# *Conservation Assessment*
# *for*
# *Tumbling Creek Cavesnail (Antrobia culveri)*

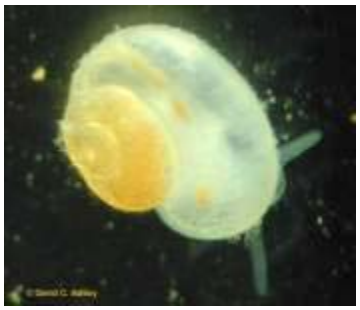

*Photo: David C. Ashley*

## *USDA Forest Service, Eastern Region*

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*This Conservation Assessment was prepared to compile the published and unpublished information on Antrobia culveri. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203*

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## EXECUTIVE SUMMARY

The Tumbling Creek cavesnail is designated as a Regional Forester Sensitive Species on the Mark Twain National Forest in the Eastern Region of the Forest Service. The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve the species.

The Tumbling Creek cavesnail is an imperiled cavernicolous aquatic snail that is known only from Tumbling Creek Cave, Taney County, Missouri. Monitoring of the population of this species demonstrated a seasonal and annual fluctuations from 1996 to 2000. Six surveys conducted in 2001 and two in 2002 failed to demonstrate the presence of Antrobia culveri in the established monitoring stations. Small numbers of snails were found in other sections of the cave stream. This species was emergency listed as an Endangered Species on 27 December 2001, with final ruling on 14 August 2002 (USFWS, 2002).

## NOMENCLATURE AND TAXONOMY

**Classification**: Class Gastropoda
Order Neotaenioglossa
Family Hydrobiidae

**Scientific name**: Antrobia culveri

**Common name**: Tumbling Creek cavesnail

**Synonyms**: none

This species was described by Hubricht (1971) and the taxonomy has been stable since that time. A redescription with SEM micrographs was presented by Hershler and Hubricht (1988).

## DESCRIPTION OF SPECIES

The shell of Antrobia culveri is tiny, between 1.9 to 2.2 millimeters in height. Both the shell and the animal are unpigmented and eyes are absent. Although this species as presently known is restricted to a single cave system, identification otherwise requires a specialist familiar with the systematics of hydrobiid snails.

## LIFE HISTORY

As pointed out by Ashley (2001), little is known about cavesnails in general other than their taxonomy. Greenlee (1974) speculated that the snail fed on aquatic microfauna. The snails were concentrated in parts of the cave adjacent to quantities of bat guano, leading to the supposition that the snails were at least indirectly dependent on the guano as a food source.

Little is known of the life history of Antrobia culveri. Shell length analysis by Ashley (2000, 2001) based on data spanning 1996-2000 revealed that Antrobia exhibited a slight, but not statistically significant, peak during the summer months. Ashley also analyzed shell lengths during the fall season of 1997-2000 and noted a decrease in the frequency of smaller shells during that period. The conclusion was that fewer snails and fewer smaller snails (in younger age cohorts) were seen during the fall monitoring visits of 1997-2000. This suggested a reduction in recruitment of younger age cohorts during this period (USFWS, 2002).

## HABITAT

In general, Antrobia culveri is an obligate cavernicole known only from the cave stream in Tumbling Creek Cave, where it is found on the undersides of stones. Greenlee (1974) reported that the snails were found primarily on "3 inch gravel substrate", with a few snails seen in the recesses of a solid rock stream bottom. Subsequent monitoring (Ashley, 2000; 2001) has not documented the use of the solid rock bottom of the stream by the snails, with most observations being on rocks of various sizes. Greenlee (1974) indicated that Antrobia was absent from areas where guano was found, but subsequent observers have documented the presence of the snails in areas with guano (USFWS, 2002). Greenlee (1974) indicated that the snails preferred areas of the stream that lacked silt, but Ashley (2000) found no significant correlation, i.e., differences in the number of snails present in silted versus silt-free areas. There are some indications that silt deposition may serve to cement the stones usually inhabited by the snails, making them uninhabitable (USFWS, 2002).

## DISTRIBUTION AND ABUNDANCE

Antrobia culveri is known only from Tumbling Creek Cave, Taney County, Missouri (Figure 1). The history of population monitoring of this species is summarized in some detail by the USFWS (2002). Germane here are the population estimates conducted between 1996 to 2001 (Ashley, 2001). In a monitoring area of the cave the population was demonstrated to have vacillated greatly:

| Date | Population estimate |
|---|---|
| 9 Sept 1996 | 435 |
| 3 Sept 1997 | 1166 |
| 6 Dec 1997 | 157 |
| 21 Feb 1998 | 39 |
| 25 May 1998 | 509 |
| 17 July 1998 | 497 |
| 26 Sept 1998 | 307 |
| 13 Feb 1999 | 100 |
| 29 July 1999 | 55 |
| 12 May 2000 | 233 |
| 28 July 2000 | 69 |
| 7 Oct 2000 | 106 |
| 11 Jan 2001 | 0 |
| 17 Mar 2001 | 0 |
| 8 May 2001 | 0 |
| 16 July 2001 | 0 |
| 31 Aug 2001 | 0 |

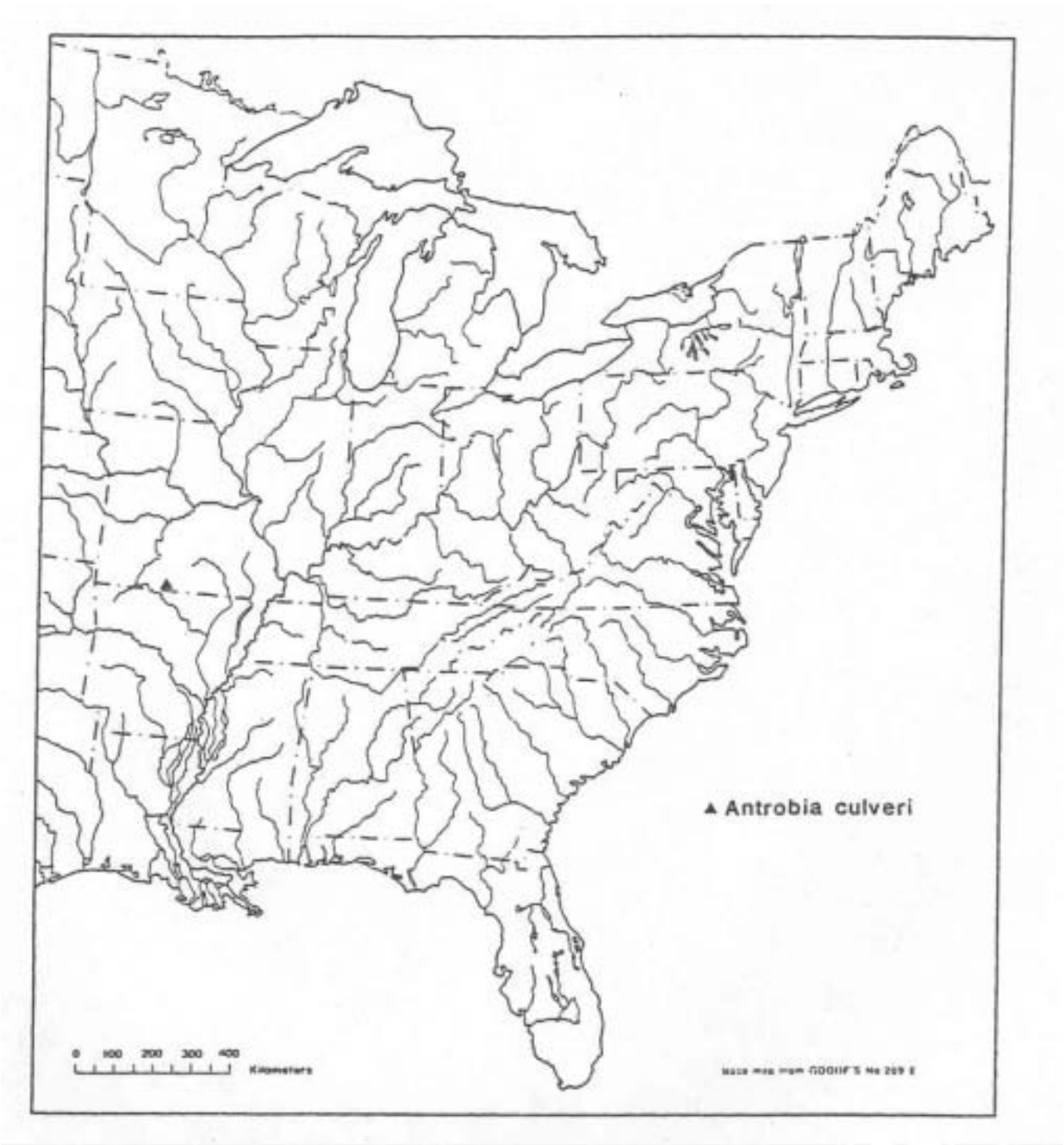
Antrobia culveri could not be found during any of the censuses conducted in 2001. However, the snail was found to be present in another area upstream of the census area (Ashley, 2001). In addition to the above data, the trend has continued as demonstrated by two additional monitoring surveys conducted in 2002, in which no snails were found in the traditional census areas (USFWS, 2002).

## RANGEWIDE STATUS

**Global Rank**: G1 critically imperiled; The global rank of G1 is assigned to species that are known from between 1-5 localities. Antrobia culveri is known from only one cave. The species was emergency listed as a Federal Endangered Species on 27 December 2001, with final ruling on 14 August 2002 (USFWS, 2002).

**Missouri State Rank**: S1 critically imperiled; Similarly, the state rank of S1 is assigned to species that are known from between 1-5 localities in the states. The species was listed as a State Endangered Species on 27 November 2001.

**Figure 1.** *The distribution of Antrobia culveri (modified from Hershler and Hubricht, 1988).*



## POPULATION BIOLOGY AND VIABILITY

As noted above, the viability of this species is in question. It is unknown whether the decline in population estimates is from normal variation or due to some other factor (Ashley, 2001).

## POTENTIAL THREATS

The reason for the decline of Antrobia culveri is unknown, but is thought to be related to habitat degradation due to decline in water quality entering the groundwater system from upstream locations that have been unprotected and/or improperly managed. Water turbidity has reportedly increased in Tumbling Creek Cave in recent years with speculation that resulting siltation from sediment load in the water has degraded the snail's habitat. The owners of the cave have noted that clay settling on the stream substrate cements the gravel and eliminates the interstices used by the snails (Ashley, 2000; 2001; USFWS, 2002).

In the recharge area of Tumbling Creek Cave, two prominent possibilities for silt sources include a broken earthen dam and an pasture severely eroded due to overgrazing. In one area pasture expansion by bulldozing within the riparian corridor to intermittent streams has accelerated soil erosion (USFWS, 2002).

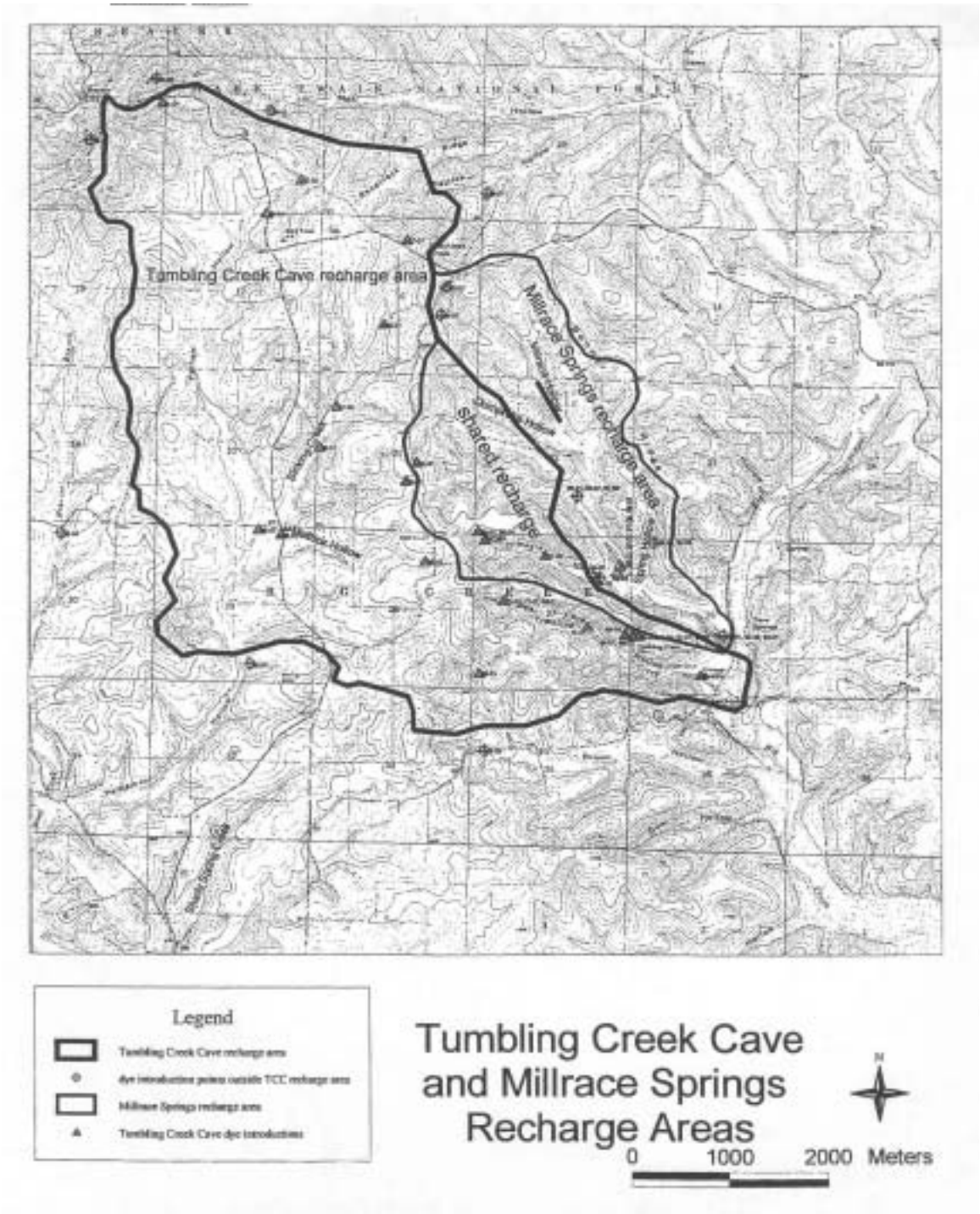
Other factors occurring within the recharge area of Tumbling Creek Cave that might be contributing to groundwater degradation were listed by USFWS (2002): (1) nutrient enrichment from livestock feedlots or fertilizers; (2) chemicals used for highway maintenance or from accidental spills; (3) contamination from trash or hazardous waste deposited on the karst terrain; or (4) contamination from hormones, antibiotics, disinfectants, or other chemicals found in animal or human waste.

Possible biological factors affecting the cavesnail include a limpet (Ferrisia sp.) invasion and the documented decline of the Gray bat colony in the cave. The reason for the presence of limpets in Tumbling Creek Cave remains a mystery. Out-competition of Antrobia for habitat, food or some other resource is one of the possibilities for the decline of the cavesnail (USFWS, 2002).

## SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

Tumbling Creek Cave is owned by the Ozark Underground Laboratory. The cave lies outside of the proclamation area of the Mark Twain National Forest, although 24% of the recharge area of the cave is within the national forest (figure 2).

**Figure 2.** *The recharge area of Tumbling Creek Cave, the only known locality of Antrobia culveri.*



## SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

Antrobia culveri was listed as a Federal Endangered Species on 27 December 2001. The Tumbling Creek cavesnail was included in the Mark Twain National Forest Programmatic Biological Assessment in September, 1998. On 23 June 1999, the U.S. Fish & Wildlife Service concurred with a "may affect, not likely to adversely affect" determination for the species.

## RESEARCH AND MONITORING

Population estimates of this species have been conducted since 1996 by (Ashley, 2001). Dr. David C. Ashley, Western Missouri State College and Dr. Paul McKenzie, U.S. Fish & Wildlife Service, are leading the studies on the Tumbling Creek cavesnail, in cooperation with Tom Aley, owner of the cave.

## RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

## REFERENCES


Ashley, David C. 2000. Monitoring project to evaluate the population status of the Tumbling Creek Cavesnail (Antrobia culveri). Progress report to U. S. Fish and Wildlife Service, Columbia, MO. 19 pages.

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