United States Department of the Interior
U.S. Fish and Wildlife Service
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AESO/SE

May 17, 2006

Memorandum

To: Interested Parties and Agencies

From: Field Supervisor

Subject: Notification of Preliminary Species Status Assessment and Information Request for the San Bernardino Springsnail

The Arizona Ecological Services Field Office of the U.S. Fish and Wildlife Service is responsible for compiling and maintaining biological information on fish and wildlife species in the State of Arizona. This memorandum is notification of the information we have compiled for the San Bernardino springsnail (*Pyrgulopsis bernardina*) provided in the attached Preliminary Species Status Assessment.

This memorandum is also a request for additional information regarding this species, its habitats, or land management actions that may affect the species or its habitats. If you have such information, please submit it to our office by July 17, 2006. Also, feel free to distribute this notification and request to other knowledgeable and/or affected parties. If we can be of further assistance, please contact Mike Martinez (x-224) or Debra Bills (x-239).

/s/ Steven L. Spangle

Attachment

cc: Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

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PRELIMINARY SPECIES STATUS ASSESSMENT

For San Bernardino springsnail (*Pyrgulopsis bernardina*)

By the U.S. Fish and Wildlife Service (FWS)

May 17, 2006

Background:

The San Bernardino springsnail is a small aquatic snail of the family Hydrobiidae first described by Taylor (1987) as *Yaquicoccus bernardinus* and later by Hershler (1994) as *Pyrgulopsis bernardina*. The species is currently limited in distribution in the United States to one natural spring, Snail Spring, on the Slaughter Ranch, and to artificial habitat, Tule Spring, on the San Bernardino National Wildlife Refuge (NWR), Cochise County, Arizona (FWS 2003, Malcom *et al*. 2005). The species is also known from Mexico, but limited information is available regarding its status there. The current range is significantly reduced from the former range which is believed to have included at least eight populations along the headwaters of the Rio Yaqui on lands now within the San Bernardino NWR and John Slaughter Ranch (Malcom *et al*. 2003). Flow in the remaining natural spring nearly dried up during the summer of 2002, causing land managers to use a garden hose to maintain habitat for the springsnail (Smith 2003).

Life History:

Hydrobiid snails occur in springs, seeps, marshes, spring pools, outflows, and diverse lotic (flowing) waters. The most common habitat for *Pyrgulopsis* snails is a rheocrene, or a spring emerging from the ground as a flowing stream. In arid desert environments, these oases are often aquatic climax communities referred to as cienegas (Hendrickson and Minckley, 1984). Substrate is typically firm and characterized by cobble, gravel, woody debris, and aquatic vegetation. These substrate types provide a suitable surface for grazing and egg laying. *Pyrgulopsis* snails are rarely found on or in soft sediment (Hershler 1998).

Pyrgulopsis snails are strictly aquatic and respiration occurs through an internal gill known as a ctenidium. Their primary food source is believed to be periphytic diatoms, and perhaps bacteria and detritus. Food is consumed by scraping from hard surfaces with the radula. *Pyrgulopsis* snails are largely oviparous (Hershler 1998), though no specific data are available on the reproductive biology of the San Bernardino springsnail. Among most prosobranchs, the veliger, or larval, stage is completed in the egg capsule and upon hatching, tiny snails crawl out into their adult habitat (Brusca and Brusca 1990). Death and birth rates are unknown. Significant migration most likely does not occur, although small snails have been known to disperse by becoming attached to the feathers or the mud on the feet and legs of waterfowl and shorebirds (Dundee *et al*. 1967). The species' life span is unknown, but for the majority of aquatic gastropods the usual length of life is 9 to 15 months (Pennak 1989). Natural predators of springsnails include waterfowl,

shorebirds, amphibians, fishes, crayfish, leeches, and aquatic insects. Little information on disease or parasites is available, though other aquatic snails have been known to serve as the intermediate hosts for a variety of trematodes (Trematoda).

Physicochemical habitat variables, such as dissolved carbon dioxide, dissolved oxygen, temperature, and conductivity, have been shown to influence other *Pyrgulopsis* congeners (O'Brien and Blinn 1999, Mladenka and Minshall 2001, Martinez and Thome, In press). The density of San Bernardino springsnail has been shown to be positively associated with water velocity, dissolved oxygen, water temperature, and pH (Malcom *et al*. 2005). *P. bernardina* densities appear, however, to be more strongly related to structural characteristics: there are positive relationships to sand and cobble substrates, vegetation density, and water velocity, and negative relationships to silt and organic substrates, and water depth (Malcom *et al*. 2005).

Threats:

<u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>:

The greatest threat to the continued existence of the San Bernardino springsnail is habitat loss believed attributable to groundwater depletion and diversion (Landye 1981; Malcom *et al*. 2003). The loss of several populations of San Bernardino springsnail is believed to have been caused by the loss of water flow attributable to water diversion or springhead modification (Anthony Velasco, FWS, pers. comm., 2000). It is believed that historic groundwater pumping in Mexico is primarily responsible for the lowering of ground-water levels (Bill Radke, FWS, pers. comm., 2006).

The Chiricahua Mountains appear to be the main source of recharge for the northern part of the San Bernardino Valley basin. The main aquifer in the San Bernardino Valley is unconfined throughout much of the basin, but confined conditions are present at depth at the NWR where lacustrine clays split the main aquifer into two distinct aquifers (Earman *et al*. 2003). Heavy groundwater pumping in the confined portion of the aquifer system, which exists in the vicinity of the San Bernardino NWR, could cause ground-water levels to decrease at artesian well heads within the NWR that supply water to fish ponds (James Broska, FWS, pers. comm., 2006). Although the Arizona Department of Water Resources lists more than 300 current registered wells in the valley it is unclear what proportion are pumping from the shallow unconfined aquifer and/or the deep confined aquifer.

It has been demonstrated that that the shallow unconfined aquifer and the deep confined aquifer of the San Bernardino Valley exhibit different chemistries and thermal properties (Earman *et al*. 2003). Snail Spring and Tule Spring appear to be significantly influenced by basalt sediments associated with the shallow aquifer (Earman *et al*. 2003). All records of the San Bernardino springsnail are from springs associated with the shallow aquifer and the species is probably evolutionarily adapted to these waters. Wells drilled on the John Slaughter Ranch in early 1900's are believed to have tapped a warm artesian aquifer distinct from that which produces natural springs in the area (Hendrickson and Minckley

1985), although some leakage between the shallow and deep aquifers may occur (Earman *et al*., 2003)

The potential for continued drawdown in hydraulic head on the NWR due to pumping in Mexico is a matter of concern, particularly with rapid growth in the community of Agua Prieta. Several wells are located on land near enough to the NWR to be of concern. Some wells appear to be located in the confined aquifer that provides water to NWR resources, but limited data are available to assess their impact (Earman *et al*. 2003).

Metapopulation theory supports the notion that species with few subpopulations within a metapopulation exhibit a higher extinction probability than those with more populations (Meffe *et al*. 1994). If the remaining spring supporting the last natural population of San Bernardino springsnail runs dry, the species will be in imminent danger of extinction.

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

Not a known threat.

Disease or predation:

The non-native mosquitofish (*Gambusia affinis*) is believed to be a predatory threat to the San Bernardino springsnail (FWS 1995). The congener Page springsnail (*Pyrgulopsis morrisoni*) has been found in gut analysis of mosquitofish from Bubbling Springs in Central Arizona (Raisanen 1991). There are currently no known *Gambusia* populations on either San Bernardino NWR or Slaughter Ranch, however, mosquitofish do occur within ¼-mile of the NWR in the wetlands on Rancho San Bernardino in Sonora where they currently coexist with San Bernardino springsnails. No work has been done to analyze gut contents of these mosquitofish in Mexico to determine potential impacts to springsnails.

The inadequacy of existing regulatory mechanisms:

The San Bernardino springsnail is currently not protected by any Federal or State statutes or regulations. Its habitats are, however, under the direct land management authority of the FWS San Bernardino NWR. Other springsnail congeners are listed under Arizona Game and Fish Commission Order 42, which establishes no open season for those species. Although this order prohibits direct taking of species, it does not prohibit spring modification or habitat destruction.

Other natural or manmade factors affecting its continued existence:

According to Malcom et al. (2003), contamination from pesticides is a threat. Private property owners at Slaughter Ranch use a number of herbicides and other pesticides to maintain desirable landscape conditions. Spring endemic species are highly adapted to the unique environmental conditions provided by spring water (Hershler 1998) and may be quite sensitive to shifts in water quality including those caused by contamination.

Endemic spring-dependent organisms whose populations exhibit a high degree of geographic isolation are extremely susceptible to stochastic extinction resulting from catastrophic natural and anthropogenic disasters such as fires, floods, or changes in spring water chemistry.

Habitat inundation, through human alteration of existing springs in both Arizona and Sonora, has impacted San Bernardino springsnails by altering water chemistry, substrate, dissolved oxygen content, and perhaps increasing predation by fish and increasing competition with other mollusks (Physa). This habitat alteration, typically accomplished with the well-intended motive of "developing" a spring or creating more open water, only serves to drown the cienega wetlands that are key habitat for springsnails and ultimately eliminate the springsnail from the altered habitats.

Conservation Measures and Monitoring

Efforts to rehabilitate Tule Spring are currently underway on the NWR with the intent of potentially reintroducing San Bernardino springsnail into that wetland. In addition, the privately owned Slaughter Ranch (Johnson Historical Museum of the Southwest) is being acquired by the Service as part of San Bernardino NWR, which will provide opportunities to actively protect, manage, and enhance existing springsnail habitat on the property. This acquisition should take place during 2006.

Biologist Contact:

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