

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Heterelmis stephani*

COMMON NAME: Stephan's riffle beetle

LEAD REGION: Region 2

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION

Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

New candidate

Continuing candidate

Non-petitioned

Petitioned - Date petition received: May 11, 2004

90-day positive - FR date:

12-month warranted but precluded - FR date:

Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

Higher priority listing actions, including court-approved settlements, court-ordered statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for Stephan's riffle beetle. We continue to monitor Stephan's riffle beetle and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov>) provides information on listing actions taken during the last 12 months.

Listing priority change

Former LP:

New LP:

Date when the species first became a Candidate (as currently defined): June 13, 2002

___ Candidate removal: Former LPN: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act’s definition of “species.”

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insects, Coleoptera, Elmidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Arizona

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Santa Cruz, Arizona

LAND OWNERSHIP: The entire range of this species is believed to be confined to Madera Canyon in the Coronado National Forest. We estimate 5 acres (2 hectares) of habitat on the Coronado National Forest.

LEAD REGION CONTACT: Sarah Quamme, 505-248-6419, Sarah_Quamme@fws.gov

LEAD FIELD OFFICE CONTACT: Arizona Field Office, Phoenix, Mike Martinez, 602-242-0210 ext. 224, Mike_A_Martinez@fws.gov

BIOLOGICAL INFORMATION

Species Description: Beetles are the largest order of insects with more than 300,000 described species, almost a third of all known animals (Brusca and Brusca 1990, p. 551). Stephan’s riffle beetle was fully described by Brown (1972a, pp. 230-234). In general, the species length is 2.3–2.6 millimeters (mm) (0.09-0.1 inches (in)) and breadth is 1.05–1.20 mm (0.04-0.05 in).

Taxonomy: Stephan’s riffle beetle is a member of the family Elmidae (Phylum Arthropoda; Class Insecta; Order Coleoptera). It was originally identified by Brown (1972a, pp. 230-234) as *Heterelmis stephani* from 71 specimens collected from Madera Canyon in the Santa Rita Mountains, Santa Cruz County, Arizona. Its validity as a taxon was confirmed by Brown (1983, p. 5) and Bosse *et al.* (1988, p. 199). Thus, we have carefully reviewed the available taxonomic information to reach the conclusion that *H. stephani* is a valid taxon.

Historical Range/Distribution: Stephen's riffle beetle is an endemic riffle beetle found in isolated spring environments within the Santa Rita Mountains, Santa Cruz County, Arizona. Based on relatively intensive surveys, the entire range of this species was believed to be confined to Madera Canyon on the Coronado National Forest (Barr and Shepard 1993, p. 1, Arizona Game and Fish Department 2002, p. 1). Historically, only three populations have been documented, including Bog Springs, Sylvester Spring, and in seepage from a water tank filled with water diverted from Bog Springs.

Current Range/Distribution: Currently, the species is known only from Sylvester Spring on the Coronado National Forest. During field investigation in 2005, U.S. Forest Service personnel confirmed that Sylvester Spring was still flowing and providing suitable habitat conditions for the beetle (U.S. Forest Service 2005, p. 8-9). Although they did not conduct beetle surveys, the confirmation of flowing water indicates that conditions conducive to survival of the species remain intact. The population in the seepage from Bog Springs has been extirpated since water ceased flowing from the water tank in 1976.

Habitat/Life History: Beetles of the family Elmidae gain their common name "riffle beetle" from their propensity to be found living in shallow streams, rapids, or other comparable flowing waters. The springs can be described as a typical isolated, mid-elevational, permanently saturated, spring-fed aquatic climax community that is commonly referred to as a ciénega (Hendrickson and Minckley 1984, pp. 133-134, p. 169). Elmid larvae are strictly aquatic and respiration occurs through gills (Brown 1983, p. 1). Riffle beetles attach their eggs to the underside of submerged rocks, woody debris, or aquatic plants (Brown 1987, p. 254). Life histories of elmids are quite variable with a short incubation period and a larval stage lasting from 6 to 36 months (Tavares and Williams 1990, p. 564).

Upon reaching maturity, riffle beetle larvae crawl out of the aquatic environment to pupate under cover of sand, rock, bark, or other debris (Brown 1972b, p. 1; Brown 1983, pp. 1-2). In temperate zones, pupation typically requires 1-2 weeks and occurs from late spring through summer (Brown 1987, p. 255). After emergence, adults commonly fly and may be attracted to lights during their sole dispersal flight (Brown 1983, p. 2; Brown 1987, p. 255). Adults are small, typically less than 3 mm (0.12 in) in total length (Brown 1983, p. 2). Upon reentering the aquatic environment, most adult riffle beetles never again leave the water (Brown 1987, p. 256; Brown 1972b, p. 1). Respiration for adults occurs through the use of a plastron (a semipermanent bubble of air through which respiratory gases are exchanged in some aquatic invertebrates) (Brown 1972b, pp. 1-2). Riffle beetle diet consists of microorganisms and debris, such as diatoms and detritus, scraped from substrate surfaces (Brown 1987, p. 262; Tavares and Williams 1990, p. 564).

An interesting and important note about riffle beetle biology is that these organisms are suspected of possessing some sort of chemical defense that readily repels diverse types of predators (Brown 1987, p. 264). There are also accounts of indigenous peoples of Lima, Peru, who utilize beetles of the elmid family as a food seasoning (Brown 1987, p. 264). The potential medicinal value of elmids has not been explored.

Based on our current knowledge, primary constituent elements appear to include: 1) permanent free-flowing springs; 2) shallow, unpolluted water; 3) coarse firm substrates such as pebble, gravel, cobble, and woody debris; and 4) native aquatic macrophytes, algae, and periphyton.

Population Estimates/Status: No information is available on population sizes for the Stephan's riffle beetle. However, in a study to assess the effect of sampling-without-replacement on endemic aquatic invertebrates, Martinez and Sorensen (2007, p. 30) found elmud populations as high as 1,328 individuals within a spring system as small as 2.055 square meters (m^2) (22.12 square feet (ft^2)).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The springs where Stephan's riffle beetle is known to occur no longer exist within their natural conditions. The springs have all have been boxed, capped, or channeled into pipes (Barr 1991, p. 2). Concrete boxes were constructed around spring heads in the 1930s by the Civilian Conservation Corps (Barr and Shepard 1993, p. 9). The most significant habitat losses occurred after the species was originally described. The type locality, where the species was originally collected, no longer exists as habitat for the species (Barr and Shepard 1993, p. 18). After conferring with the original collector, Barr and Shepard (1993, p. 18) determined that the type locality was not Bog Springs proper but actually a site 2.4 kilometers (km) (1.5 miles (mi)) away near a U.S. Forest Service campground. Apparently the original population was maintained by seepage from a pipe which was believed to be overflow seepage from a nearby tank storing water diverted from Bog Springs. Seepage from the tank ceased in 1976 and the tank was removed entirely in 1992 (Barr and Shepard 1993, pp. 18-19). During the surveys conducted by Barr and Shepard (1993, p. 11) only one adult riffle beetle was collected from Sylvester Spring. They were unable to find the beetle in Bog Springs proper (p. 9). Based on the 71 beetle specimens originally collected in 1969 it appears the species was once very common, but as of 1993 is now quite rare (Barr and Shepard 1993, p. 24). The loss of habitat at the type locality represents a significant portion of the range of Stephan's riffle beetle.

All of these springs are located immediately off a U.S. Forest Service maintained recreational trail. It is unlikely that recreationists are entirely aware of the sensitive nature of those spring ecosystems. In the absence of public education, recreationists may unknowingly degrade habitat by introducing chemicals or allowing pets into the springs. The unintentional killing of larvae may also occur as a result of trampling.

In summary, the Stephan's riffle beetle is threatened by habitat loss and modification as a result of the removal/altention of springs. Therefore, we believe they are substantial enough to constitute viable threats to the species.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

Stephan's riffle beetle has been subjected to a limited number of scientific studies aimed at

determining taxonomy and distribution. The species is not utilized for commercial or recreational purposes. Therefore, this is not known to be a factor threatening the Stephan's riffle beetle.

C. Disease or predation.

We have no information regarding disease or predation for the Stephan's riffle beetle. This is not known to be a factor threatening the Stephan's riffle beetle.

D. The inadequacy of existing regulatory mechanisms.

There are no State, or local government, programs structured to address the conservation of rare and imperiled insects. Jurisdiction over insects lies with the Arizona Department of Agriculture, which does not currently have an insect conservation program. This species is not identified in a State Wildlife Action Plan as the Arizona Game and Fish Department does not have regulatory authority over insects.

E. Other natural or manmade factors affecting its continued existence.

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

Periods of drought in the southwest are not uncommon. But, the frequency and duration of dry periods may be altered by climate change. Global climate change and associated effects on regional climatic regimes, is not well understood, but the predictions for the Southwest indicate less overall precipitation and longer periods of drought. Seager *et al.* (2007, p. 1181) predict, based on broad consensus among 19 climate models, that the southwest will dry in the 21st century and that the transition to this drier state is already underway. The increased aridity associated with the current on-going drought, and the 1950s drought will become the norm for the American southwest within a timeframe of years to decades, if the models are correct. Almost certainly this species, along with its habitat, will be affected in some manner by climate change; but the magnitude and extent of the change cannot be quantified at this time.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

In 2007, the U.S. Forest Service acquired funds to conduct updated surveys for the species. Unfortunately, they were unable to procure the appropriate expertise, so no surveys were conducted. The U.S. Forest Service will continue to coordinate with the Service as new information becomes available. Additionally, we have informally contacted the U.S. Forest Service and expressed an interest in developing a candidate conservation agreement. We have also contacted the Arizona Department of Agriculture and expressed an interest in developing an agreement that would allow us to award Section 6 dollars to the State of Arizona for insect conservation. No progress has been made towards these efforts.

SUMMARY OF THREATS

The last known locality for this species has not been surveyed for beetles in 17 years, though relatively recent investigations have revealed that suitable habitat conditions persist. The rarity of this species coupled with habitat loss/degradation and a lack of State and/or local government

insect conservation programs puts this species in danger of extinction. Therefore, we find that the Stephan's riffle beetle is warranted for listing throughout all its range, and, thus, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

The documented loss of habitat and extirpation of a population of Stephan's riffle beetle demonstrates the need to develop a conservation program in coordination with the U.S. Forest Service. Therefore the following conservation measures have been identified: confirm continued persistence, evaluate current distribution, assess habitat needs, and develop and implement conservation measures in coordination with the U.S. Forest Service and academia.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8*
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: All springs that the species is known from have been modified in some manner, though field investigations have revealed that Sylvester Spring continues to provide suitable habitat conditions. The site of the type locality has been entirely dewatered resulting in localized extirpation, though that site was man-made habitat. We believe these threats are biologically significant because they affect the entire range of the species. However, survey data are 17 years old and we have no current information indicating whether the species is extinct or extant. Therefore, we conclude the overall magnitude of threats is moderate to low.

Imminence: Most of the species' habitat is currently maintained in modified conditions. To our knowledge, the U.S. Forest Service has no plans to further modify or restore habitats. Also, threats from recreationists are on-going. Therefore, we conclude that the threats to this species are imminent.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No, because the U.S. Forest Service has no current plans to modify remaining habitat.

DESCRIPTION OF MONITORING

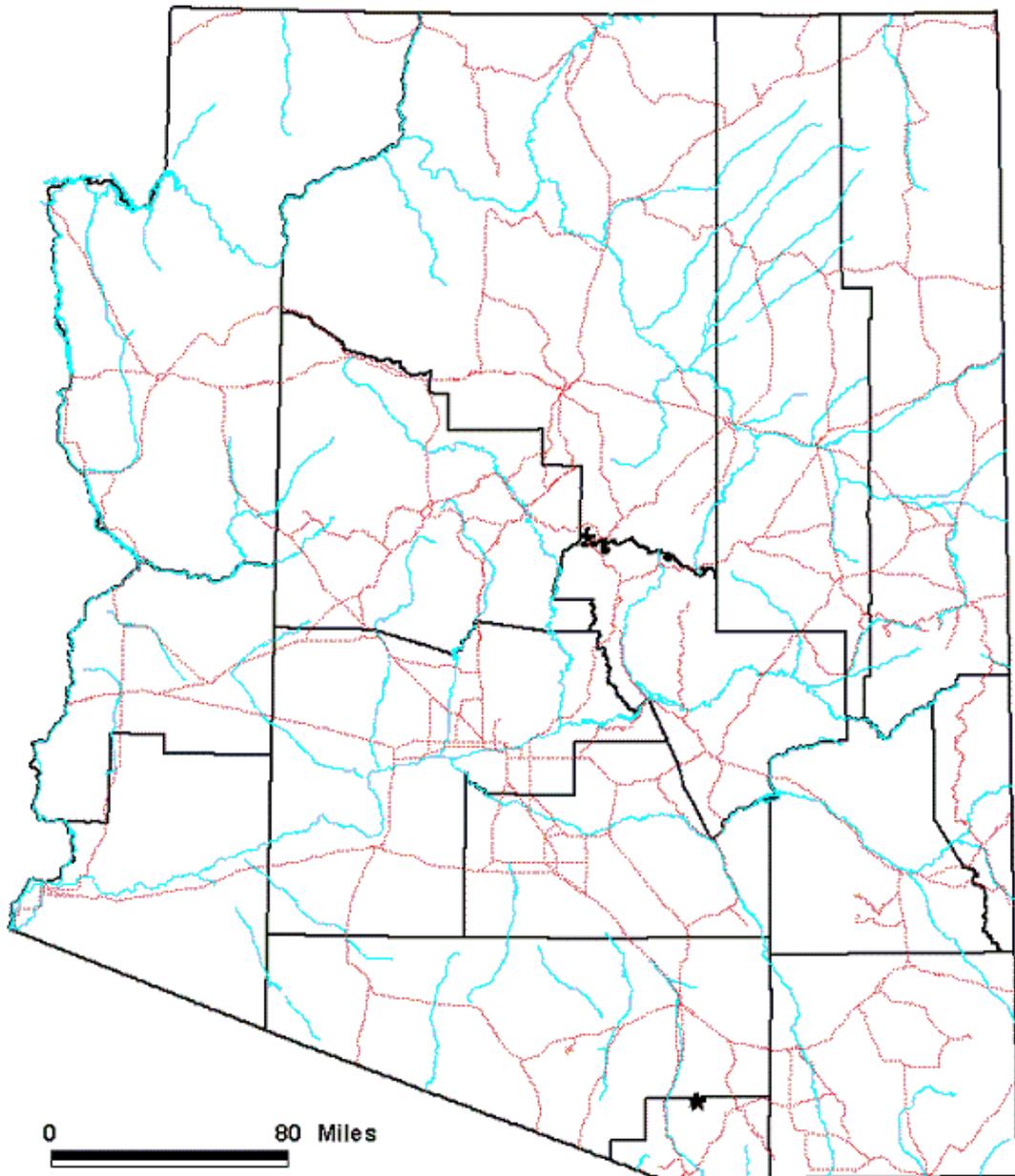
No monitoring of the species has occurred since surveys by Barr and Shepard (1993). The U.S. Forest Service recently attempted to procure a researcher to conduct updated surveys for the species. The effort was not successful. The most recent surveys for the species are 17 years old, though U.S. Forest Service field investigations have revealed the persistence of suitable habitat. When updated information is available, we will re-evaluate the magnitude and immediacy of threats to this species.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Arizona

Indicate which State(s) did not provide any information or comments: N/A

Heterelmis stephani occurrences in Arizona



- ★ **Heterelmis stephani**
- **State highways**
- **Major Waterways**
- **County Lines**

Heritage Data Management System, January 1, 2004.



Heritage Fund
Lottery dollars at work

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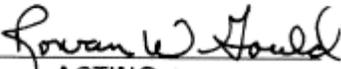
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U.S. Forest Service. 2005. Burned Area Emergency Response Plan, Florida Fire, Wildlife Resources Assessment. Prepared by Debbie Sebesta, Nogales District Wildlife Biologist, Coronado National Forest. 11 pp.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  May 21, 2010
Acting Regional Director, Fish and Wildlife Service Date

Concur: 
ACTING : Director, Fish and Wildlife Service Date: October 22, 2010

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 2010
Conducted by: Mike Martinez