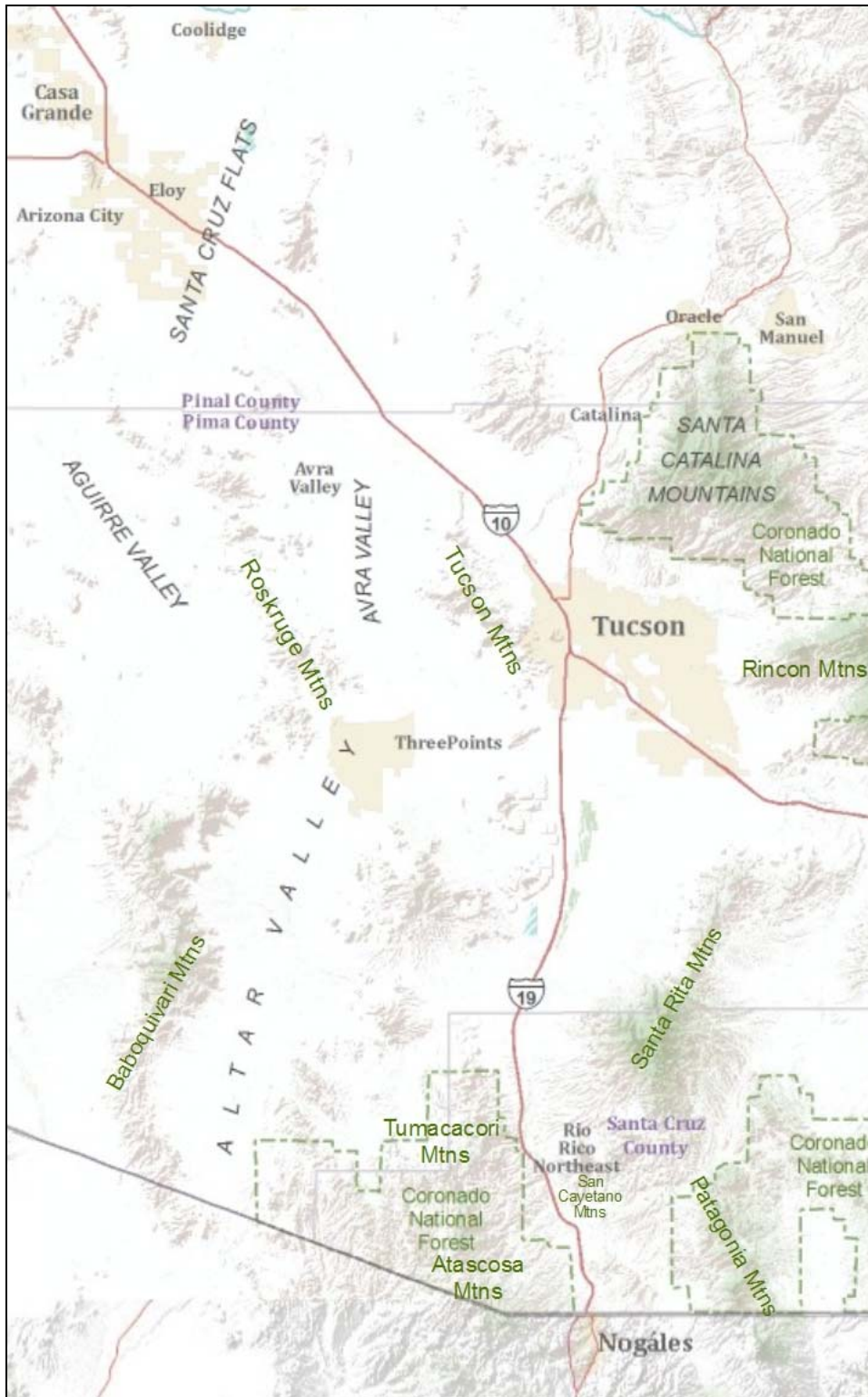


Figure 1. Map of Sky Island Mountain Ranges (Western). The Rosemont talussnail occurs only in the Santa Rita Mountains south of Tucson. The Sonoran talussnail occurs in the Santa Ritas, in the Tucson and Roskrige mountains west of Tucson, and in the San Cayetano and Tumacacori mountains north of Nogales. Both species face multiple threats throughout their ranges.

SPECIES ACCOUNTS

Rosemont Talussnail (*Sonorella rosemontensis*)

Description

The Rosemont Talussnail (*Sonorella rosemontensis*, Pislbry 1939) is a terrestrial snail in the order *Stylommatophora* and family *Helminthoglyptidae*. It is a valid species (Turgeon et al. 1998). The Arizona Game and Fish Department (2008) provides the following description of *Sonorella* species:

“Snails in the genus *Sonorella* have a “depressed globose, helicoids shell, 12 to 30 mm in diameter, umbilicate or perforate, with a wide, unobstructed mouth and a thin, barely expanded peristome, smoothish or slightly sculptured with growth-lines, occasionally with fine oblique or spiral granulation and short hairs (mainly on the early whorls), lightly colored, and normally with a dark peripheral band. Its most characteristic features are, however, in the genitalia, which lack a dart sac and mucus glands.” (Bequaert and Miller, 1973). For species in the *S. hachitana* Complex: the penis is a usually long, slender, narrowly pointed verge; and in extreme forms, the verge is thick and club-shaped. Shells are relatively large and capacious, with a smooth, silky-lustrous periostracum; usually with apical spirally descending threads. (Bequaert and Miller, 1973).”

Habitat

The Rosemont talussnail is usually found in talus or coarse broken rock slides, in crevices one to several feet below the surface. *S. rosemontensis* has been collected in rockslides facing north and west at elevations ranging from 4,400 – 5,600 feet (AGFD 2008). Talus snails are also associated with limestone outcrops (Fonseca 2009). In addition to deep talus slopes, this snail also occurs in canyons with rock rubble (Westland Resources 2009). Surveys for *Sonorella* in the Rosemont area detected snails near the edges of talus slopes in areas of accumulated leaf litter (Ibid.) Talus snails are dependent on areas with moist microhabitat to prevent desiccation (NatureServe 2010, *S. rosemontensis* species account). They generally only surface after rain events (Guralnick and Hedrick undated). Because talus snails are dependent on specific microhabitat conditions, including sufficient moisture and enough interstitial space among rocks for adults to move, they are highly vulnerable to habitat disturbing activities (AGFD 2008).

Ecology

Sonorella snails feed on lichens (including *Xanthoparmelia* spp.), plants, leaf litter, and potentially fungus (Westland Resources 2009). They have been observed mating during summer rains (Ibid.).

Range

The Rosemont talussnail occurs only in the Santa Rita Mountains in Pima County, Arizona. Very narrow range and extremely limited ability to disperse make this species inherently at high-risk of extinction.

Populations, Status, and Trend

Population data are not available for *S. rosemontensis*. NatureServe (2010) ranks the Rosemont talussnail as critically imperiled in Arizona and vulnerable rangewide (G3S1). This snail is known only from a limited area in a single mountain range and the G3 ranking does not accurately reflect its limited distribution. It is a Species of Concern on the Coronado National Forest (FS 2009).

The Rosemont talussnail has no state or federal protective status, but is imminently threatened by the proposed Rosemont Copper Mine. On October 15, 2009, the Arizona Ecological Services Field Office of the U.S. Fish and Wildlife Service issued a memorandum stating that information had been compiled “indicating that the Rosemont talussnail (*Sonorella rosemontensis*) may warrant listing as threatened or endangered under the Endangered Species Act” (Spangle 2009).

Land Management

Sonorella rosemontensis occurs on the Coronado National Forest and on land owned by Rosemont Copper Company, a subsidiary of Augusta Resource Corporation (WestLand Resources 2010). It may also occur on lands managed by the BLM Tucson Field Office (AGFD 2008).

THREATS

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Mining

The Rosemont talussnail could be driven to extinction by the proposed Rosemont Copper Mine which is currently scheduled to begin operations in 2012 (Augusta Resource Corporation 2010). Augusta Resource Corporation (Rosemont Copper Company) is planning to destroy at least 4,415 acres of habitat at the north end of the Santa Rita Mountains 30 miles southeast of Tucson in Pima County. The mine would consist of a 2,900-foot-deep open pit and associated facilities including roads, a leach field, retention structures, utilities, wells, and ore transportation systems, and is expected to operate for at least 20 years (SWCA 2009, Augusta Resource Corporation 2010). The Rosemont talussnail is threatened by direct habitat destruction in the footprint of the mine and facilities, habitat degradation adjacent to the mine resulting from mining activities, and habitat degradation resulting from planned post-mining activities.

Sonorella rosemontensis occurs only in the Rosemont area and the mine will directly destroy sites where this snail occurs if not its entire range. An email from the district biologist of the Coronado National Forest to the Service states, “We have recently discovered that the Rosemont talussnail, *Sonorella rosemontensis*, more than likely occurs on or near the site of the proposed Rosemont Mine . . . I’m concerned that the mine may destroy a substantial part of its habitat” (Sebesta 2008a).

Westland Resources (2010) collected talus snails in and around the proposed mine footprint and graphically analyzed shell morphology and embryonic sculpturing which revealed that two distinct morphotypes of talus snails (representing *S. rosemontensis* and *S. magdalenensis*) occur within the footprint of the proposed mine pit and in adjacent areas (see WestLand Figures 9, 11, 17). They found that *S. rosemontensis* and *S. magdalenensis* occur together on the same talus slopes, and that

they both occur on the east and west slopes of the north ridge. WestLand also analyzed the genitalia of 12 snails and this analysis also revealed that *S. rosemontensis* and *S. magdalenensis* co-occur, and are found on both the east and west slope of the north ridge. They state:

“RJS dissected 12 *Sonorella* snails that had been collected alive by RJS and other WestLand biologists from the North Ridge. Of these twelve *Sonorella*, six had the cylindrical verge with a conic end and strongly spiral placcation of *S. magdalenensis* (sensu Miller 1967). . . The lengths and forms of the latter six genitalia correspond with that of *S. rosemontensis* (as described by Miller 1967). . . both verge types were found on the east slopes and the west slopes of the North Ridge.”

It is undeniable that mining operations will cause the loss and degradation of habitat for the Rosemont talussnail and Sonoran talussnail.

Talus snails primarily inhabit talus, but may also be found in association with rock outcrops, rocky slopes, canyons, rocky drainages, and riparian areas (Bequaert and Miller 1973). The Rosemont talussnail may thus occur not only on talus slopes, but also in rocky canyons in the waste rock footprint (Jones 2008) and in other areas with rock rubble (Bequaert and Miller 1973, Westland Resources 2009).

Terrestrial snails are vulnerable to any form of substrate disturbance or mining activity (Lang 2000, FWS 2009 p. 66893). *Sonorella rosemontensis* is known to be threatened by the destruction and disturbance of talus slopes (AGFD 2008). Fonseca (2009) states, “[D]estruction or disturbance of their talus slope habitat may lead to the complete extinction of a talus snail species.” Because the Rosemont talussnail occurs only in the Rosemont area, it is highly vulnerable to extinction.

The Rosemont talussnail is threatened not only by direct habitat destruction within the footprint of the mine and associated facilities, but also by the degradation of adjacent habitat due to altered microhabitat conditions-- “Talusnail habitat is vulnerable to actions that might remove talus, increase interstitial sedimentation or erosion, open vegetal canopy, alter runoff or discharge patterns, or otherwise change moisture conditions in ways that might be lethal to a local population of *Sonorella*” (Fonseca 2009). In addition to the outright destruction of habitat within the mine’s footprint, the mine and associated facilities will degrade adjacent habitat by increasing erosion and dust, reducing leaf litter and vegetative cover, lowering the water table and reducing surface flows, and altering temperature, moisture, wind, reflection, and evapotranspiration patterns and conditions. The removal of more than 4000 acres of natural vegetation will alter reflection patterns and could increase ground temperatures and wind exposure in areas outside the footprint. Talus snails are dependent on moist microhabitats and the altered humidity conditions due to the diversion of ground and surface water and loss of vegetation could render their habitat unsuitable in areas adjacent to the mine.

Interstitial space between rocks is an important habitat feature for *Sonorella* because it allows for vertical migration in response to climatic variation (Westland Resources 2009). Dust and sediment from mining activities, topsoil removal and replacement, road construction and maintenance, traffic, and tailing piles threatens the survival of *S. rosemontensis*, not only in the footprint of the mine and facilities but also in surrounding habitat, because it could fill the interstitial spaces and make their

habitat unusable. Increased interstitial sedimentation from mining and road construction and maintenance is a documented threat to talus snails (FWS 1998, AGFD 2003b). The mine would require the construction and maintenance of numerous new roads. Mine haul and access roads are planned along the north, east, and south edges of the mine pits (SWCA 2009). A new two-lane, unpaved road is planned to allow access between SR 83 and the mine, and there are plans to widen SR 83. Several new roads are planned to reconnect the prior forest road system due to the closing of some existing roads to the public during mining activities (SWCA 2009). A new section of single-lane unpaved road would be built to connect the East Access Road to the existing forest road over Gunsight Pass, where the petitioned snails occur. Dust from mining activities and increased traffic (a heavy truck is expected to leave the mine site every 15 minutes), and dust from tailings piles directly threatens talussnail habitat outside the mine footprint. Increased dust and reduced moisture may also threaten the lichens on which talussnails feed.

Talus snails are threatened by windblown pollutants (Fonseca 2009). Airborne contaminants from mining, waste rock, and tailings piles include uranium, sulfate, fluoride, and antimony (Pima County Administrator 2009b). Herbicides used in conjunction with mining activities and road maintenance could be washed into areas where talus snails could encounter them (AGFD 2003b). Air pollution and herbicides from mining activities could also threaten the lichens which provide food for the snails.

Proposed post-mining land uses include cattle ranching and recreation, both of which threaten talus snails. Current and probable post-mine recreational activities that threaten snails include prospecting, ATV and motorcycle riding, and four-wheeling (SWCA 2009). The Rosemont property is part of an existing ranching facility with more than 15,000 acres of grazing lease, and cattle are expected to be present during and after the proposed mining (Ibid.).

It is highly likely that impacts to the Rosemont talussnail and Sonoran talussnail from mining activities in the Rosemont area will be underestimated by the mining corporation and their consultants. Talus snails are notoriously difficult to survey for and only surface during appropriate weather conditions. Sites that support either of the petitioned species could easily be missed during surveys. The snails are threatened both in the footprint of the mine and in adjacent areas due to altered microhabitat conditions (discussed above) and the mining corporation will dismiss impacts outside the footprint. Whether or not the mining company acknowledges that sites are going to be destroyed, the mine will certainly result in curtailment of range for both the Rosemont talussnail and the Sonoran talussnail, and could result in extinction for *S. rosemontensis*.

Even if the mine currently proposed by Augusta Resource Corporation does not move forward, mining will remain a threat to the Rosemont talussnail. Mining has been a threat in the Rosemont area since at least the early 1900's (Schrader 1915), and will continue to be a threat into the future. The Rosemont property has been sold numerous times, and if the current owner fails to develop the currently planned mine, the property is likely to be sold to yet another mining corporation.

Recreation and Vandalism

The Rosemont talussnail is threatened by several recreational activities. SWCA (2009) reports that the Rosemont area is disturbed by all-terrain vehicle use. Use of dirt bikes and other ATVs in

authorized and unauthorized areas is a documented threat to talus snails (FWS 1998). Occurrence on talus slopes may mitigate the threat posed by ATV-use, but the talussnail also occurs at the edges of talus slopes in areas of accumulated leaf litter and in rocky canyons. Talus snails are also threatened by dust generated from off-road vehicles, as dust can fill in interstitial rock spaces and decrease habitat suitability. It is well known that habitats in the Coronado National Forest have been degraded by authorized and unauthorized off-road vehicle use. The Coronado National Forest is currently amending the Forest Plan to allow off-route driving up to 300 feet from designated routes for the purpose of dispersed camping (FS 2010). The explicit authorization of off-road driving threatens species which could be crushed by vehicles and this threat will escalate as camping corridors expand and more habitat is destroyed, creating ever-increasing areas of degradation.

Hiking, climbing off trail, and crushing or collection of snails by recreationists is also a threat. Construction of recreational trails can intersect talus and may threaten talus snails (FWS 1998, Fonseca 2009). Rapid human population growth in the city of Tucson and increased recreational use of the Santa Ritas magnifies the threat posed by recreation to the Rosemont talussnail (eg. FWS 2009, p. 66895).

Other Known Habitat Threats

Talus snails are threatened by many additional habitat degrading activities. The removal of loose rock from talus deposits for landscaping or building use is a documented threat (Fonseca 2009). Talus snails are threatened by habitat degradation from invasive buffelgrass, fire carried by buffelgrass, and by buffelgrass removal efforts including fire, rock disturbance, and herbicide application (Fonseca 2009). Buffelgrass invades both lower slopes and steep rocky hillsides and is expanding very rapidly (Arizona-Sonora Desert Museum 2010). Aerial herbicide applications to control buffelgrass threaten non-target species such as talussnails (eg. Garcia and Conway 2007).

Livestock grazing occurs in the Rosemont area (SWCA 2009) and threatens the Rosemont talussnail. Although talus snails are primarily associated with rocky areas, they are also associated with areas of shrubs, small trees, and leaf litter (Westland Resources 2009) which are appealing to cattle. Talus snails are threatened by any activity that causes rock disturbance, such as reptile collecting (Fonseca 2009). Vandalism is also a threat (eg. FWS 1998).

Habitat disturbance for collection threatens *S. rosemontensis*. The Rosemont area is now subject to heavy collection pressure due to the need to delineate the range of the talus snails for the development of the proposed Rosemont Copper Mine. WestLand Resources dug around 200 pits in talussnail habitat (2010, p. 26). They sometimes removed rocks to a depth of 2 feet to search for snails (2009). Talus environments are easily disturbed and talus snails are dependent on specific microclimates for survival. Decreased interstitial space and reduced moisture resulting from collection activities could be lethal to snails, even if researchers attempt to return rocks to their original positions.

Overutilization

Collection is a known threat for talus snails (FWS 1998). Overutilization is a present and increasing threat to *S. rosemontensis*. The Rosemont talussnail occurs only in the Rosemont area, making it highly vulnerable to extinction. Population information is not available, but it is likely that

populations are small and sensitive to collection. Due to the financial interest in mining the area, this species is now subject to increased collection from county, state, and federal agencies, corporations and their consultants, and scientists. Because talus snails are difficult to identify to species in the field, surveys are generally lethal because snails are dissected for identification purposes. The Forest Service instructed surveyors to collect up to 10 living animals per site in the Rosemont area for identification purposes (Jones 2008). Every live snail encountered was collected by Westland Resources in 2008 surveys in the Rosemont area. The company collected over 100 live talus snails in 2008 and 2009, with unknown but likely significant population effects for this extremely limited-range species.

Inadequacy of Existing Regulatory Mechanisms

There are no existing regulatory mechanisms which protect the Rosemont talussnail or its habitat. *Sonorella rosemontensis* occurs on the Coronado National Forest and may also occur on private lands and on lands managed by the BLM Tucson Field Office (AGFD 2008). The snail has no protection whatsoever on private or public land.

This snail has no substantial protection on the Coronado National Forest where it is a “Species-of-Concern” under the 2008 planning rule for the revision of the Land and Resource Management Plan. This designation provides no regulatory protection. *Sonorella rosemontensis* was not carried forward in the ecological sustainability analysis for the Coronado because the Forest Service felt that “their distribution and natural history are too poorly understood to allow us to effectively manage for them, or because of other reasons” (FS 2009). The Rosemont talussnail is not protected on the Forest from grazing, recreation, mining, or other threats.

The proposed Rosemont open-pit copper mine would destroy and degrade at least 3,670 acres of National Forest land where mining waste would be dumped, and processing and support facilities erected (FS 2008). The General Mining Act of 1872 confers a statutory right to enter upon public lands open to location in pursuit of locatable minerals, and under valid existing mining claims to conduct mining activities, in compliance with federal and state statutes and regulations. The Forest Service entered into a Memorandum of Understanding with Augusta Resource Corporation intended to allow the use of the National Forest for the dumping of mining waste (FS 2008). The MOU provides no protection for the Rosemont talussnail. Augusta Resource Corporation has not established that they have valid existing rights on the Forest, and the Forest Service has not indicated that they will even examine the validity of the claims (Pima County Administrator 2009b).

The 1960 Multiple-Use Sustained-Yield Act (74 Stat. 215; 16 U.S.C. 528–531) requires that National Forest System lands be administered in a manner that includes consideration of the relative values of various resources as part of management decisions. The Federal Register notice for the mine stated that “The purpose of the proposed Forest Service action is to grant permission to the Company to use NFS land for certain activities related to operation of the Rosemont Mine.” Given the obligation of the Forest Service to consider the relative values of resources in decisions, the notice should have stated that the purpose of the proposed action was not to grant the company permission to use the land for the dumping of mining waste, but to consider whether granting permission to the company would negatively affect other National Forest resources, such as wildlife. The use of the National Forest for the dumping of waste rock and tailings is inconsistent with the

Forest Plan, but the Forest Service has indicated that if necessary, they will amend the Coronado National Forest Land and Resource Management Plan to allow the dumping of mine waste on the Forest (FS 2008b). Existing regulatory mechanisms are clearly not adequate to protect the Rosemont talus snail on National Forest lands.

There are also no existing regulatory mechanisms which require the mining company to protect the Rosemont talussnail. It is given no consideration in the environmental assessment of the mine (SWCA 2009). Mining activity is expected to occur 24 hours a day, 365 days a year, for 19 years (SWCA 2009), and it is unlikely that mining activity could be curtailed, even if unintended impacts to snails were detected. Augusta Resource Corporation has no revenue from operations, has incurred significant revenue loss for the past three years, and Rosemont is their “most significant” (Augusta Resource Corporation 2010b p. 10) asset:

“The Company incurred a loss of \$5,527,941 for the year ended December 31, 2009 (2008 - \$16,686,384; 2007 - \$7,652,783) and has an accumulated deficit of \$50,880,792 as at December 31, 2009. The losses have been funded primarily through the issuance of \$30,806,064 in equity and draw down of \$8,940,150 of a loan facility provided by Sumitomo Corporation of America (“Sumitomo”) (Note 9, Loan facility). The Company has no revenues from operations and does not expect to generate any revenues from operations until the Company completes its development and construction of the Rosemont project, which is expected to be in early 2012” (Augusta Resource Corporation 2010b, p. 10).

Given the dire financial situation of the company, it is highly unlikely that they will prioritize talussnail protection. In fact, in the latest report on talus snails at the mine site (WestLand Resources 2010), the consulting firm hired by the mining corporation tries to demonstrate that *S. rosemontensis* is not even a species, contradictory to the published literature, without any genetic analyses, and contradictory to their own dissections of genitalia from the site. (Terrestrial snails are differentiated based on reproductive morphology and/or genetic markers, eg. Pilsbry 1939, Fairbanks and Reeder 1980, McCord 1994, Wade et al. 2006, Weaver et al. 2010).

There are no existing mechanisms which protect talus snails from collection. In Pima County, all *Sonorella* except for *S. eremita* may be legally collected via a fishing license, without restraint on numbers (Fonseca 2009).

Nor are there any existing regulatory mechanisms at the state level which protect talus snails, and the state of Arizona does not have the resources to fund talussnail research and monitoring (Sorensen 2008).

In sum, there are no existing regulatory mechanisms which protect the Rosemont talussnail or its habitat, and given the imminent threats facing this species, it clearly qualifies for Endangered Species Act protection.

Other Natural or Anthropogenic Factors

Sonorella species are found in isolated, small patches, making them highly vulnerable to extinction (Fonseca 2009). The Rosemont talussnail could be extirpated by a single catastrophic event (eg.

FWS 1998). Talus snails are threatened by any factor that disturbs the substrate, including fire and rock slides (Lang 2000, FWS 2009, p. 66893). The Rosemont talussnail is dependent on moist conditions and is threatened by drought and climate change. Talus snails generally only surface following monsoon rains (Guralnick and Hedrick undated). Annual precipitation in the Santa Ritas has been less than average since 1995, resulting in severe drought conditions locally and regionally (Westland Resources 2007, p. 3). Range contraction of *Sonorella* species is already attributed to drying of the climate since the Pleistocene, and talussnail ranges are expected to continue to contract with ongoing warming of the climate (Sullivan 1997). Global climate change is expected to create drier overall conditions in the southwest and to increase the frequency and intensity of severe weather events such as droughts and fires (U.S. Global Change Research Program 2009). The Service has previously acknowledged threats to talus snails resulting from climate change (FWS 2009).

In sum, *S. rosemontensis* is an endemic species that is imminently threatened with extinction due to the proposed Rosemont Copper Mine, overutilization, recreation, climate change and drought, and other threats. The Service has acknowledged that this species may warrant listing under the Endangered Species Act (Spangle 2009).

Sonoran Talussnail (*Sonorella magdalenensis*)

Description

The Sonoran talussnail (*Sonorella magdalenensis*, Stearns 1890) is a terrestrial snail in the order *Stylommatophora* and the family *Helminthoglyptidae* (Turgeon et al. 1998). The Arizona Game and Fish Department (2008) provides the following description of *Sonorella* species:

“Snails in the genus *Sonorella* have a “depressed globose, helicoids shell, 12 to 30 mm in diameter, umbilicate or perforate, with a wide, unobstructed mouth and a thin, barely expanded peristome, smoothish or slightly sculptured with growth-lines, occasionally with fine oblique or spiral granulation and short hairs (mainly on the early whorls), lightly colored, and normally with a dark peripheral band. Its most characteristic features are, however, in the genitalia, which lack a dart sac and mucus glands.” (Bequaert and Miller, 1973). For species in the *S. hachitana* Complex: the penis is a usually long, slender, narrowly pointed verge; and in extreme forms, the verge is thick and club-shaped. Shells are relatively large and capacious, with a smooth, silky-lustrous periostracum; usually with apical spirally descending threads. (Bequaert and Miller, 1973).”

Habitat

Talus snails are usually found in talus or coarse broken rock slides or limestone outcrops. They live in crevices one to several feet below the surface, and generally only surface during or after periods of rainfall (Guralnick and Hedrick undated). Talus snails are dependent on areas with moist microhabitat to prevent desiccation (NatureServe 2010, *S. rosemontensis* species account). They are also found near the edges of talus slopes in areas of accumulated leaf litter (Westland Resources 2009). The Sonoran talussnail occurs at elevations from 2,750 - 6,000 feet (Bequaert and Miller 1973).

Ecology

Sonorella snails feed on lichens (including *Xanthoparmelia* spp.), plants, leaf litter, and potentially fungus (Westland Resources 2009). They have been observed mating during summer rains (Ibid.). *S. rosemontensis* and *S. magdalenensis* co-occur on talus slopes (Westland Resources 2010).

Range

Sonorella magdalenensis occurs in Pima and Santa Cruz counties in Arizona. It is also known from Sonora, Mexico, but it is unknown whether the species is still extant in Mexico. In Santa Cruz County it is known from the San Cayetano and Tumacacori mountains. In Pima County, it is known from the Roskruge mountains, the southern end of the Tucson mountains, the northern end of the Santa Ritas, and from Cerro Colorado and Tumamoc Hill near Tucson (AGFD 2008b).

Populations, Status, and Trend

Sonorella magdalenensis is ranked as imperiled (G2S2) by NatureServe (2010). Population data are not available for this little known species. It has no protective status.

Land Management

The Sonoran talussnail occurs on the Coronado National Forest, on lands owned by the State Land Department, and on private lands. In the Santa Ritas, it occurs on land owned by Rosemont Copper Company, a subsidiary of Augusta Resource Corporation.

THREATS

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

Mining

In the Santa Ritas, the Sonoran talussnail is threatened by the proposed Rosemont Copper Mine which is currently scheduled to begin operations in 2012 (Augusta Resource Corporation 2010). Augusta Resource Corporation (Rosemont Copper Company) is planning to destroy at least 4,415 acres of habitat at the north end of the Santa Rita Mountains 30 miles southeast of Tucson in Pima County. The mine would consist of a 2,900-foot-deep open pit and associated facilities including roads, a leach field, retention structures, utilities, wells, and ore transportation systems, and is expected to operate for at least 20 years (SWCA 2009, Augusta Resource Corporation 2010). The Sonoran talussnail is threatened by direct habitat destruction in the footprint of the mine and facilities, habitat degradation adjacent to the mine resulting from mining activities, and habitat degradation resulting from planned post-mining activities.

Westland Resources (2010) collected talus snails in and around the proposed mine footprint and graphically analyzed shell morphology and embryonic sculpturing which revealed that two distinct morphotypes of talus snails (representing *S. rosemontensis* and *S. magdalenensis*) occur within the footprint of the proposed mine pit and in adjacent areas (see WestLand Figures 9, 11, 17). They found that *S. rosemontensis* and *S. magdalenensis* occur together on the same talus slopes, and that they both occur on the east and west slopes of the north ridge. WestLand also analyzed the genitalia of 12 snails and this analysis also revealed that *S. rosemontensis* and *S. magdalenensis* co-occur, and are found on both the east and west slope of the north ridge. They state:

“RJS dissected 12 *Sonorella* snails that had been collected alive by RJS and other WestLand biologists from the North Ridge. Of these twelve *Sonorella*, six had the cylindrical verge with a conic end and strongly spiral placcation of *S. magdalenensis* (sensu Miller 1967). . . The lengths and forms of the latter six genitalia correspond with that of *S. rosemontensis* (as described by Miller 1967). . . both verge types were found on the east slopes and the west slopes of the North Ridge.”

It is undeniable that mining operations will cause the loss and degradation of habitat for the Santa Rita population of Sonoran talussnail.

Talus snails primarily inhabit talus, but may also be found in association with rock outcrops, rocky slopes, canyons, rocky drainages, and riparian areas (Bequaert and Miller 1973). The Sonoran talussnail may thus occur not only on talus slopes, but also in rocky canyons in the waste rock footprint (Jones 2008) and in other areas with rock rubble (Bequaert and Miller 1973, Westland Resources 2009).

Terrestrial snails are vulnerable to any form of substrate disturbance or mining activity (Lang 2000, FWS 2009 p. 66893). *Sonorella magdalenensis* is known to be threatened by the destruction and disturbance of talus slopes (AGFD 2008b). The Sonoran talussnail is threatened not only by direct habitat destruction within the footprint of the mine and associated facilities, but also by the degradation of adjacent habitat due to altered microhabitat conditions-- "Talusnail habitat is vulnerable to actions that might remove talus, increase interstitial sedimentation or erosion, open vegetal canopy, alter runoff or discharge patterns, or otherwise change moisture conditions in ways that might be lethal to a local population of *Sonorella*"(Fonseca 2009). In addition to the outright destruction of habitat within the mine's footprint, the mine and associated facilities will degrade adjacent habitat by increasing erosion and dust, reducing leaf litter and vegetative cover, lowering the water table and reducing surface flows, and altering temperature, moisture, wind, reflection, and evapotranspiration patterns and conditions. The removal of more than 4000 acres of natural vegetation will alter reflection patterns and could increase ground temperatures and wind exposure in areas outside the footprint. Talus snails are dependent on moist microhabitats and the altered humidity conditions due to the diversion of ground and surface water and loss of vegetation could render their habitat unsuitable in areas adjacent to the mine.

Interstitial space between rocks is an important habitat feature for *Sonorella* because it allows for vertical migration in response to climatic variation (Westland Resources 2009). Dust and sediment from mining activities, topsoil removal and replacement, road construction and maintenance, traffic, and tailing piles threatens the survival of talus snails, not only in the footprint of the mine and facilities but also in surrounding habitat, because it could fill the interstitial spaces and make their habitat unusable. Increased interstitial sedimentation from mining and road construction and maintenance is a documented threat to talus snails (FWS 1998, AGFD 2003b). The mine would require the construction and maintenance of numerous new roads. Mine haul and access roads are planned along the north, east, and south edges of the mine pits (SWCA 2009). A new two-lane, unpaved road is planned to allow access between SR 83 and the mine, and there are plans to widen SR 83. Several new roads are planned to reconnect the prior forest road system due to the closing of some existing roads to the public during mining activities (SWCA 2009). A new section of single-lane unpaved road would be built to connect the East Access Road to the existing forest road over Gunsight Pass, where the petitioned snails occur. Dust from mining activities and increased traffic (a heavy truck is expected to leave the mine site every 15 minutes), and dust from tailings piles directly threatens talussnail habitat outside the mine footprint. Increased dust and reduced moisture may also threaten the lichens on which talussnails feed.

Talus snails are threatened by windblown pollutants (Fonseca 2009). Airborne contaminants from mining, waste rock, and tailings piles include uranium, sulfate, fluoride, and antimony (Pima County Administrator 2009b). Herbicides used in conjunction with mining activities and road maintenance could be washed into areas where talus snails could encounter them (AGFD 2003b). Air pollution

and herbicides from mining activities could also threaten the lichens which provide food for the snails.

Proposed post-mining land uses include cattle ranching and recreation, both of which threaten talus snails. Current and probable post-mine recreational activities that threaten snails include prospecting, ATV and motorcycle riding, and four-wheeling (SWCA 2009). The Rosemont property is part of an existing ranching facility with more than 15,000 acres of grazing lease, and cattle are expected to be present during and after the proposed mining (Ibid.).

It is highly likely that impacts to the Sonoran talussnail from mining activities in the Rosemont area will be underestimated by the mining corporation and their consultants. Talus snails are notoriously difficult to survey for and only surface during appropriate weather conditions. Sites that support either of the petitioned species could easily be missed during surveys. The snails are threatened both in the footprint of the mine and in adjacent areas due to altered microhabitat conditions (discussed above) and the mining corporation will dismiss impacts outside the footprint. Whether or not the mining company acknowledges that sites are going to be destroyed, the mine will certainly result in curtailment of range for the Sonoran talussnail,

Even if the mine currently proposed by Augusta Resource Corporation does not move forward, mining will remain a threat to the Sonoran talussnail in the Rosemont area. Mining has been a threat in the Rosemont area since at least the early 1900's (Schrader 1915), and will continue to be a threat into the future. The Rosemont property has been sold numerous times, and if the current owner fails to develop the currently planned mine, the property is likely to be sold to yet another mining corporation.

The Sonoran talussnail is likely also threatened by mining and mineral exploration in other parts of its Arizona range (eg. Warshall 1999, AGFD 2003b, Sky Island Alliance 2007, Coronado Planning Partnership 2008, Fonseca 2009) and in Mexico, if it is still extant there (Felger and Wilson 1999).

Development

Development threatens the Sonoran talussnail through direct habitat loss, increased use of talussnail habitat, and removal of talus for construction. The removal of loose rock from talus deposits for landscaping or building use is an increasing threat to talus snails (Fonseca 2009). Talus removal has occurred near two reported talus snail occurrences: at Tumamoc Hill/Sentinel Peak near downtown Tucson, and at Rancho Seco prior to Pima County's acquisition (John Sullivan, pers. comm.. cited in Fonseca 2009). The Sonoran talussnail occurs on Tumamoc Hill (AGFD 2008) making this activity a direct threat to the survival of that population.

The Sonoran talussnail is increasingly threatened by sprawling real estate development in the San Cayetano mountains (Sheridan 2004, Avatar Homes of Arizona 2010, Backpage.com 2010, Loopnet.com 2010, Villages of Rio Rico 2010). Many developments in the San Cayetano intentionally target areas of undisturbed habitat (see Appendix A). All of the land in the San Cayetano is privately owned and subject to development.

Illegal Immigration, Smuggling, and Border Control Activities

In the Tumacacori Mountains, the Sonoran talussnail is threatened by illegal immigration, smuggling, and Border Patrol activities (eg. BLM 2002). Increasing densities of foot traffic, off-highway vehicles, and horses negatively affect wildlife habitat in the Tumacacori's (Tumacacori Wild undated) and could trample talus snails or degrade their habitats. Talus snails are dependent on interstitial space and moist microhabitats, and disturbance of their rock substrate could crush snails or alter the specific microhabitat conditions on which they depend. Border Patrol is authorized to conduct motorized off-road pursuit of suspected cross-border violators at any time, including in areas designated or recommended as wilderness (Dept. of Homeland Security 2006).

Recreation and Vandalism

The Sonoran talussnail is threatened by several recreational activities. SWCA (2009) reports that the Rosemont area is disturbed by all-terrain vehicle use. Use of dirt bikes and other ATVs in authorized and unauthorized areas is a documented threat to talus snails (FWS 1998). Occurrence in talus slope habitats may protect this species from ATV use to some extent, but populations at the edge of slopes and in rocky canyons are vulnerable. Talus snails are also threatened by dust generated from off-road vehicles, as dust can fill in interstitial rock spaces and decrease habitat suitability. It is well known that habitats in the Coronado National Forest have been degraded by authorized and unauthorized off-road vehicle use. The Coronado National Forest is currently amending the Forest Plan to allow off-route driving up to 300 feet from designated routes for the purpose of dispersed camping (FS 2010). The explicit authorization of off-road driving threatens species which could be crushed by vehicles and this threat will escalate as camping corridors expand and more habitat is destroyed, creating ever-increasing areas of degradation.

Hiking, climbing off trail, and crushing or collection of snails by recreationists is also a threat. Construction of recreational trails can intersect talus and may threaten talus snails (FWS 1998, Fonseca 2009). Rapid human population growth in the city of Tucson and increased recreational use of its habitat magnifies the threat posed by recreation to the Sonoran talussnail (eg. Sky Island Alliance 2007, FWS 2009, p. 66895). Recreation is a range-wide threat to this species, with the populations in the Tucson Mountains and on Tumamoc Hill being particularly vulnerable. The population on Cerro Colorado is potentially threatened by habitat disturbance from treasure hunters (Wikipedia 2010). Vandalism may also threaten this snail (eg. FWS 1998).

Livestock Grazing

Livestock grazing threatens the Sonoran talussnail. Although talus snails are primarily associated with rocky areas, they are also associated with areas of shrubs, small trees, and leaf litter (Westland Resources 2009) which are appealing to cattle. This snail occurs on the Coronado National Forest which is extensively grazed (eg. FS 2007, 2006, 2005, 2004, 2003). There are six USFS Grazing Allotments in the Tumacacoris. Horse and cattle grazing also occurs in the San Cayetanos, which are privately owned. Livestock grazing threatens this snail in the Santa Ritas (SWCA 2009) and may also threaten *S. magdalenensis* in the rest of its Arizona range as grazing is extensive in this region

(eg. Warshall 1999, Sky Island Alliance 2007, Coronado Planning Partnership 2008). This species is also threatened by livestock grazing in Mexico, if still extant (Felger and Wilson 1999).

Other Known Habitat Threats

Throughout much of its range, including the Roskrige Mountains, Tumamoc Hill, and Mexico, the Sonoran talussnail may be threatened by habitat degradation from buffelgrass and buffelgrass removal efforts including rock disturbance, fire, and herbicide application (Fonseca 2009). Buffelgrass invades both lower slopes and steep rocky hillsides and is expanding very rapidly (Arizona-Sonora Desert Museum 2010). Aerial herbicide applications threaten non-target species including talussnails (eg. Garcia and Conway 2007). Fountain grass and fountain grass removal efforts may also threaten this species, particularly in the Tucson Mountains. It may also be threatened by chemicals used in noxious weed control on the National Forest (FS 2004b).

Habitat disturbance for collection threatens *S. magdalenensis* in the Santa Ritas. The Rosemont area is now subject to heavy collection pressure due to the need to delineate the range of the talus snails for the development of the proposed Rosemont Copper Mine. WestLand Resources dug around 200 pits in talussnail habitat (2010, p. 26). They sometimes removed rocks to a depth of 2 feet to search for snails (2009). Talus environments are easily disturbed and talus snails are dependent on specific microclimates for survival. Decreased interstitial space and reduced moisture resulting from collection activities could be lethal to snails, even if researchers attempt to return rocks to their original positions. Habitat disturbance for reptile collecting also threatens talus snails (Fonseca 2009).

In Mexico, this snail is likely threatened by habitat degradation due to the drug trade. Both the cultivation of marijuana and opium poppies and the aerial spraying of herbicides in drug control efforts threaten rare species (Felger and Wilson 1999). This species is also threatened by agricultural practices in Mexico. The wholesale clearing and replacement of native vegetation in Sonora and Sinaloa began in the late 1960's, and slash and burn and other agricultural practices threaten even rural, isolated, and high elevation areas (Felger and Wilson 1999).

Overutilization

Collection is known to threaten talus snails (FWS 1998). Overutilization is a present and increasing threat to *S. magdalenensis*. Population information is not available, but it is likely that populations are small and sensitive to collection. Due to the financial interest in mining the Rosemont area, this species is now subject to increased collection from county, state, and federal agencies, corporations and their consultants, and scientists. Because talus snails are difficult to identify to species in the field, surveys are generally lethal because snails are dissected for identification purposes. Both *S. rosemontensis* and *S. magdalenensis* are being collected due to the difficulty of field identification and conservation interest in *S. rosemontensis*. In the Rosemont area of the Coronado, the Forest Service instructed surveyors to collect up to 10 living animals per site for identification purposes (Jones 2008). Every live snail encountered was collected by Westland Resources in 2009 surveys in the Rosemont area. The company collected over 100 live talus snails in 2008 and 2009, with unknown but potentially devastating population effects for this population of Sonoran talussnail.

Inadequacy of Existing Regulatory Mechanisms

There are no existing regulatory mechanisms which adequately protect the Sonoran talussnail or its habitat. It occurs on the Coronado National Forest, on state and private lands, and potentially in Mexico.

The snail has no protection whatsoever on private land, including its entire range in the San Cayetanos. There are no existing state regulatory mechanisms which protect talus snails, and the state does not have the resources to fund talussnail research and monitoring (Sorensen 2008). There are no existing mechanisms which protect talus snails from collection. In Pima County, all *Sonorella* except for *S. eremita* may be legally collected via a fishing license, without restraint on numbers (Fonseca 2009).

This snail has no substantial protection on the Coronado National Forest. *Sonorella magdalenensis* was not carried forward in the ecological sustainability analysis for the Coronado because the Forest Service felt that “their distribution and natural history are too poorly understood to allow us to effectively manage for them, or because of other reasons” (FS 2009). The Sonoran talussnail is not protected on the Forest from grazing, recreation, mining, or other threats.

The proposed Rosemont open-pit copper mine would destroy and degrade at least 3,670 acres of National Forest land where mining waste would be dumped, and processing and support facilities erected (FS 2008). The General Mining Act of 1872 confers a statutory right to enter upon public lands open to location in pursuit of locatable minerals, and under valid existing mining claims to conduct mining activities, in compliance with federal and state statutes and regulations. The Forest Service entered into a Memorandum of Understanding with Augusta Resource Corporation intended to allow the use of the National Forest for the dumping of mining waste (FS 2008). The MOU provides no protection for the Sonoran talussnail. Augusta Resource Corporation has not established that they have valid existing rights on the Forest, and the Forest Service has not indicated that they will examine the validity of the claims, despite pressure from Pima County to do so (Pima County Administrator 2009b).

The 1960 Multiple-Use Sustained-Yield Act (74 Stat. 215; 16 U.S.C. 528–531) requires that National Forest System lands be administered in a manner that includes consideration of the relative values of various resources as part of management decisions and specifically provides that nothing in the Act be construed to affect the use or administration of the mineral resources on National Forest lands. The Federal Register notice for the mine stated that “The purpose of the proposed Forest Service action is to grant permission to the Company to use NFS land for certain activities related to operation of the Rosemont Mine.” Given the obligation of the Forest Service to consider the relative values of resources in decisions, the notice should have stated that the purpose of the proposed action was not to grant the company permission to use the land for the dumping of mining waste, but to consider whether granting permission to the company would negatively affect other National Forest resources, such as wildlife. The use of the National Forest for the dumping of waste rock and tailings is inconsistent with the Forest Plan, but the Forest Service has indicated that if necessary, they will amend the Coronado National Forest Land and Resource Management Plan to allow the dumping of mine waste on the Forest (FS 2008b). Existing regulatory mechanisms are clearly not adequate to protect the Sonoran talussnail on National Forest lands.

There are also no existing regulatory mechanisms which require the mining company to protect the Sonoran talussnail. It is given no consideration in the environmental assessment of the mine (SWCA 2009). Mining activity is expected to occur 24 hours a day, 365 days a year, for 19 years (SWCA 2009), and it is unlikely that mining activity could be curtailed, even if unintended impacts to snails were detected. Augusta Resource Corporation has no revenue from operations, has incurred significant revenue loss for the past three years, and Rosemont is their “most significant” (Augusta Resource Corporation 2010b p. 10) asset:

“The Company incurred a loss of \$5,527,941 for the year ended December 31, 2009 (2008 - \$16,686,384; 2007 - \$7,652,783) and has an accumulated deficit of \$50,880,792 as at December 31, 2009. The losses have been funded primarily through the issuance of \$30,806,064 in equity and draw down of \$8,940,150 of a loan facility provided by Sumitomo Corporation of America (“Sumitomo”) (Note 9, Loan facility). The Company has no revenues from operations and does not expect to generate any revenues from operations until the Company completes its development and construction of the Rosemont project, which is expected to be in early 2012” (Augusta Resource Corporation 2010b, p. 10).

There are no existing regulatory mechanisms to protect the Sonoran talussnail in Mexico, where it may no longer be extant.

Other Natural or Anthropogenic Factors

Sonorella species are found in isolated, small patches, making them highly vulnerable to extinction (Fonseca 2009). Populations of Sonoran talussnail could be extirpated by catastrophic events (eg. FWS 1998). Talus snails are threatened by any factor that disturbs the substrate, including fire and rock slides (Lang 2000, FWS 2009, p. 66893). The Sonoran talussnail is dependent on moist conditions and is threatened by drought and climate change. Talus snails generally only surface following monsoon rains (Guralnick and Hedrick undated). Annual precipitation in the region has been less than average since 1995 resulting in severe drought conditions locally and regionally (Westland Resources 2007, p. 3). Range contraction of *Sonorella* species is already attributed to drying of the climate since the Pleistocene, and talussnail ranges are expected to continue to contract with ongoing warming of the climate (Sullivan 1997). Global climate change is expected to create drier overall conditions in the southwest and to increase the frequency and intensity of severe weather events such as droughts and fires (U.S. Global Change Research Program 2009). The Service has previously acknowledged threats to talus snails resulting from climate change (FWS 2009).

In sum, the Sonoran talussnail occurs in only two counties in Arizona and potentially in Sonora, Mexico, where its status is unknown but its habitat is threatened. It is known to be threatened by mining in the Santa Rita's, and is likely threatened by mining in other parts of its range. Recreational impacts pose a range-wide threat to its habitat. In the San Cayetano's and the Tucson Mountains it is threatened by development. In the Tumacacori's it is threatened by smuggling and Border Patrol activities. On Tumamoc Hill it is threatened by talus removal. It is also threatened by collection, livestock grazing, climate change, drought, buffelgrass invasion and control efforts, and other

threats. Existing regulatory mechanisms provide this snail with no protection whatsoever, necessitating Endangered Species Act protection.

CONCLUSION

Sonorella magdalenensis and *S. rosemontensis* are rare Arizona invertebrates that are gravely threatened by mining, recreation, collection, climate change, and other factors. These two imperiled Sky Island species are not adequately protected by any existing regulatory mechanisms and need the protection of the Endangered Species Act to ensure their continued survival.

REQUEST FOR CRITICAL HABITAT DESIGNATION

We request and strongly recommend that all known locations for both petitioned species be designated as critical habitat concurrent with species' listing. As required by the Endangered Species Act, the Secretary shall designate critical habitat concurrent with determination that a species is endangered or threatened (16 U.S.C. 1533(a)(3A)). Critical habitat is defined by Section 3 of the ESA as: (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species. 16 U.S.C. §1532(5).

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Acknowledgements

The Center thanks Dr. Peter Reinthal and the University of Arizona Museum of Natural History for the photograph of the Rosemont talussnail shell, and Alan Cressler for the photograph of mating *Sonorella danielsi*. Curt Bradley, Noah Greenwald, Randy Serraglio, and Cyndi Tuell contributed to this petition.

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Appendix A:
Examples of Development Threats to *Sonorella magdalenensis* in the San Cayetano

1. Loopnet.com. 2010. Accessed May 20, 2010 at:
<http://www.loopnet.com/Arizona/Rio-Rico-Commercial-Real-Estate/>

[.72 acres in Rio Rico, Arizona.](#)

Rio Rico, Arizona

BANKRUPTCY REAL ESTATE .72+/- acres in Santa Cruz County, Arizona. Property Address:
313 Circulo Cerro Parcel # 116-04-002 0.72 Acres Land Residential (land)

[.90 acres in Santa Cruz County, Arizona.](#)

Rio Rico, Arizona

BANKRUPTCY REAL ESTATE AUCTION .90+/- acres in Santa Cruz County, Arizona. Property
Address: 317 Camino Canoa, Rio Rico, AZ Legal: Sub Rio...
0.90 Acres Land Residential (land)

[13xx W Frontage Rd](#)

Rio Rico, Arizona

Great Investment opportunity in a growing area.
\$240,000 2.00 Acres Land Industrial (land)

[1359 W Frontage Rd](#)

Rio Rico, Arizona

Great Investment opportunity in a growing area.
\$350,000 3.19 Acres Land Industrial (land)

[Rio Rico Mountaintop 1.77 Acres](#)

Rio Rico, Arizona

Large lot with amazing views! This lot sits high up on a ridge nestled into the San Cayetano
Mountains overlooking Rio Rico. 1.75 Acres Land Residential (land)

[Freeway Interchange](#)

Rio Rico, Arizona

The subject site is between Nogales and Rio Rico, Utilities and sewer in close proximity to the
property line. Zoned B-2. In path of growth. \$6,500,000 33.00 Acres
Land Commercial/Other (land)

[RIO RICO Retail Land Frontage Road](#)

Rio Rico, Arizona

Cross Easements have already been completed. Drainage and Retention Improvements have been
made to site Seller Financing Available \$527,511 3.46 Acres Land Retail (land)

[24 Calle Mora](#)

Rio Rico, Arizona

Enjoy the life of the country yet close to freeway I-19. 12 minutes drive to the artist village of Tubac. \$225,000 35.29 Acres Land Residential (land)

[Rio Rico Estates](#)

Rio Rico, Arizona

1.64 Acres of bare ground in Rio Rico Estates in Beautiful Santa Cruz County. In 2004, 342 new single-family homes were constructed in Rio Rico \$19,500 1.64 Acres Land Residential (land)

2. Avatar Homes of Arizona. 2010. <http://www.tucsonnewhomesguide.com/SellerAll.asp>

Avatar Homes of Arizona

Winner of the prestigious Apex Award for Innovative Design, Avatar consistently ranks among America's top builders. Famous for award-winning, master-planned, resort-style communities in the southeast for more than 30 years, Avatar brings an unparalleled level of experience to building your new home at The Villages of Rio Rico. Avatar Homes welcomes you to the unique master-planned community of Rio Rico where you can experience blue skies, open spaces and natural splendor from your finely appointed new home. From the pristine San Cayetano Mountains across the Santa Cruz River, along the historic Anza National Trail to the Sonoita Creek Natural Preserve, you can enjoy hiking, biking, bird watching, or horse riding. More activities include the championship Robert Trent Jones Sr. Golf Course and Fitness Center. We offer value too big to ignore, numerous floor plans and locations to suit your lifestyle, built-in designer touches and quality craftsmanship.

3. Backpage.com. 2010. Tucson Real Estate for Sale. San Cayetano Mountains. \$329,000, \$329,000 Morning Star Ranch - 36 Acres of Lush High Country Foothills land in the San Cayetano Mtns Posted: April 28, 2010. Accessed May 19, 2010 at: <http://tucson.backpage.com/LandForSale/339000-339000-morning-star-ranch-36-acres-of-lush-high-country-foothills-land-in-the-san-cayetano-mtns/9858598>

\$329,000 Morning Star Ranch - 36 Acres of Lush High Country Foothills land in the San Cayetano Mtns

Location: Morning Star Ranch

Spectacular panoramic 36 acre parcel on Morning Star Ranch in Tubac. Your homesite is set gracefully on the shoulders of the San Cayetano Mtns overlooking the valley below. This wonderfully lush parcel with lrg mesquite trees, prairie grasses & wild oregonillo is excellent for building a custom home. There is already a driveway, underground utilities & water line being installed! Morning Star Ranch is an upscale gated ranch community of fine homes near Tubac.

Plan your custom home to blend in with the surrounding foothills. This location is far from the heavy development going on in the Santa Cruz Valley. This land provides a panorama of the Santa Rita Mtns yet is cloistered against the private east slope of the San Cayetano mountains. Come to Morning Star Ranch and see what others have held secret.

4. Villages of Rio Rico. 2010. <http://www.thevillagesofriorico.com/>

Nestled In Nature

Imagine waking to a golden sunset as it peeks over the majestic mountain ranges that surround your own piece of paradise. Imagine gazing out from your doorway, a lifetime of outdoor diversions just minutes away. Where an evening walk through the neighborhood is the preferred method of transportation, and a long drive includes the greens at the nearby golf course.

Welcome to The Villages of Rio Rico – a heart-warming community designed in perfect harmony with nature.